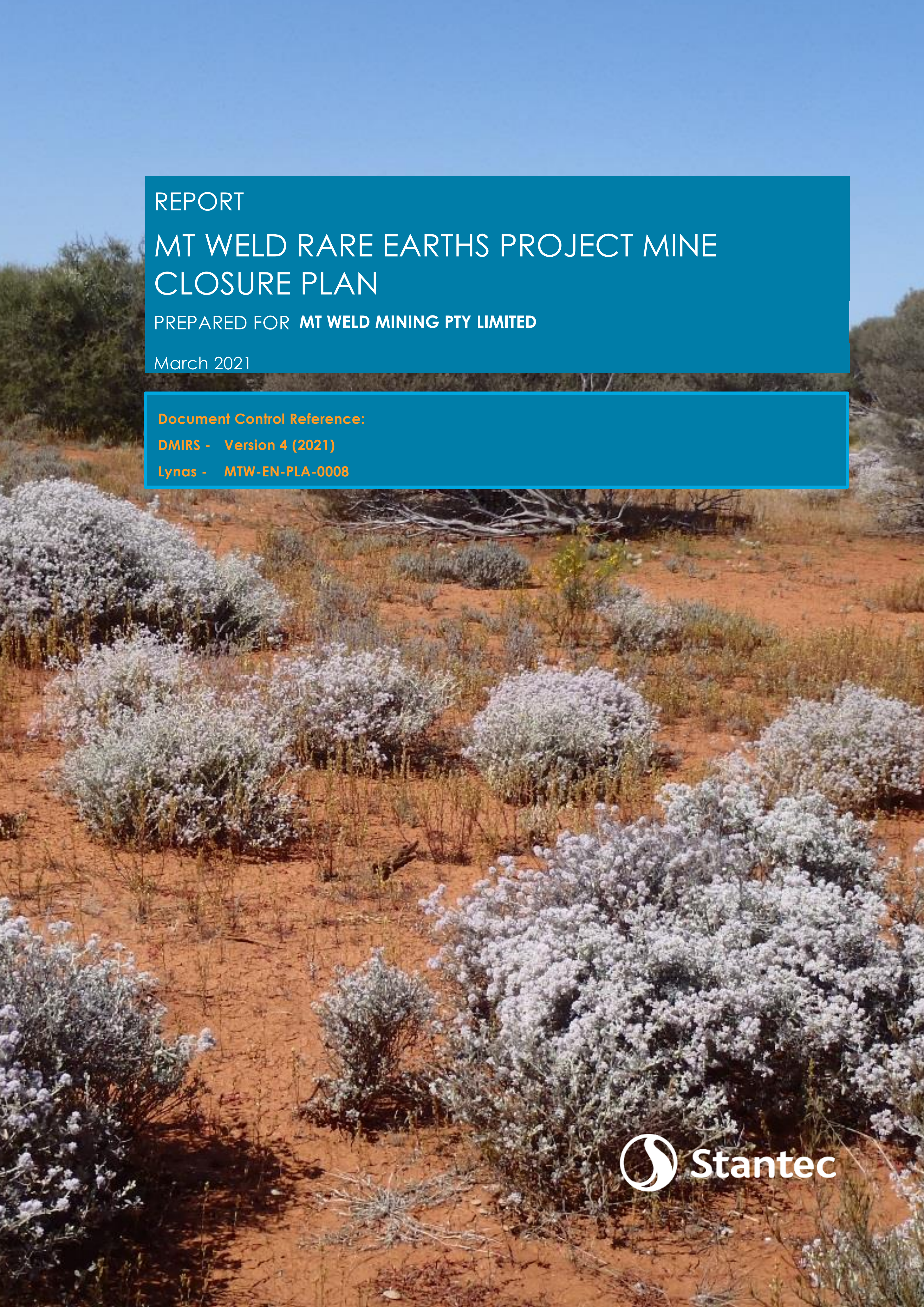

REPORT

MT WELD RARE EARTHS PROJECT MINE CLOSURE PLAN

PREPARED FOR **MT WELD MINING PTY LIMITED**

March 2021

Document Control Reference:

DMIRS - Version 4 (2021)

Lynas - MTW-EN-PLA-0008

Stantec

QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Tracy Schwinkowski	Kim Bennett

PREPARED BY		
Petina Wallace	…………………………………………	……/……/……
CHECKED BY		
A Cargill	…………………………………………	……/……/……
REVIEWED BY		
Kim Bennet	…………………………………………	……/……/……
APPROVED FOR ISSUE BY		
Kim Bennett	…………………………………………	…30/03/2021

PERTH
Ground Floor, 226 Adelaide Terrace
PERTH WA 6000
TEL +61 (08) 6222 7000

REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
A	18/11/20	Draft Closure Plan	P. W	K. B	A.C	K. B
0.20	24/12/20	Draft Closure Plan			A.C, C. Torrisi & K. McElroy	
1.1	30/03/2021	Final	K. B			K. B

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ACRONYMS AND ABBREVIATIONS	
AMD	Acid and Metalliferous Drainage
ARI	Annual Recurrence Interval
ASLP	Australian Standard Leaching Procedure
Bq	Becquerel (activity of a quantity of radioactive material)
Bq/g	Becquerel per gram
BCM	Bankable Cubic Meters
CCI	Chamber of Commerce and Industry
CME	Chamber of Minerals and Energy
DDW	De-ionised Water
BoM	Bureau of Meteorology
BOS	Blended Ore Stockpile
CS Act	Contaminated Sites Act (WA) 2003
m^3	Cubic metres
DEM	Digital Elevation Model
DOH	Department of Health
DMIRS	Department of Mines, Industry, Regulation and Safety
DWER	Department of Water and Environment Regulation
DPLH	Department of Planning, Lands and Heritage
EC	Electrical Conductivity
EDC	Eastern Diversion Channel
EFA	Ecosystem Function Analysis
EP	Evaporation Pond
EP Act	Environmental Protection Act 1986
ERT	Emergency Response Training
ETD	Enhanced Tailings Deposition
ha	Hectares
GSGM	Granny Smith Gold Mine (Gold Fields)
GL	Gigalitres
HDPE	High Density Polyethylene
kL	Kilolitres
km	Kilometres
LAA	Lands Administration Act 1997 (WA)
LCR	Legal Compliance Register
LFA	Landscape Function Analysis
Lynas	Lynas Rare Earths Limited
LoM	Life of Mine
m	Metres
magl	Metres Above Ground Level

ACRONYMS AND ABBREVIATIONS	
MAR	Managed Aquifer Recharge
mbgl	Metres Below Ground Level
MCP	Mine Closure Plan
mg/l	Milligrams per Litre
Mining Act	Western Australian *Mining Act 1978*
mm	Millimetres
mRL	Metres Relative Level
MSIR	Mine Safety and Inspection Regulations 1995
mSv	MilliSievert (unit of dose equivalent radiation)
Mt	Mount
MW	Megawatts
MWS	Mineralised Waste Stockpile
NAF	Non-Acid Forming
NAG	Net Acid Generation
NAPP	Net Acid Production Potential
NORM	Naturally Occurring Radioactive Material
PAW	Plant Available Water
pH	Degree of alkalinity/ acidity
ppm	parts per million
PSI	Preliminary Site Investigation
REO	Rare Earths Ore
RO	Reverse Osmosis
ROM	Run-of-mine
RWP	Return Water Pond
SRE	Short Range Endemic
SWL	Standing Water Levels
Sv	Sievert (unit of dose equivalent radiation)
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
t	Tonnes
tpa	Tonnes per Annum
tph	Tonnes per hour
WA	Western Australia
WRL	Waste Rock Landform

1. Cover Page, Checklist and Corporate Endorsement

1.1 Cover Page Details

Mine Closure Plan Requirements	
Title of Project	Mt Weld Rare Earths Project
Site Name and Code	Mt Weld Rare Earths Project (J00772)
Version Number	MTW-EN-PLA-0008_2
Date	31/03/2021
Tenement(s)	M38/58, M38/59, M38/326, M38/327 and L38/98
Tenement Holder or Authorised Company/Person	Chris Torrisi General Manager Email: Chris.Torrisi@lynascorp.com Website: www.lynascorp.com Mt Weld Mine Site, Elora Road, Laverton, WA, 6440 T: +61 8 9031 1645 F: +61 8 9031 1909

1.2 Checklist: Mine Closure Plan

Q No	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No	Comments	Changes from previous version	Page No.	Summary
1	Has the Checklist been endorsed by a senior representative within the tenement holder/operating company? (See bottom of Checklist.)	Y					
Public Availability							
2	Are you aware that all approved MCPs will be made publicly available?	Y		NA			
3	Is there any information in this MCP that should not be publicly available?	N		NA			
4	If "Yes" to Q3, has confidential information been submitted in a separate document/section?	NA		NA			
Cover Page, Table of Contents							
5	Does the MCP cover page include • Project Title • Company Name\Contact Details (including telephone numbers and email addresses) • Document ID and version number • Date of submission (needs to match the date of this checklist)	 Y Y Y Y Y Y	Page 1		Update to reflect new guidance requirements		
Scope and Purpose							
6	State why the MCP is submitted (as part of a mining proposal, a reviewed MCP or to fulfil other legal requirements)	Y	N/A	Triennial Review, as stipulated in tenement conditions and as part of a MP.	N		

Q No	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No	Comments	Changes from previous version	Page No.	Summary
Project Overview							
7	Does the project summary include: • Land ownership details (include any land management agency responsible for the land / reserve and the purpose for which the land / reserve (including surrounding land) is being managed) • Location of the project • Comprehensive site plan(s) • Background information on the history and status of the project.	Y					
Legal Obligations and Commitments							
8	Does the MCP include a consolidated summary or register of closure obligations and commitments?	Y					
Stakeholder Engagement							
9	Have all stakeholders involved in closure been identified?	Y					
10	Does the MCP include a summary or register of historic stakeholder engagement with details on who has been consulted and the outcomes?	Y					
11	Does the MCP include a stakeholder consultation strategy to be implemented in the future?	Y					
Post-mining land use(s) and Closure Outcomes							
12	Does the MCP include agreed post-mining land use(s), closure outcomes and conceptual landform design diagram?	Y					Conceptual landform design diagrams are presented where available.

Q No	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No	Comments	Changes from previous version	Page No.	Summary
13	Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?	Y					
14	Has any soil or groundwater contamination that occurred, or is suspected to have occurred, during the operation of the mine, been reported to DWER as required under the *Contaminated Sites Act 2003*?	N		Reported to DWER under a Section 72 Waste Discharge Notification.			
Development of Completion Criteria							
15	Does the MCP include an appropriate set of specific completion criteria and closure performance indicators?	Y					
16	Does the MCP include baseline data (including pre-mining studies and environmental data)?	Y					
17	Has materials characterisation been carried out consistent with applicable standards and guidelines (e.g., GARD Guide)?	Y					
18	Does the MCP identify applicable closure learnings from benchmarking against other comparable mine sites?	N					
19	Does the MCP identify all key issues impacting mine closure objectives and outcomes (including potential contamination impacts)?	Y					
20	Does the MCP include information relevant to mine closure for each domain or feature?	Y					

Q No	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No	Comments	Changes from previous version	Page No.	Summary
Identification and Management of Closure Issues							
21	Does the MCP include a gap analysis/risk assessment to determine if further information is required in relation to closure of each domain or feature?	Y					
22	Does the MCP include the process, methodology, and has the rationale been provided to justify identification and management of the issues?	Y					
Closure Implementation							
23	Does the MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?	Y					
24	Does the MCP include a closure work program for each domain or feature?	Y					
25	Does the MCP contain site layout plans to clearly show each type of disturbance as defined in Schedule 1 of the MRF Regulations?	Y					
26	Does the MCP contain a schedule of research and trial activities?	Y					
27	Does the MCP contain a schedule of progressive rehabilitation activities?	Y					
28	Does the MCP include details of how unexpected closure and care and maintenance will be handled?	Y					
29	Does the MCP contain a schedule of decommissioning activities?	Y					

Q No	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No	Comments	Changes from previous version	Page No.	Summary
30	Does the MCP contain a schedule of closure performance monitoring and maintenance activities?	Y			Y		
Closure Monitoring and Maintenance							
31	Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?	Y			N		
Financial Provisioning for Closure							
32	Does the MCP include costing methodology, assumptions and financial provision to resource closure implementation and monitoring?	Y			Y		
33	Does the MCP include a process for regular review of the financial provision?	Y					
Management of Information and Data							
34	Does the MCP contain a description of management strategies including systems, and processes for the retention of mine records?	Y					

1.3 Corporate Endorsement

"I hereby certify that to the best of my knowledge, the information within this mine closure plan and checklist is true and correct and addresses all the requirements of the Guidelines for Mine Closure Plans approved by the Director General of the Department of Mines, Industry Regulation and Safety.

Name: Chris Torrisi ______________________________ Signed: ______________________________

Position: General Manager ______________________ Date: 31 March 2021

(NB: The corporate endorsement must be given by tenement holder(s) or a senior representative authorised by the tenement holder(s), such as a Registered Manager or Company Director).

2. Project Summary

2.1 Purpose

The following mine closure plan (MCP) has been revised and updated for the Mount (Mt) Weld Rare Earth Project (Mt Weld Project) on behalf of Mt Weld Mining Pty Ltd (Mt Weld). Mt Weld is a wholly owned subsidiary of Lynas Rare Earths Limited (Lynas).

This MCP has been compiled to accompany a Mining Proposal (MP) for the Stage 4 open pit cutback and associated mining infrastructure. Additionally, this MCP also satisfies tenement conditions requiring the submission of an MCP, in accordance with the Western Australia (WA) 2020 Statutory Guidelines for Preparing Mine Closure Plans (the Guidelines). Specifically, those MCP guidelines and the 2010 amendments to the Mining Act 1978 (Mining Act), which stipulate that an approved MCP must be reviewed, updated and submitted to the Department of Mines, Industry Regulation and Safety (DMIRS) three years after the initial MCP approval or such other time as approved in writing by a prescribed officer.

The 2017 MCP was compiled to accompany the MP for the expansion of the Process Plant, construction of Tailings Storage Facility 3 (TSF 3) and implementation of the Managed Aquifer Recharge system in accordance with the joint Department of Mines and Petroleum[1]/ Environmental Protection Authority Guidelines for Preparing Mine Closure Plans (2015). This MCP was approved as REG ID: 71255 on the 14th December 2017. The 2015 MCP was developed for the Project by MWH (now Stantec), on behalf of Mt Weld Mining, to meet the tenement conditions requirements for the Project; this was approved as REG ID: 54212 on the 8th September 2016.

Accordingly, this MCP represents an update to the 2017 MCP and includes additional features presented within the accompanying MP document. Furthermore, the MCP has been developed in consideration of feedback from the DMIRS on the 14th December 2017 MCP version (REG ID 75569) (**Section 13.2**).

This MCP has also been prepared in accordance with:

- *Mining Act 1978* (WA);
- *Mines Safety and Inspection Regulations 1995* (WA) [MSIR]; and
- *Contaminated Sites Act 2003* (WA) [CS Act].

This MCP fulfils the requirement for a plan outlining the decommissioning of the Project facilities in accordance with the 1995 MSIR and the requirements of the Department of Water and Environmental Regulation (DWER)[2]. This plan addresses:

- removal, or if appropriate, disposal on-site of plant and infrastructure;
- rehabilitation of all disturbed areas to agreed final land use(s); and
- the process for the identification of contaminated sites.

A comprehensive list of relevant legislation and regulatory guidance documents pertaining to mine closure that have been referred to when preparing this MCP is provided in **Section 3**.

Planning for mine closure and rehabilitation needs to be undertaken in an effective and progressive manner in order to prevent and minimise adverse long term environmental, social and economic impacts. Mt Weld Mining is cognisant that effective and progressive mine closure planning is a prerequisite for the creation of stable, safe, and non-polluting landforms suitable for the agreed post mining land use. In general, mine closure works aim to:

- minimise the footprint of operations upon closure;
- determine the optimum strategies for effective closure and rehabilitation of the mine site;
- progressively rehabilitate disturbed areas during the mine life; and
- monitor the site during operations and upon completion of rehabilitation activities to demonstrate compliance with closure objective.

[1] The Department of Mines and Petroleum (DMP) underwent a change of name to the Department of Mines, Industry, Regulation and Safety (DMIRS) on 1 July 2017. Publications produced by DMP have been continued to be referenced as such. [2] The Department of Water (DoW), the Department of Environmental Regulation (DER) and the Office of the Environmental Protection Authority (OEPA) merged on 1 July 2017 to become the Department of Water and Environmental Regulation (DWER). Publications produced by either agency have been continued to be referenced as such.

This MCP has been prepared to accompany a revised MP submission with the aim of enabling Mt Weld Mining to close the Mt Weld Project so that all closure obligations are met and there are no unacceptable liabilities to the State of Western Australia. These core goals have been instrumental when developing this revised MCP.

2.2 MCP Structure

This MCP sets out a strategic approach to ensure the closure of the Mt Weld Project. The plan is set out in accordance with the 2020 Guidelines sections as follows:

- Cover Page, checklist and corporate endorsement
- Project summary;
- Identification of closure obligations and commitments;
- Stakeholder engagement;
- Collection and analysis of baseline and closure data;
- Post-mining land use;
- Closure risk assessment;
- Development of Closure outcomes and completion criteria;
- Closure implementation;
- Closure monitoring and maintenance;
- Financial provisioning for closure;
- Management of information and data; and
- Reviewed mine closure plans.

All the knowledge gaps presented within this MCP have been refined based on the current level of understanding. The current overarching (site-wide) gaps are presented in **Section 9.3,** with feature-specific gaps also presented within each Domain in **Section 9**. The allocation of an appropriate timeframe to close out the gaps has also been captured within this MCP. Where feasible, the information relevant to closure will be incorporated into the next iteration of the MCP. All the knowledge gaps and associated tasks identified within this MCP have been collated and presented in **Appendix E**.

2.3 Project Setting, Ownership, Tenure and MCP Scope

The Project is located approximately 35 kilometres (km) southeast of Laverton, and approximately 10 km southeast of the existing Gold Fields Granny Smith Gold Mine (GSGM) in the North-Eastern Goldfields Region of WA (**Figure 2-1**). The Project is located in the Mt Margaret Mineral Field (**Section 2.3**) on the Mt Weld Pastoral Station which is currently held by GSGM.

The Laverton Shire covers an area of 183,198 km^2 with an estimated resident population of 871 people (2016 census, ABS 2020). The major locality within the Shire is the town of Laverton. The local industries comprise of mining (gold, nickel, and rare earth minerals), light industrial, commercial/retail, pastoralism and tourism. Past and present land use in the vicinity of the Project, is summarised in **Section 5.1.2**.

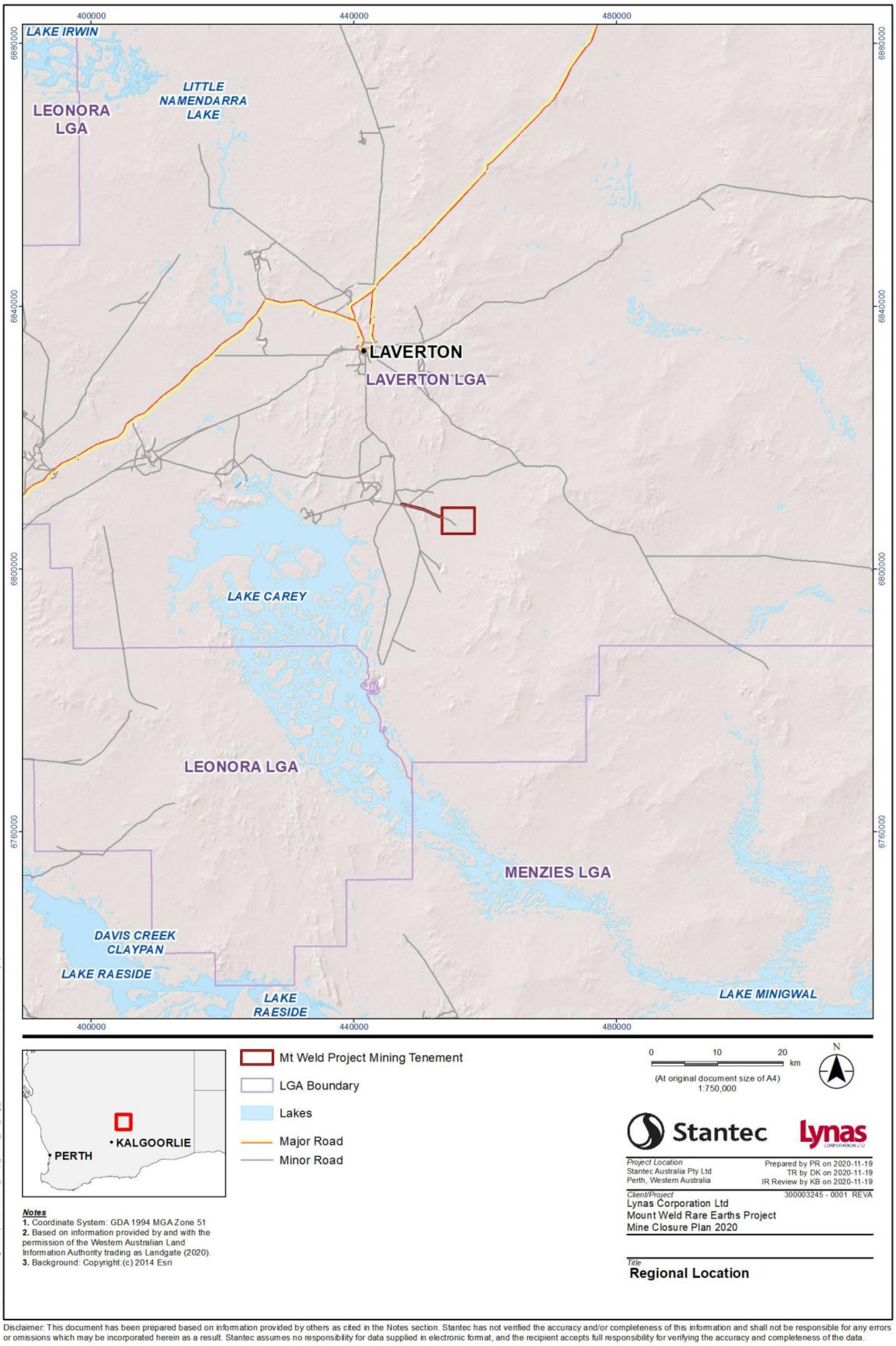

Figure 2-1: Regional location of the Mt Weld Rare Earths Project

The scope of this MCP has been defined by the list of tenements held by Mt Weld Mining Pty Ltd which have the following tenement condition requiring the submission of an MCP: 'A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMIRS. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans, available on the DMIRS website: 2020.'

Mt Weld Mining Pty Ltd, currently holds five tenements, which cover an area of 2,064.25 hectares (ha), comprising four Mining Leases and a Miscellaneous Licence (**Table 2-1, Figure 2-2**), which have a condition requiring the submission of an MCP. This MCP addresses the closure of these five tenements (**Table 2-1**) and the associated infrastructure. Although it reflects the current state of closure planning, once accepted, this MCP is intended to be continually reviewed and updated over the life of the mine.

Table 2-1: Tenements of the Mt Weld Project

Tenement	Type	Grant Date	End Date	Area (ha)
M 38/58	Mining Lease	20/11/1984	25/11/2026	931.1
M 38/59	Mining Lease	20/11/1984	25/11/2026	859.55
M 38/326	Mining Lease	15/11/1991	26/11/2033	104.6
M 38/327	Mining Lease	15/11/1991	26/11/2033	104.5
L 38/98	Miscellaneous Lease	14/08/2013	13/08/2034	64.5

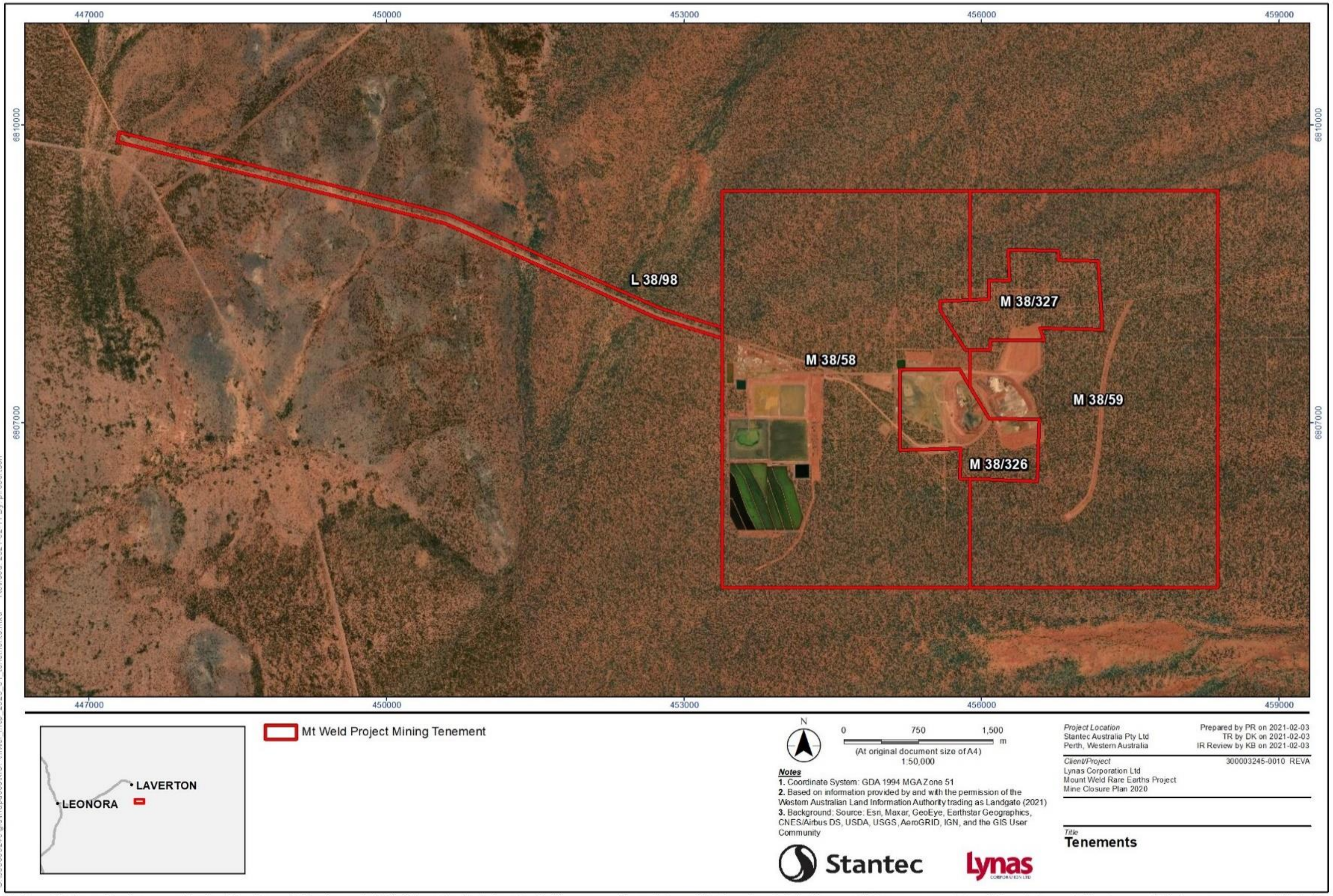

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Figure 2-2: Mt Weld 2021 MCP Tenements

2.4 Project History

A summary of the Project approval and mining history is tabulated below in **Table 2-2**.

Table 2-2: Mt Weld Project History

Date	Event
1966	Recognition of a strong, circular magnetic anomaly detected in the course of an airborne survey carried out by the Australian Bureau of Mineral Resources, and Mt Weld carbonatite deposit discovered
1967	Utah Development Company pegged the area and later confirmed by drilling, the presence of the carbonatite intrusion bearing rare earth ore lying beneath 20 to 50 metres (m) of superficial sediments.
November 1992	Ministerial Statement 290 granting rare earths mining and beneficiation at Mt Weld, Laverton and secondary processing at Meenaar, near Northam.
May 1998	Revised Ministerial Statement 476 (MS 476) granted with amended conditions.
May 2003	Attachment 1 to MS 476 - Change to Proposal granted with amendment to Schedule 1, Key Characteristics Table.
June 2003 – March 2004	Knight Piesold Pty Ltd (KP) completed the initial TSF 1 and evaporation pond design which was incorporated into a Notice of Intent in June 2003. Following some changes to the basis of design, KP issued a design report addendum in March 2004.
May 2007	Project was commissioned, and mining commenced.
February 2005	Attachment 2 to MS 476 - Change to Proposal granted with amendment to Schedule 1, Key Characteristics Table and change to transport route to allow transport of concentrate through Fremantle or Esperance.
July 2006	Attachment 3 to MS 476 - Change to Description of Proposal granted with amendment to Schedule 1. Construction of an access road requiring vegetation clearance, between the Mt Weld Mine Site and the Mt Weld-Elora Road.
June 2008	Completion of the initial mining campaign of 773,300 tonnes (t) of material, which was stockpiled according to grade and mineralogical characteristic. Of the total material extracted, 409,000 t was Cz (monazite rich siltstone) ore type (high grade rare earths phosphate ore) and 364,000 t was Li material (limonite-cemented rare earths phosphate). A Mining Proposal (MP) incorporating construction of TSF 1 was submitted and approved by June 2008.
December 2008	Worley Parsons Services Pty Ltd undertook geotechnical investigations and completed a design report for the concentration plant and associated infrastructure, including a design for TSF 1 and the evaporation ponds.
May 2011	The final design of TSF 1 was completed by KP and the facility was constructed and commissioned in May 2011. Processing of ore commenced.
January 2012	Attachment 4 to MS 476 - Change to Proposal granted with amendment to Schedule 1. Key Proposal Characteristics Table, incorporating Stage 2 Expansion of Operations, and Revised Regional Location Map (Figure 1), Location of Existing Infrastructure (Figure 2), and Waste Dump Footprint (Figure 3).
April 2013	Phase two project expansion completed which lifted the design capacity of the processing plant to 30.3 tonnes per hour (tph).
October 2013	Licence amendment to allow for pilot plant trial of tailings dewatering plant (screw press, dewatering system and thickener).
November 2013	Plant operation reached the design rate. The plant has the capability to process 242,072 tonnes per annum (tpa).

Date	Event
December 2013	Attachment 5 to MS 476 - Change to Proposal granted with amendment to Schedule 1. Changes to Schedule 1 included: • Increase "Life of project" from 20 to 25 years. • Remove "Size of ore body"; • Increase in the "area of disturbance" from approximately <270 hectares (ha) to <370 ha. Of the 100-ha increase in area of clearing, approximately 55 ha is for Mining Campaign 2, the remaining 45 ha is associated with the increase in TSF Area footprint from 27.3 to 67.3 ha (40 ha) and Process Water Pond Facility (5 ha); • Remove "maximum carbon dioxide output"; and • Remove "Development Stages".
March 2014	Submission of a MP to construct Tailings Storage Facility (TSF) 2 and the Tailings Dewatering System. The proposed TSF 2 and Tailings Dewatering System has formed an integral part of the modified process water management at the Mt Weld Project, with the specific objective of addressing the water-balance and tailings consolidation issues previously reported to DMIRS. Pre-emptive dewatering of the carbonatite for Mining Campaign 2 began in March 2014, with the intention to reduce the current Carbonatite water table to 360 m AHD.
November 2014	Submission of a MP for the second mining campaign (Lynas 2014a), for a cut-back to the open pit to the west to extract a further 5,000,000 t of material from the Central Lanthanide Deposit (CLD), of which 80,000 t was to be ore and 4,200,000 t waste rock. Pre-emptive dewatering of the carbonatite for Campaign 2 began in March 2014, with the intention to reduce the current Carbonatite water table to 360 m AHD.
March 2015 – March 2016	A design for TSF 2 was completed by Hatch in March 2015 and the facility was commissioned in March 2016. TSF 2 has a geosynthetic clay liner (GCL).
August 2016	Licence amendment to authorise Category 5 production capacity increase consistent with W5078 (Phase 2 tonnages) and increase to authorise amount of wastewater discharged to the evaporation ponds.
2017	Mining Campaign 1B (MC1B) January 2017 – May 2017. MC1B comprised a deepening of the existing pit footprint. No waste rock was removed during this campaign. MC1B was the first time since 2008 the pit became active. Mining Campaign 2 involved a cutback to the open pit. Commenced in September 2017 and continued to September 2018. Waste rock material was removed to the WRL.
November 2017	Submission of a MP to upgrade the plant, construct TSF 3 and implement Managed Aquifer Recharge; this MP was augmented by an MCP (REG ID; 71255). Amendment Notice 1 – authorise removal of clarifiers and discharge of TSF supernatant direct to evaporation ponds without additional treatment.
December 2017	A design for TSF 3 was completed by ATC Williams (ATCW) in December 2017 and the facility was constructed and commissioned in 2018. TSF 3 is divided into West and East cells and has a compacted in situ clayey sand liner.
January 2018	Attachment 6 to MS 476 - Change to Proposal granted with amendment to Schedule 1: • Inclusion of a third Tailings Storage Facility (TSF 3) to be incorporated into the current approved TSF footprint; and • Remove key characteristics which have no direct environmental impact and are regulated through legislation enforced by other agencies.
December 2018	Mining Campaign 3 commenced, which involved an open pit cut back 80 m from Campaign 2 envelope.

Date	Event
February 2019	Authorise operation of TSF 3, increased production to 443,000 tpa; and use of saline wastewater for dust suppression irrespective of total dissolved solids (TDS) concentration.
February 2020	Completion of Mining Campaign 3 to a depth of 60 m below ground level.
September 2020	Attachment 7 to MS 476 - Change to Proposal granted with amendment to Schedule 1: • Increase in the area of disturbance from 370 ha to 429 ha – an increase of 59 ha: and • An increase in the development envelope from 455 ha to 505 ha (an increase of 50 ha).
2021	Submission of a MP for the Stage 4 open pit cutback and associated mining infrastructure; this MP is augmented by this MCP.

The open pit is mined using a conventional drill and blast method with ore excavated and hauled to the Run of Mine (ROM) Pad, located to the west of the open pit, for storage prior to processing. Overburden is currently hauled directly to the Waste Rock Landform (WRL) located to the east-northeast of the open pit. The current WRL is positioned above the mineral resource and will be relocated during the Life of Mine to the Final WRL.

The ore is sorted and stockpiled on an intermittent basis using a crushing/screening plant in the ROM area. Subsequently, the ore is transferred to the ore stockpiles and blended to a head grade of 15% Rare Earth Oxides (REO), then transferred into the feeder bins by a front-end loader.

Ore is then ground and classified in the comminution circuit before entering the flotation circuit which consists of four stages of roughing/scavenging and two stages of cleaning. Reagents are added at each stage. The product (or concentrate) of the flotation circuit contains approximately 33.5% REO. The product is then filtered to reduce the water content to below 18%, dried to 10% moisture then bagged and containerised for transport to the Lynas Advanced Materials Plant in Malaysia for further processing. The construction of the Lynas Kalgoorlie plant will result in concentrate being delivered to Kalgoorlie within the forthcoming three-year Mine Closure Planning period.

Lynas have made numerous improvements to the Concentrator Plant, since the major plant expansion associated with Phase 2, to gradually increase the throughput of the plant and recovery of rare earth minerals.

2.5 Project Life of Mine

As of 2020, the operational Life of Mine (LoM) at the Mt Weld Project based on current ore reserves is expected to be 24 years. On this basis, mining is anticipated to cease in 2044 and closure is planned for 2045. Mt Weld has an internal business objective to maintain 20 years of ore reserves. Practically, declared mineral resources will be drilled and economic factors assessed to convert resources to ore reserves as per the Joint Ore Reserves Committee (JORC) code, thus extending the Life of Mine.

Closure scenarios presented in this iteration of the MCP account for current approved disturbance and the proposed disturbance, which is the subject of the 2021 MP application. The relatively long mine life allows sufficient time to implement trials and close out the knowledge gaps identified within this MCP. To this end, it is likely that further MPs and accompanying MCPs will be submitted to DMIRS for approval which capture further project expansion.

Mining Campaign 4 is proposed to commence in February 2022. Mine planning and scheduling is being finalised to consider the Stage 4 envelope which will include several cutbacks over a five year period.

2.6 Project Domains and Features

To facilitate effective mine closure planning, the Project has been divided into a number of physically distinct 'domains' and 'features'. There are seven closure domains applicable to this MCP with a total of 55 features (**Table 2-3**).

The domains are comprised of features that have similar rehabilitation, decommissioning and closure requirements and objectives. An inventory of the 55 features addressed within this MCP, along with the respective domain is presented in **Section 9.1**.

Table 2-3: Summary of Project Domains and numbers of Features

Domain	Number of Features
Landforms	9
Industrial Infrastructure	25
Mining Infrastructure	1
Water Containment Infrastructure	11
Groundwater Infrastructure	5
Roads	2
Exploration Disturbance	2
Total	**55**

An overview of the site, depicting the mine site layout and identifying all disturbed areas as defined in Schedule 1 of the Mining Rehabilitation Fund Regulations 2013, and proposed or existing disturbance types is presented in **Figure 2-3**. A detailed view of the features located within the plant area is presented in **Figure 2-4.**

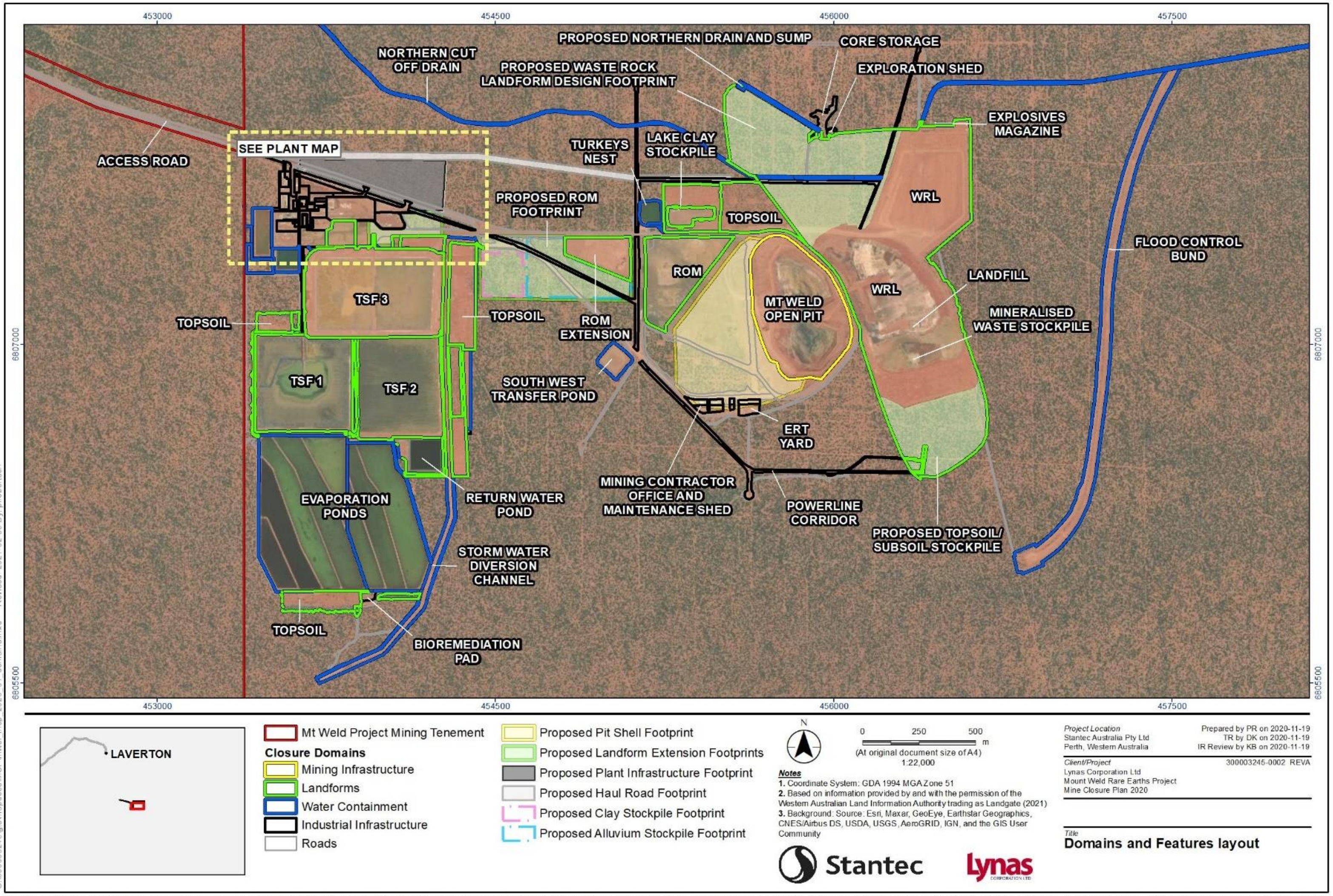

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Figure 2-3: Domains and Features, Overview

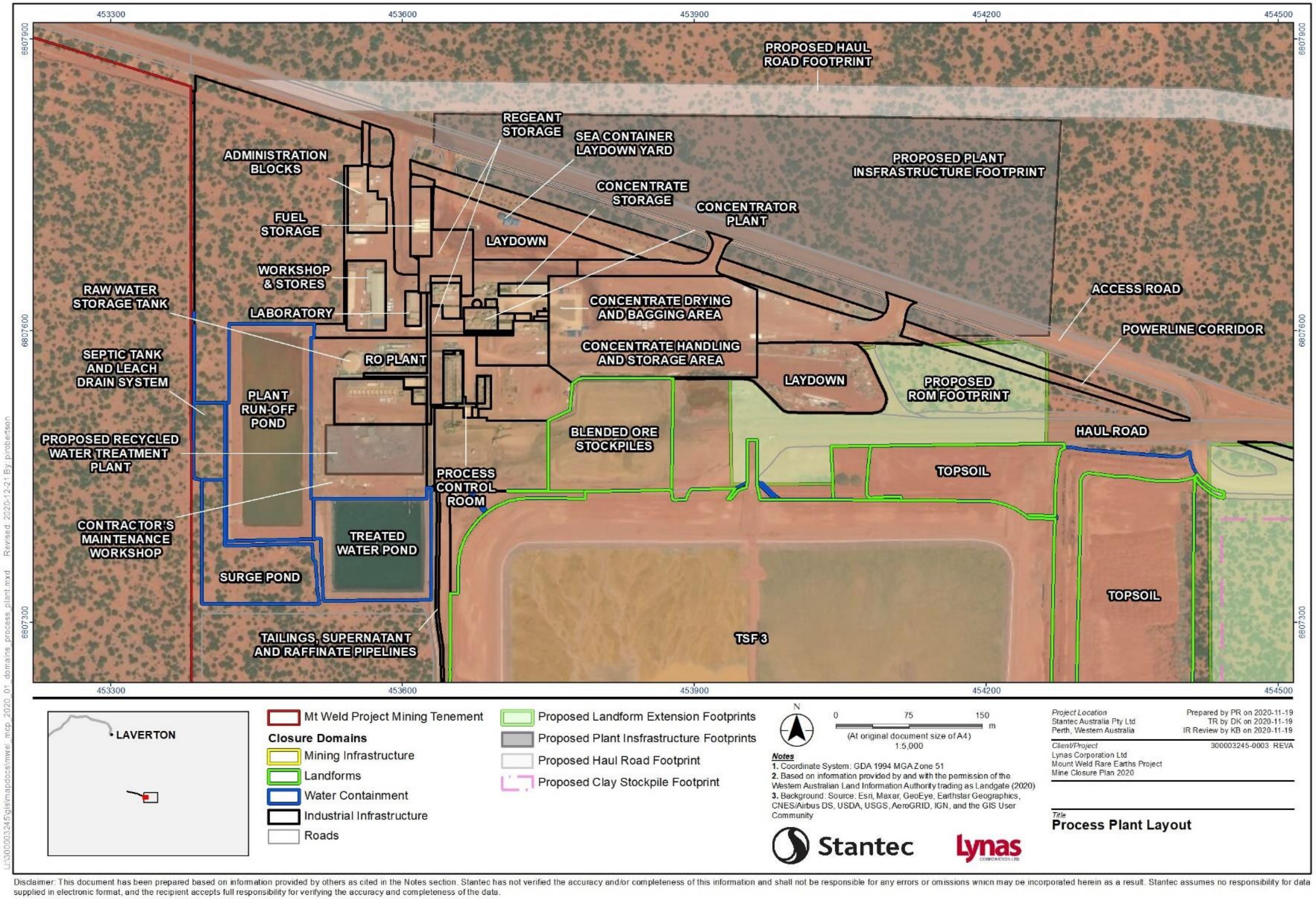

Figure 2-4: Domains and Features, Plant Area

3. Identification of Closure Obligations and Commitments

Legal obligations relevant to rehabilitation and closure of the Project have been identified using records available at the time of compilation of this MCP, these are compiled within a comprehensive Legal Compliance Register (LCR). Mt Weld Mining will continue to update the LCR and maintain it as a live document. The 2021 LCR has been used as a tool to assist with development of the closure implementation tasks for the Project. A condensed version of the LCR is presented in **Appendix A**; this incorporates only those tenements which define the scope of this MCP (as defined in **Section 2.3**).

The LCR includes all legally binding conditions and commitments and legal obligations applicable under relevant State and Federal legislation, including the *Mining Act, MSI Act*, *CS Act* and *Aboriginal Heritage Act 1972 (WA)*. The register also encompasses legally binding conditions included within individual tenement conditions, Mining Proposals, Notices of Intent, Letters of Intent, Programmes of Work, Commitments, current DWER Licence Conditions and all other legally binding documents relevant to the Project.

Decommissioning and rehabilitation of the Project will be conducted in accordance with the general provisions of the following key policy documents and related guidelines:

- Principles of the Strategic Framework for Mine Closure (ANZMEC/ Minerals Council of Australia 2000);
- Mine Closure Handbook (Department of Industry, Tourism and Resources 2016);
- Tailings Management Handbook (Department of Industry, Innovation and Science 2016);
- Mine Rehabilitation, (Department of Industry, Innovation and Science 2016);
- Water and Rivers Commission: Mine Void Water Resource Issues in Western Australia – Hydrogeological Record Series, Report No HG (2003);
- Planning for Integrated Mine Closure: Toolkit; International Council on Mining and Metals (ICMM 2008);
- Integrated Mine Closure: Good Practice Guide, (ICMM 2018);
- Guide to Departmental requirements for the management and closure of tailings storage facilities (TSFs), Government of Western Australia Department of Mines and Petroleum Resources and Safety Divisions, August 2015;
- Australian National Committee on Large Dams Inc. (ANCOLD), Guidelines on Tailings Dams: Planning, Design, Construction, Operations and Closure (May 2012);
- Department of Environment Regulation (DER) (2014) Assessment and Management of Contaminated Sites Guideline, December 2014; and
- all relevant legally binding conditions and commitments.

This MCP has also been prepared with consideration of the key objectives for closure planning included in the Strategic Framework for Mine Closure (ANZMEC & MCA, 2000) which are to:

- protect the environment and public health and safety by using safe and responsible closure practices;
- reduce or eliminate environmental effects once the mine ceases operations;
- establish conditions which are consistent with the pre-determined end land use objectives; and
- reduce the need for long term monitoring and maintenance by establishing effective physical and chemical stability of disturbed areas.

3.1 Summary of Closure Commitments

Mt Weld Mining Pty Limited commit to undertaking the following closure commitments:

1. Re-instate natural hydrology upon closure as far as practicable, ensuring any surface water diversion structures which will be retained post closure are suitable, without impacting the integrity of permanent landform features.
2. Perform the research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule.
3. Undertake the decommissioning tasks identified in the Closure Schedule.
4. Updating the Legal Compliance Register with any new approvals or licences that may be granted following submission of the 2021 MCP.
5. Design landforms within the constraints of the waste material properties, to ensure they are physically (geotechnically) stable, (geochemically) non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.
6. The physical and chemical characteristics of waste materials and the placement within landforms will be utilised as the basis for selecting appropriate target analogues.
7. If the material within the temporary Lake Clay and Alluvium Stockpiles is not utilised prior to closure it will be required to be incorporated into the approved WRL footprint, the Lake Clay material will need to be encapsulated away from the surface due to its physical and chemical characteristics.
8. Ensure surface water management is incorporated into the detailed design of landforms to ensure that runoff is managed to reduce erosion.
9. Source local-provenance seed that is appropriately cleaned and stored for rehabilitation activities.
10. Rehabilitate all disturbed areas to their agreed final land use(s).
11. Install target rehabilitation monitoring analogues on rehabilitated landforms, which are agreed to be representative of post-closure Project landforms, or in representative areas undisturbed by mining.
12. Ensure that current completion criteria become more comprehensive and detailed in future revisions of the MCP, through the inclusion of quantitative standard values.
13. Develop remedial and intervention strategies over the next three years in the event that monitoring demonstrates movement outside of agreed parameters and continue post closure monitoring until agreed completion criteria has been demonstrated to be met.
14. Implement a Stakeholder Engagement Strategy for continued broad-scale consultation with stakeholders that is documented throughout the life of the Project.
15. Remove all infrastructure at closure unless a signed legal transfer of asset agreement is in place.
16. Install abandonment bunds at closure in accordance with Department of Mines, Industry, Regulation and Safety requirements.
17. Undertake a Preliminary Site Investigation (PSI) to progress the mine closure planning and to ensure potentially contaminated sites identified at the Mt Weld project are managed in accordance with the Contaminated Sites Act (WA) 2003 (CS Act).

4. Stakeholder Engagement

Mt Weld Mining's stakeholder engagement process follows the five guiding principles from the Australian and New Zealand Minerals and Energy Council and the Minerals Council of Australia Strategic Framework for Mine Closure (ANZMEC/MCA, 2000). These essentially encompass:

- identification of all stakeholders and interested parties;
- continuous engagement with all parties throughout the LoM;
- a targeted communication strategy which reflects needs of stakeholder groups;
- ensuring adequate resources are allocated for effective engagement; and
- working closely with communities to manage potential impacts of mine closure.

DMIRS are recognised as Mt Weld Mining's key external stakeholder for mine closure. Due to the Project LoM, stakeholder consultation efforts undertaken by Mt Weld Mining subsequent to submission of the 2015, 2017 and this iteration of the MCP has centred on discussions with DMIRS / DWER to obtain project approval.

Mt Weld Mining are committed to implementing the stakeholder engagement strategy presented in **Section 4.3**. The Stakeholder Engagement Register presented in **Appendix B**, is focused on consultation undertaken to date which has relevance to closure planning.

4.1 Stakeholder Identification

A list of Mt Weld Mining's internal and external stakeholder, categorised into groups, is provided below.

Key stakeholders have been engaged in the development of the proposed post mining land use, potential closure objectives and closure criteria and have had the opportunity to comment during the process in both Perth and Laverton. In 2011, Mt Weld Mining together with Outback Ecology (now Stantec) held presentations to key stakeholders on mine closure, in a forum which then led to detailed discussion. The stakeholders' interests/concerns were captured in the development of the original MCP, particularly in the process to determine post-mining land use, closure objectives and outcomes.

4.1.1 Internal Stakeholders

- Mt Weld Mining management team, Mine Manager, Mine Planners and Mining Engineers;
- Mt Weld Mining Environmental management contractors; and
- Mt Weld Mining Contractors.

4.1.2 External Stakeholders

4.1.2.1 Indigenous Groups

- Nyalpa Pirniku are the Registered Native Title Claimants for the Mt Weld area and are represented by Native Title Services Goldfields.

4.1.2.2 Adjacent or Concurrent Land Holders

- Gold Fields Granny Smith Gold Mine (GSGM); and
- Mt Weld Pastoral Company (held by GSGM).

4.1.2.3 State Government Agencies

- Department of Agriculture and Food;
- Department of Biodiversity, Conservation and Attractions;
- Department of Health (DoH) – Radiation Health Branch;
- DMIRS (Safety, Environment and Radiation divisions);
- Department of Planning, Lands and Heritage (DPLH);
  - Aboriginal Heritage;
  - Pastoral Lands Board;
  - Reserves; and
  - State Heritage Office.

- Department of Primary Industries and Regional Development (DPIRD);
- DWER; and
- Radiological Council.

4.1.2.4 Local Government Authorities

- Shire of Laverton.

4.1.2.5 Industry Groups

- Chamber of Minerals and Energy (CME); and
- Chamber of Commerce and Industry (CCI).

4.1.2.6 Community Interest Groups

- Laverton Community Members.

4.2 Consultation Process

Consultation regarding closure of the Project has been undertaken with relevant stakeholders during the development of this MCP (**Appendix B**). Mt Weld Mining has considered internal and external stakeholders in developing the post mining land use, closure outcomes (objectives) and completion criteria for the Project. DMIRS as the key stakeholder has been provided with the opportunity to comment during the process.

The Mt Weld Pastoral Station, currently held by GSGM, is recognised as a key stakeholder and likely post mining occupier of the Mt Weld Project Area. Mt Weld Mining propose to commence discussions with the pastoralist to ascertain the extent of the infrastructure that will remain post-closure. Mt Weld Mining are cognisant that this may require approval from the Pastoral Lands Board and that the appropriate land holder will have to accept ongoing liability and maintenance of the infrastructure.

Mt Weld Mining are cognisant that any transfer of residual liability to the subsequent owners or land managers, including management of contaminated sites, must be clearly communicated, agreed to and documented, to the satisfaction of the relevant regulators. Mt Weld Mining will ensure that there is an explicit, written legal agreement with the subsequent land managers to accept the mining legacy obligations and any outstanding costs of remediation, monitoring and reporting. Mt Weld Mining will only proceed if they are confident that the subsequent land managers have capacity to take on the responsibility. For any transfer of responsibility for remediation to be recognised under the CS Act, written approval from the Chief Executive Officer of the DWER will be obtained in accordance with section 30 of that Act.

4.3 Future Stakeholder Engagement Strategy

The Stakeholder Engagement Strategy sets out a roadmap for broad-scale consultation with stakeholders, to continue throughout the life of the project. The approach will seek input and feedback on closure criteria, objectives and post-closure land use. Mechanisms for recording stakeholder input, considering stakeholder views and responding back to stakeholders are built into the plan.

The Mt Weld Project has a proposed 24-year LoM and subsequently sufficient time is available to continue stakeholder engagement and address any outstanding knowledge gaps. A Stakeholder Engagement Strategy, which identifies timelines for specific stakeholder engagement to be undertaken throughout the life of the project is presented **Table 4-1**. This approach has been outlined and agreed upon during consultation between Mt Weld Mining and DMIRS in October 2017 (**Appendix B**).

Following broad community consultation and acceptance of the process from stakeholders, Mt Weld Mining is likely to move to consultation with a more refined stakeholder group made up of key stakeholders, three years prior to closure. This group will maintain transparency and accountability through in-built mechanisms for reporting back to all stakeholder groups.

Table 4-1: Stakeholder Engagement Strategy

Closure Phase	Stakeholder Group	Consultation Method / Topic	Responsible Person
10 to six years from Closure	Government – DMIRS, DWER, Department of Planning Lands and Heritage (DPLH)	Submission of MCP and other required documents.	HSE Manager
		Provide briefings/updates once every 3 to 5 years until Mt Weld Mining are within 5 years of closure when annual briefings would be provided.	
	DMIRS - Resources Safety Division and DPLH	Seek approval for abandonment bunding alignment, if not compliant with the 1997 guidelines, and confirm expectations for any other alternative barrier / signage requirements (apart from bunding) to ensure human safety.	HSE Manager
	DMIRS and DWER	Post closure pit lake water balance, water quality, access barriers, in relation to post closure land use	HSE Manager
		Tenure Relinquishment Plan – proposed monitoring – analogue site selection, rehabilitation trials / outcomes	
	Local Government – Shire of Laverton	Provide regular briefings/updates at a minimum once a year.	General Manager for W.A.
	Indigenous – Nyalpa Pirniku Native Title Claimants	Commence circumstantial early conceptual discussions regarding post-closure land use, expectations, potential for heritage implications as part of operational discussions.	General Manager for W.A.
	Underlying Pastoralist (Mt Weld Pastoral Station)	Consultation regarding post mining land use expectations.	General Manager for W.A.
Five years from closure	Government – DMIRS, DWER & DPLH	Submission of required documents following review of regulatory requirements relating to closure (refer Closure Plan).	HSE Manager
		Provide, at a minimum, annual briefings as required, including information about intended stakeholder consultation.	
		Encourage site visits to operation as appropriate.	
	DMIRS & DWER	Post closure pit lake water balance, water quality, access barriers, in relation to post closure land use	HSE Manager
		Tenure Relinquishment Plan – proposed monitoring – analogue site selection, rehabilitation trials / outcomes	
		Participation in Closure Information Sessions; post closure land use	

Closure Phase	Stakeholder Group	Consultation Method / Topic	Responsible Person
	Local Government – Shire of Laverton,	Seek feedback on future consultation with primary stakeholders.	General Manager for W.A.
		Report back on outcomes of Closure Information Sessions.	
	Indigenous – Nyalpa Pirniku Native Title Claimants	Participation in Closure Information Sessions (review need for separate stand-alone session with identical content to broad session).	General Manager for W.A.
		Seek preferences for future consultation leading to Closure.	
		Continue circumstantial consultation opportunities as part of operational discussions.	
		Report back on outcomes of Closure Information Sessions.	
	Community – residents	Participation in Closure Information Sessions; post closure land use	General Manager for W.A.
		Provide Closure Information Materials.	
		Report back on outcomes of Closure Information Sessions.	
	Industry – CME, CCI, neighbouring mining industry tenement holders	Opportunity for Participation in Closure Information Sessions; post closure land use	HSE Manager
		Provide Closure Information Materials.	
		Report back on outcomes of Closure Information Sessions.	
	Underlying Pastoralist (Mt Weld Pastoral Station)	Confirm post mining land use as pastoral and any feature (e.g., open pit) which may be unable to conform to this land use. Confirm requirement for infrastructure post closure (bores, roads, turkey's nests). Confirm requirement to fence open pit to prevent stock access	
Two and one year from Closure	Government – DMIRS, DWER & DPLH	Submission of final MCP	HSE Manager
		Provide annual briefings, including information about stakeholder consultation progress.	
		Detail any infrastructure to be handed over to any 3rd party (pastoralist, other resource companies); post closure land use	
		Encourage site visits to operation, if not already completed	
		Invite queries and feedback through direct Mt Weld Mining contact.	

Closure Phase	Stakeholder Group	Consultation Method / Topic	Responsible Person
	Underlying Pastoralist (Mt Weld Pastoral Station), DPLH Pastoral lands Board	Confirm formal transfer of infrastructure and liability of infrastructure to remain post closure and commence process for transfer.	General Counsel and Company Secretary
	Local Government – Shire of Laverton,	Continue targeted stakeholder consultation.	General Manager for W.A.
		Provide briefings to Local Council on impending Closure Works, or any infrastructure to be handed over to any 3rd party (if known).	
		Provide access to newsletter updates – Closure Performance Reports.	
		Invite queries and feedback through direct Mt Weld Mining contact.	
	Indigenous – Nyalpa Pirniku Native Title Claimants	Continue targeted stakeholder consultation.	General Manager for W.A.
		Conduct further consultation on Indigenous Heritage requirements for Closure Works and Post-closure land use.	
		Provide access to newsletter updates – Closure Performance Reports.	
		Invite queries and feedback through direct Mt Weld Mining contact.	
	Industry – CME, CCI, neighbouring mining industry tenement holders	Provide access to newsletter updates – Closure Performance Reports.	HSE Manager
		Discuss any interest in the site infrastructure and footprint, for further use.	
		Provide updated information materials, including schedule for closure works and anticipated impacts.	
		Invite queries and feedback through direct Mt Weld Mining contact.	
	Community – residents	Provide updated information materials, including schedule for closure works and anticipated impacts.1	General Manager for W.A.
		Invite queries and feedback through direct Mt Weld Mining contact.	
During Closure	All Stakeholders	Clear contact information for inquiries.	HSE Manager
	Underlying Pastoralist (Mt Weld Pastoral Station), DPLH Pastoral lands Board	Formal transfer of remaining infrastructure.	

Closure Phase	Stakeholder Group	Consultation Method / Topic	Responsible Person
Post Closure	All Stakeholders	Contact information for inquiries and ongoing maintenance.	General Manager for W.A.

5. Collection and Analysis of Baseline and Closure Data

Relevant baseline and operational data for the Project has been collated and presented in this Section. A summary of the baseline information has been presented for the longer sub-sections. The key baseline knowledge gaps, the associated risk and closure implementation tasks have been populated at the end of this Section.

Mt Weld will continue to utilise this data to assist in the refinement of the completion criteria and effective mitigation and management of identified risks during the proposed closure implementation program.

5.1 Baseline Environmental Data

The following sections provide a summary of details on the Project physical and biological environment including:

- biogeographical context;
- land use;
- local climatic conditions;
- local physical conditions – geomorphology, land systems, seismicity and geology;
- soil and waste material characterisation;
- local water resource details – hydrology, and hydrogeology;
- local and regional ecological information (flora, fauna, ecology, communities and habitats);
- heritage;
- other environmental data, including rehabilitation and seed mixes; and
- contaminated sites.

5.1.1 Biogeographical Context

The Mt Weld Project lies within the North-Eastern Goldfields in the East Murchison subregion (MUR1) (**Figure 5-1**) within the Murchison Bioregion. Cowan *et al.* (2001) describes the East Murchison subregion as: 'The northern parts of the 'Southern Cross' and 'Eastern Goldfields' Terrains of the Yilgarn Craton. Characterised by its internal drainage, and extensive areas of red desert sandplains with minimal dune development. Salt Lake systems associated with the occluded palaeodrainage system. Broad plains of red-brown soils and breakaway complexes as well as red sandplains. Vegetation is dominated by Mulga Woodlands often rich in ephemerals; hummock grasslands, saltbush shrublands and Halosarcia shrublands. Arid climate, with mainly winter rainfall (200 mm). The subregional area for MUR 1 is 7,847,996 ha.'

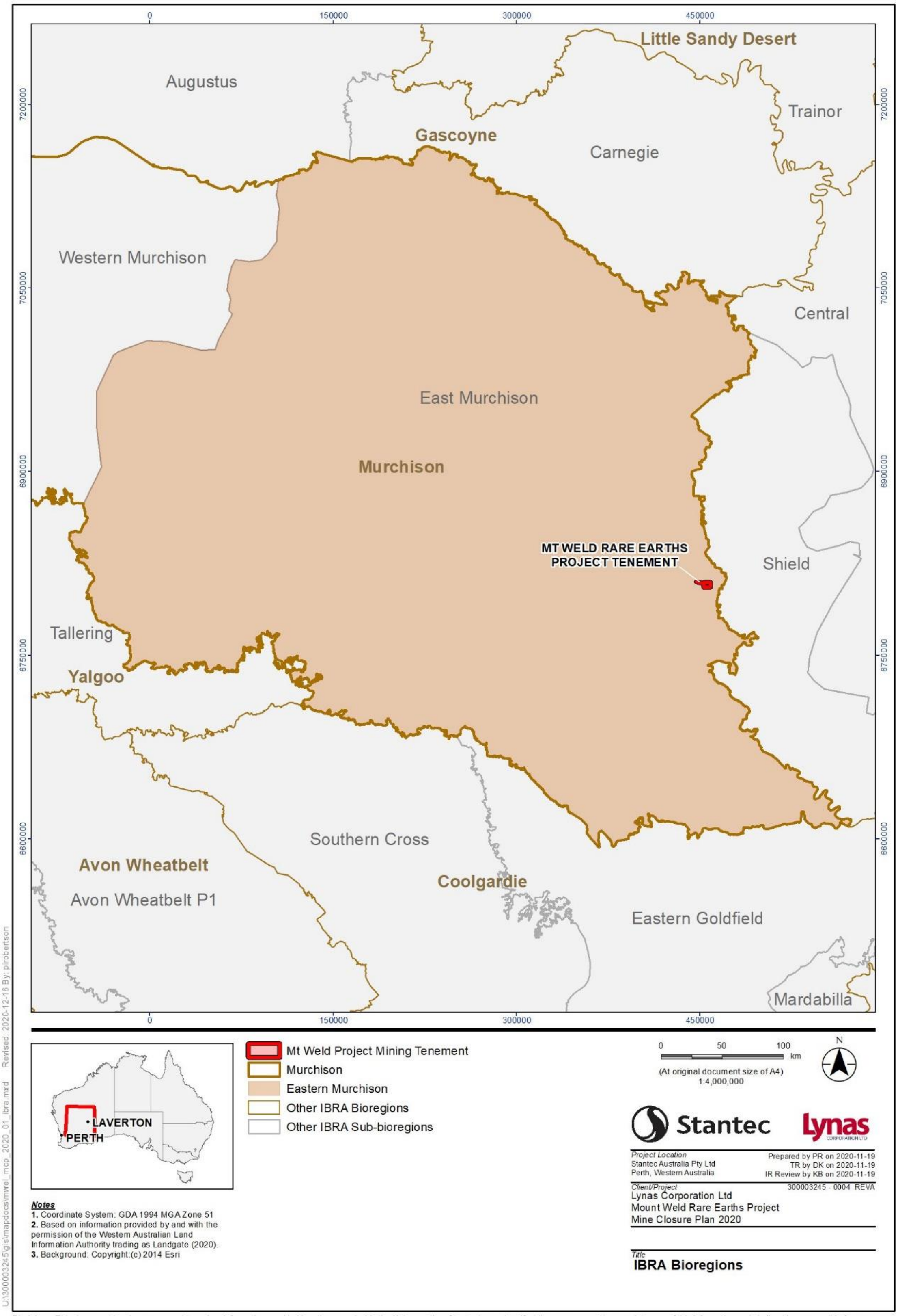

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Figure 5-1: Location of the Project within Murchison bioregion and East Murchison sub-region

5.1.2 Land Use

The dominant land use (85%) within the Eastern Murchison subregion, and surrounding the Project, is grazing of sheep and cattle on native pastures (**Figure 5-2**) (Australian Natural Resources Atlas 2010, Cowan *et al.* 2001). Other land uses include Unallocated Crown Land (UCL), Crown reserves, and mining (Cowan *et al.* 2001). Mining in the subregion largely comprises gold and nickel; however, most mining lease areas, including the Project area, are still required to be stocked, as they come under the *Land Administration Act 1997* (WA) (LAA).

The Project is situated on the Mt Weld Pastoral Station which is owned by GSGM and managed by employees from Laverton. Water for maintaining the cattle station is provided by shallow bores which are located on Crown Lease number 3114/1270. These bores draw water from a different, superficial aquifer and are not influenced by abstraction from the Mt Weld Aquifer.

The National Land and Water Resources Audit (Australian Natural Resources Atlas 2010) states that 1.4% of the Murchison bioregion is classified as conservation estate. In 2001, Cowan *et al.* (2001) reported that 1.8% of the Eastern Murchison sub-region was classified as conservation estate. Since that time, a comprehensive land acquisition program has contributed additional land for conservation purposes; in 2009 land vested in conservation reserves increased to 7.98%.

The De La Poer Range, Goongarrie National Park and Wanjarri Nature Reserves are within reasonable proximity (< 250 km) to the Project. The De La Poer Range Nature Reserve is approximately 170 km to the north; Goongarrie National Park is 145 km southwest and Wanjarri Nature Reserve is approximately 240 km west-northwest of the Project.

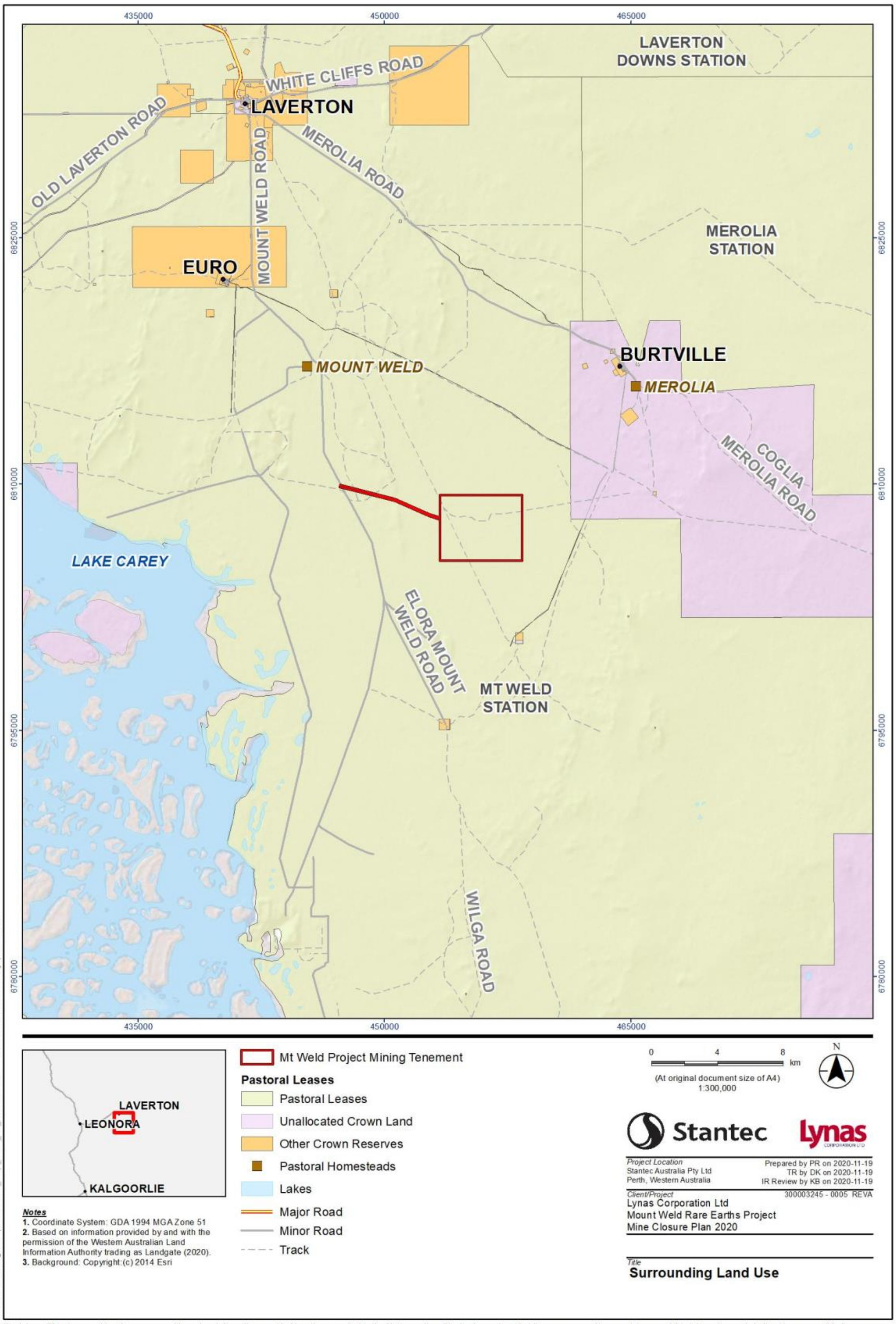

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Figure 5-2: Surrounding Land Use

5.1.3 Climate

The Project is located in the arid to semi-arid climatic region in the North-Eastern Goldfields of WA, approximately 35 km southeast of Laverton. The closest Bureau of Meteorology (BOM) weather station is Laverton (012045), located approximately 30 km in a direct line from the Mt Weld Open Pit. Temperature data is only available from Laverton (012045), for the time period 1900 to 1971, however, rainfall records have been kept continuously from 1899 until the present. A second weather station located at Laverton Airport (012305), located an additional kilometre from the project, displays temperature data from 1991 until present and rainfall data from 1994 until the present.

Laverton experiences an annual average maximum daily temperature range from 17.8°C in July to 35.8°C in January, with the average minimum daily temperature ranging from 5.2°C in July to 20.5°C in January (averages from 1900 to 1971) (**Figure 5-3**) (BOM 2020).

The average annual rainfall for Laverton is 236.3 millimetres (mm) (1899 to 2020), although Laverton airport reported an average of 293.1 mm (station 012305) for the period 1994 to 2020 (BOM 2020). Note the significant difference in the annual rainfall, despite the stations being situated approximately 1 km apart. Due to differences in the time periods recorded between the two stations and subsequent variance in mean rainfall, statistics for both weather stations are presented in **Figure 5-3**.

The intensity-frequency-duration design rainfall data specified for the approximate centre of the Mt Weld Open Pit at Latitude 28.875S and Longitude 122.550E and issued on the 27th October 2020 by the BOM (2020) (based on the 2016 revised IFD data) is included in **Table 5-1**, with design rainfall presented as total depth (mm), per Annual Recurrence Interval (ARI).

At the Mt Weld Project, the annual average evaporation rate, derived by interpolation from the BOM evaporation map, is 2,860 mm. The evaporation rate exceeds the average rainfall for every month of the year, however, approximately 70% of evaporation occurs from October through to March. During summer, winds are predominately from the east in the morning, tending south-easterly in the afternoon. During winter, the winds are more variable with easterlies in the morning, shifting to north-westerly in the afternoons (BOM 2020).

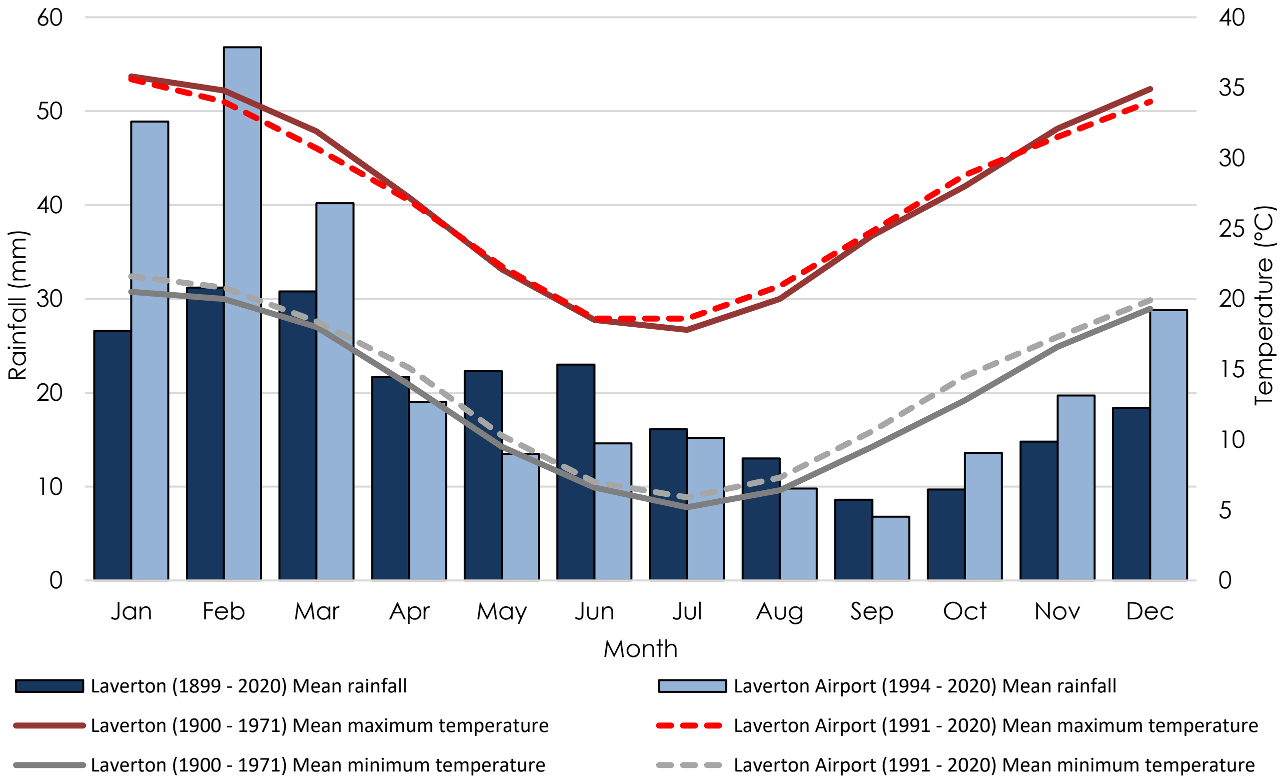

Figure 5-3: Climate Statistics (BOM 2020)

Table 5-1: Annual Recurrence Interval calculated for the Mt Weld Project (28.875S 122.550E) on 27/10/2020

Duration	1 Year	2 Years	5 Years	10 Years	20 Years	50 Years	100 Years
5 min	3.67	4.43	7.08	9.12	11.3	14.6	17.4
10 min	5.49	6.65	10.7	13.8	17.1	22	26.1
30 min	8.93	10.8	17.3	22.3	27.6	35.6	42.4
1 hour	11.4	13.8	21.8	28	34.8	44.9	53.6
2 hour	14.4	17.2	26.9	34.5	42.8	55.1	65.8
3 hour	16.4	19.5	30.5	39	48.2	61.9	73.8
6 hour	20.6	24.4	37.8	48.1	59.3	75.8	89.9
12 hour	25.6	30.4	47	59.7	73.2	93.4	110
24 hour	31.1	37.1	57.6	73.1	89.6	115	136
48 hour	36.1	43.3	67.8	86.3	106	137	164
72 hour	38.3	46.1	72.5	92.4	114	149	179
144 hour	40.2	48.3	76.5	98	121	160	194

5.1.4 Local Physical Conditions

The following section outlines the Geomorphological conditions, Land systems, Seismicity and Geological data.

5.1.4.1 Geomorphology

The Project falls within the Eastern Goldfields Province of the Yilgarn Craton with minor incursions of Officer and Nabberu Basin sediments in the northeast. This corresponds physio-graphically to the Salinaland Plateau region of the Yilgarn Plateau Province, within the Western Plateau Division, as defined by Jennings and Mabbutt (1977).

Physiographic regions compiled by Jennings and Mabbutt (1977) were further refined in 2011 and as such the Project is located within the Murchison Plateau region. The region consists of sandplains and hardpan wash plains with outgoing drainage and salt lakes, broken by ridges of metamorphic rocks and granite (Pain et al 2011).

Lake Carey is a prominent feature in the landscape is located to the west of the Project. Drainage occurs towards the lake. Further detail on the lake and drainage features is outlined in **Section 5.1.6.1.**

5.1.4.2 Land Systems

The WA Department of Agriculture completed a regional survey of land systems occurring within the Murchison to develop a comprehensive description of biophysical resources and to provide an assessment of the condition of the soils and the vegetation of the North-Eastern Goldfields (Pringle et al. 1994). A component of the survey was the mapping of land types, land units and land systems of the Murchison including the Mt Weld tenure.

The MCP tenements are underlain by six land systems (**Table 5-2**, **Figure 5-4**). The land system which represents the greatest percentage area of the Project is the Monk System (97.24%), with the Brooking System representing the smallest area (0.06%). The Monk System is pre-dominantly characterised by hardpan plains and loamy tracts (Pringle et al. 1994).

Table 5-2: Land Systems underlying the MCP Tenements

Land system	Description	Area (ha)	% area of Project
Monk	Hardpan plains with occasional sandy banks supporting mulga tall shrublands and wanderrie grasses.	2004.86	97.24
Gundockerta	Extensive, gently undulating calcareous stony plains supporting bluebush shrublands.	25.35	1.23
Jundee	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.	13.72	0.67
Mindura	Low hills, ridges and outcrops of granite, gneiss and quartz above convex, quartz-strewn interfluves and lower plains supporting sparse acacia shrublands becoming denser in drainage floors.	10.58	0.51
Sunrise	Stony plains supporting mulga shrublands.	6.13	0.30
Brooking	Prominent ridges of banded iron formation supporting mulga shrublands and occasional minor halophytic communities.	1.16	0.06

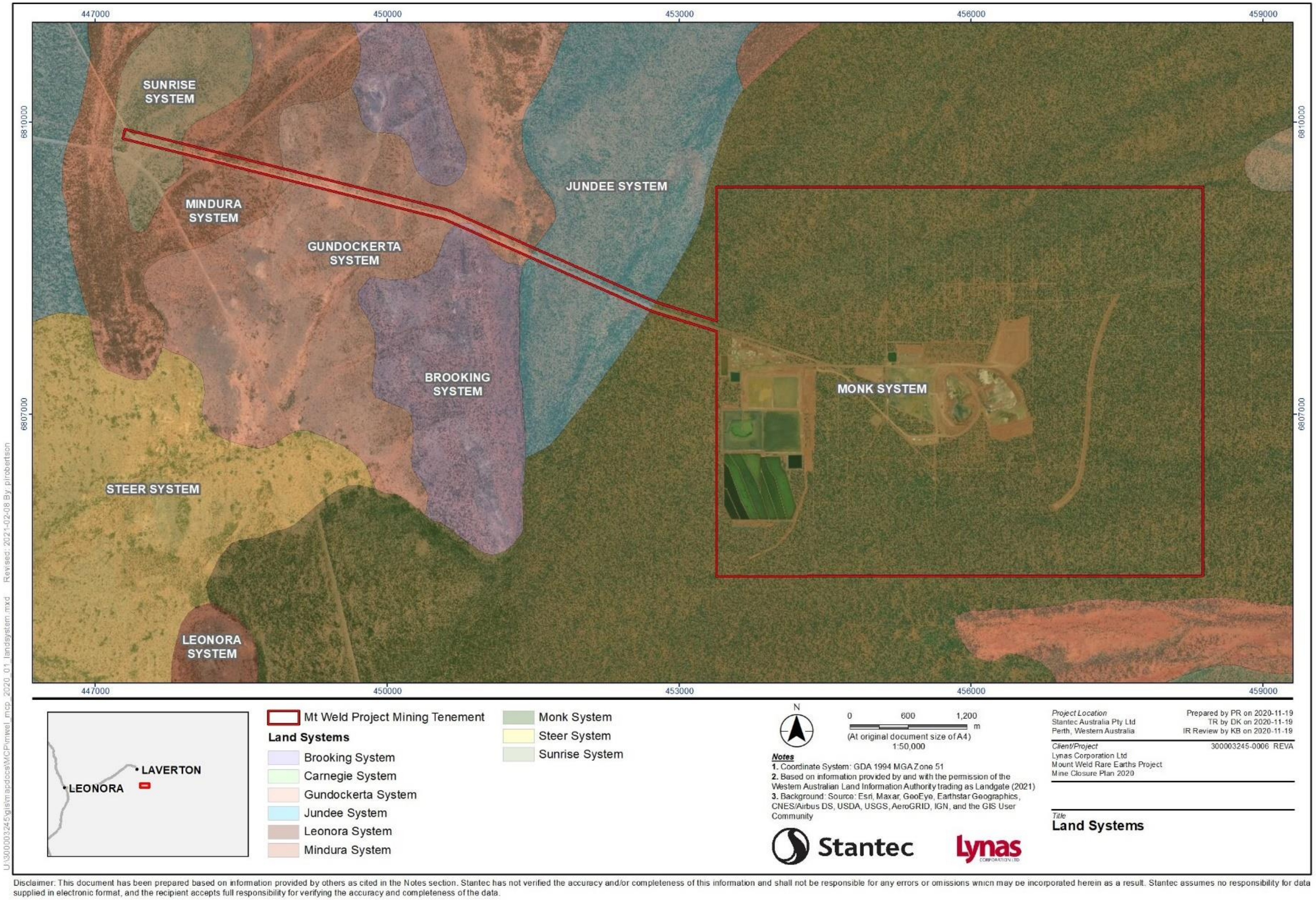

Figure 5-4: Land systems underlying the Mine Closure Plan tenements

5.1.4.3 Seismicity

The Mt Weld Project is located in an area of low seismic activity, over ~230 km away from relative hot spots located at Kalgoorlie and greater than ~600 km from the hot spots east of Perth (**Figure 5-5**).

Applicable ground acceleration values for the 1,000-year (Operating Base Earthquake) and 10,000-year (Maximum Design Earthquake) return periods were assessed using hazard curves provided by Geoscience Australia (Burbidge 2012) from which coefficients were derived to factor the acceleration given for the 1:500 return period. The peak ground acceleration, equivalent to the spectral period of zero seconds, for the 1 in 1,000-year return period is approximately 0.07 g.

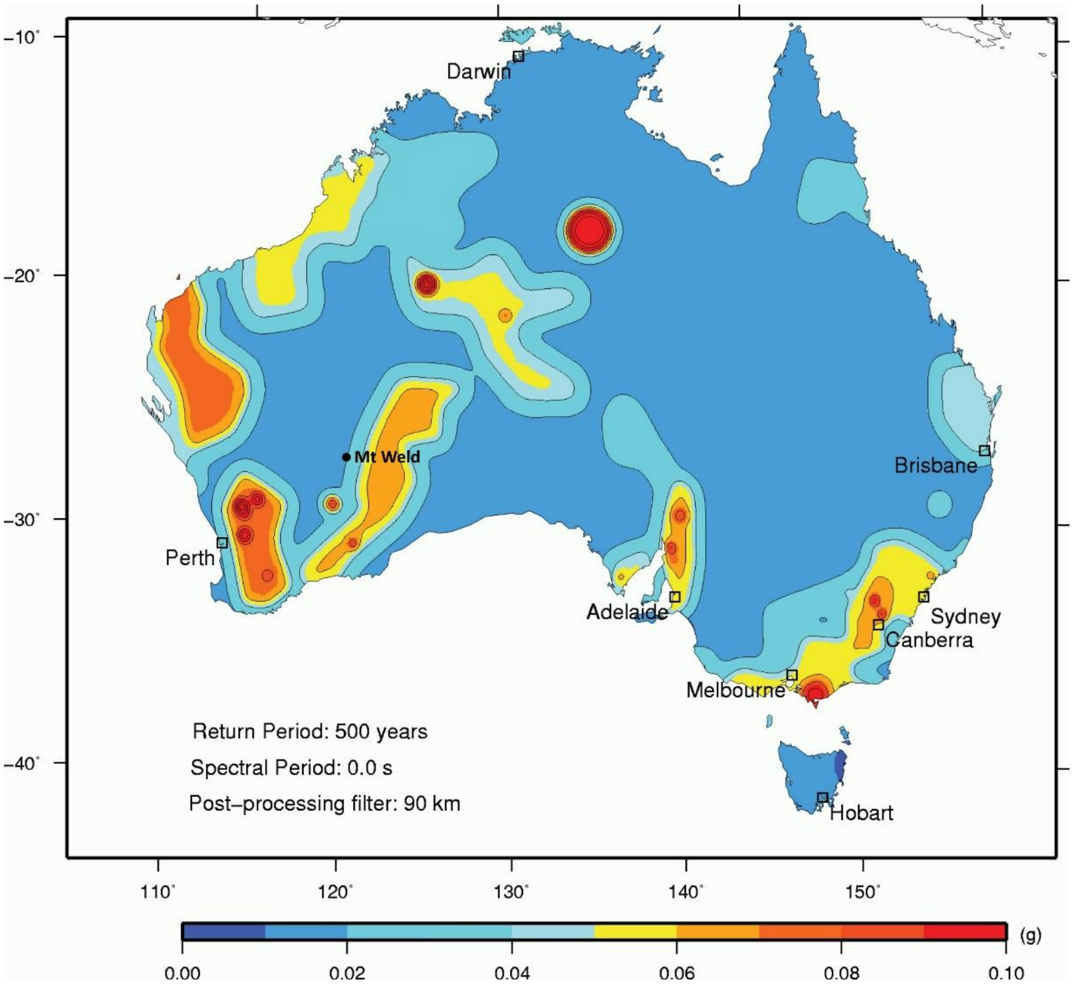

Figure 5-5: Location of the Mt Weld Project in relation to the 2012 Australian Earthquake Hazard Map (Burbidge 2012)

5.1.4.4 Regional Geology

Mt Weld lies within the Laverton Archaean granite-greenstone belt in the central north-south portion of the Eastern Goldfields Province of the Yilgarn Block within the Western Shield, a major but generally morphotectonic geological division of WA. The Archaean geology of the region is subdivided by two volcanic successions, the Base Association, and the Upper Association. The Base Association consists of mafic volcanics dominated by basalts, high magnesium basalts, interflow sediments and basal ultramafics. The Upper Association consists of calc-alkaline volcanics. Feldspathic conglomerates and siliciclastic overlie the Upper Association lithologies (Dames & Moore 2000).

Three north-south litho-structural terranes control the distribution of these rock associations. The western tern is dominated by the mafic volcanics of the Base Association. The central terrane comprises calc-alkaline volcanics and siliciclastic of the Upper Association. The eastern terrane is characterised by the mafic volcanics of the Base Association. The Mt Weld carbonatite intrudes the central terrane boundary. The boundaries between terranes display evidence for both transcurrent and reverse faulting. Elongate basins of conglomerate are localised along the flanks of the terrane, and intrusions of late syntectonic granites and granodiorite porphyry have occurred in the region (Dames & Moore 2000).

Hallberg (1985, cited Kinhill Engineers 1992), further described the regional geology as a granitoid-greenstone terrain sub-divided into sectors of open folding and minimal metamorphosis, separated by linear to turbulent tectonic zones characterised by depressed elongated deposits of sedimentary rocks, periodic shearing and faulting and peralkaline igneous activity.

5.1.4.5 Local Geology and Ore Mineralogy

The Mt Weld deposit derives from the secondary weathering of a carbonatite pipe (the Mt Weld carbonatite) followed by residual concentration within the regolith (Fitzgerald 2013 as cited in KASA 2014; Kinhill Engineers 1992). The Mt Weld carbonatite is a sub-vertical pipe-like intrusion approximately 3.5 km in diameter, that has intruded strongly deformed Archean volcanic and sedimentary rocks of the Laverton Tectonic Zone (Gower 1976; Hallberg 1985 as cited in KASA 2014). The carbonatite intrusion is generally concentric in plan view, with a margin of glimmerite alternation (wall rocks that have undergone intense brecciation and alkali metasomatism) occurring around the intrusion (Coffey 2020).

The primary carbonatite rock is medium grained calcitic carbonatite (sovite) with lesser dolomitic carbonatite (beforsite) and minor zone of silico-carbonatite. Locally, apatite and magnetite may dominate the carbonatite phase. The Mt Weld carbonatite comprises approximately 20-30% xenolithic material, particularly around the margins where it comes in contact with the Laverton Tectonic Zone rocks. The xenolithic material varies from being almost totally digested flow bands through to hard edged metasomatized boulders. Most of the xenolithic material is of mafic origin (Fitzgerald 2013 as cited in Lynas 2014a).

The Laverton Tectonic Zone formation to the west of the Mt Weld carbonatite is predominantly felsic and mafic volcanic rocks and to the east comprises predominantly mafic and sedimentary rocks. A series of Proterozoic dolerite dykes have intruded the Laverton Tectonic Zone in the Project area with one of these linear dykes also intruding the Mt Weld carbonatite from the northwest to the southeast. This dyke appears relatively impermeable to groundwater (Kinhill Engineers 1992).

Duncan and Willett in 1990 (cited Kinhill Engineers 1992) state that regional glaciation during the Permian period scoured all of the pre-existing superficial deposits from the Mt Weld Project district, leaving behind scattered sediments only. A drainage system subsequently developed over the area by the Late Eocene; since this period, a thick lateritic mantle (regolith) and secondary weathered sediments (clay) developed over the region, infilling these drainage systems. These infilled formations comprise transported alluvial sands, calcrete and lacustrine clays (Dames and Moore 2001). One of these filled drainage systems covers a portion of the Mt Weld carbonatite. From the quaternary to present day, the Mt Weld carbonatite, the lacustrine sediments, and the surrounding Laverton Tectonic Zone have been covered by a layer of alluvial gravels and sands washed in by sheet wash from the hills 10 km to the east. This layer of alluvium is approximately 20 m thick in the Mt Weld area (Fitzgerald 2013, as cited in KASA 2014).

The carbonate regolith hosts a number of different zones of mineralisation at the Mt Weld Project. The Central Lanthanide Deposit hosts the main rare earths concentration and is defined as the zone of high-grade lanthanide mineralisation (plus minor yttrium), hosted by the carbonatite regolith within Mining Lease M 38/326. Like the rest of the carbonatite regolith, the Central Lanthanide Deposit lies beneath a sequence of externally derived alluvium and lake clay (previously described as lacustrine clay) and is in turn underlain by a karstic surface on un-oxidised carbonatite.

The Central Lanthanide Deposit is approximately 400 m wide, constrained to the east by a dolerite dyke and pinching out to the west. The deposit is approximately 600 m long, extending from a subsurface hill of un-oxidised carbonatite in the south to a gradual fade-out of grade in the north. Although high-grade mineralisation extends vertically for more than 80 m in localised areas, economically recoverable ore has a general thickness of 20 to 40 m.

The major rare earth minerals present with the Central Lanthanide Deposit are secondary phosphates with variable calcium contents, which have been precipitated directly from groundwater under near-surface temperature and pressure conditions. The rare earth minerals occur as secondary fine-grained disseminations and very small crystals throughout the rare earth mineralisation. The mineralisation contains both rare earth phosphate and rare earth oxides. The thorium content of the Mt Weld Project rare earth phosphate mineral concentrates is less than 2,000 parts per million (ppm) which is approximately 20 to 40 times lower than the level for conventional monazite concentrates. It is probable that the virtual insolubility of thorium in groundwater has precluded its availability to crystallising secondary rare earth phosphate minerals.

The gangue minerals are dominated by hydrated iron oxides, mostly occurring as very soft, fine grained, porous, friable siltstone. Manganese oxides, secondary silica, secondary calcium-aluminium phosphates, residual apatite and ilmenite are common minor components of ore.

The lithological classification of the regolith, overlying the sedimentary sequence and fresh basement rock consists of four main divisions as detailed in **Table 5-3**. Local bedrock geology comprised of Archaean greenstones and the Mt Meld Carbonatite are depicted in **Figure 5-6**.

Table 5-3: Lithological Classification, Mt Weld

Lithological Zone	Lithological Description (Coffey, 2020)	Variance to lithological descriptions (Stantec 2020a)
Zone A: Ferricrete	Comprises ancient alluvial deposits consisting of quartz and rock material from hills to the east and deposited across the entire carbonatite and immediately surrounding region. Near the surface (to approximately 14 m depth), the alluvium is indurated with iron oxides forming a ferricrete hardpan.	Now referred to as alluvium. Encountered between the surface and 30 m depth. The alluvium is comprised of silty sand to sandy loam, while having a high coarse gravel content.
Zone B: Lacustrine Sediments	Comprises sediments, primarily clays. These are believed to represent freshwater sediments deposited in chains of shallow palaeolakes which formed above the carbonatite. The sediments are derived in part from the carbonatite, but mostly from the surrounding weathered mafic rocks.	Now referred to as lake clay. Encountered between 25 and 35 m depth. The lake clay comprises medium to heavy clay, with no coarse material.
Zone C: Residual	Weathered and oxidised basement rocks, mostly derived from the carbonatite intrusion, but includes surrounding Archaean country rocks and a Proterozoic dolerite dyke that bisects the carbonatite.	No change
Zone D: Bedrock	Fresh (non-weathered) basement rocks including the carbonatite, country rocks to the intrusive complex, and younger intrusive dykes.	No change

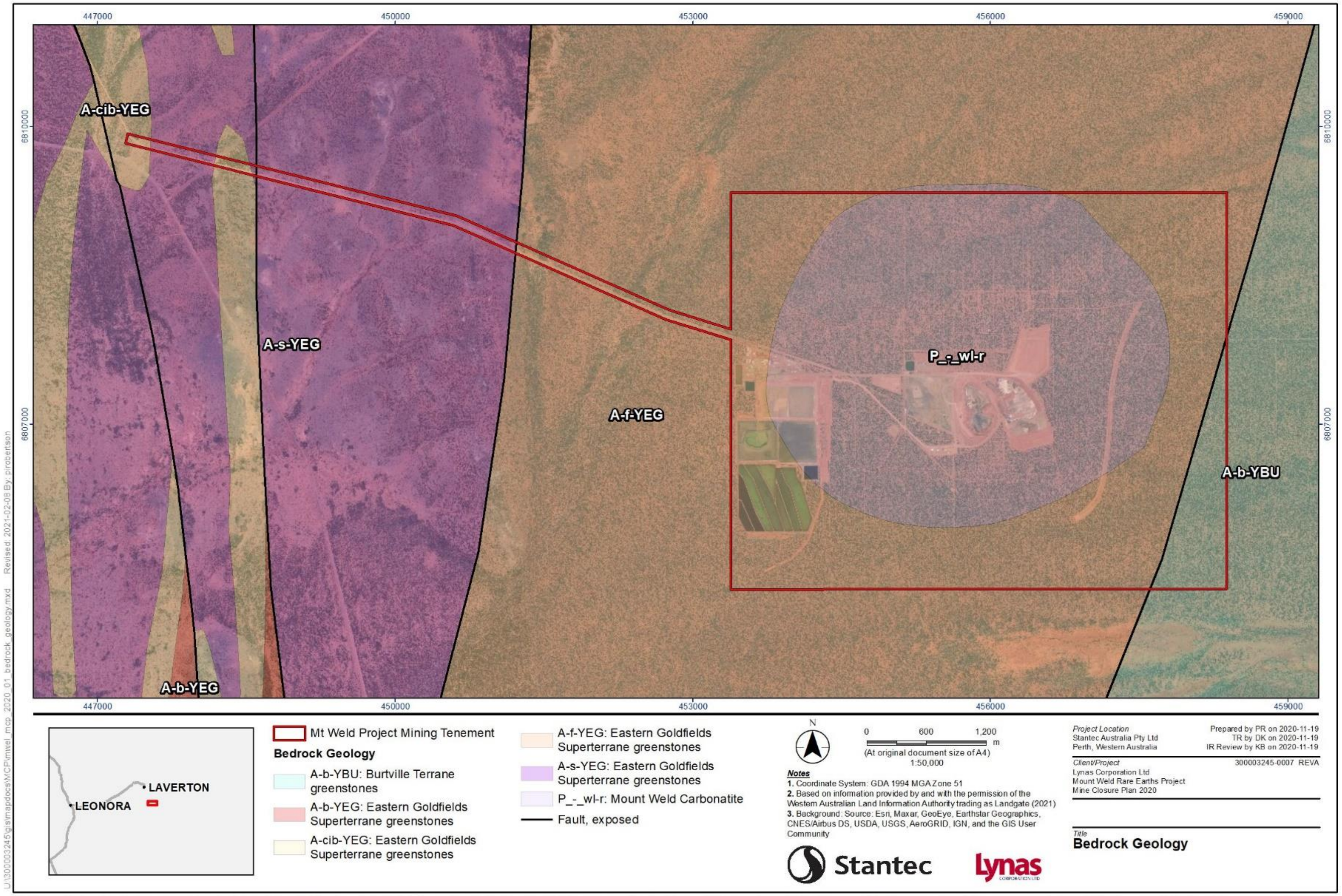

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Figure 5-6: Bedrock geology underlying the Mine Closure Plan tenements

Geotechnical assessments of the material underlying TSF 1 and TSF 2 were undertaken in 2008 and 2014 respectively; a summary of the basement conditions observed is outlined in **Table 5-4**.

Table 5-4: Summary of the Basement Conditions Beneath the Tailings Facilities

Horizon	Geotechnical Description under TSF 1 (Worley Parsons 2008).	Geotechnical Description under TSF 2 Basement (Hatch 2014a)
Topsoil	A clearly defined topsoil layer was not observed across the site. Roots extend to a depth of 300 mm. An active seed layer is expected in the upper 50 mm of the colluvial sand described below.	Colluvial soil: 0.3 to 0.6 m, comprising approximately 70% sand, 25% silt and clay and 5% gravel. Laboratory results indicate a maximum dry density of 2.0 t/m3 and a compacted permeability of 4 x 10-10 m/s; this layer was conservatively represented in a seepage model as 0.3 m depth of 1 x 10-7 m/s of colluvium (based on 0.2 m topsoil removal).
Colluvial Sand	Between 350 mm and 600 mm of colluvial soil covers the site. Laboratory test work indicated the soil contains approximately 70% sand, 25% silt and clay and 5% gravel. The soil is orange brown in colour, slightly moist, and medium density in consistency.	
Ferricrete Lithology Zone A	All the test pits excavated in the TSF terminated with refusal on the ferricrete surface at depths of between 350 mm and 650 mm below ground level. The ferricrete comprises sand and sub-angular to sub-rounded fine to course gravel of quartz and ironstone in pervasive ferruginous cement. At depths of between 6 m and 15 m, the iron oxide cementation of the ferricrete diminished to the point where the material was recovered as silty gravely sand.	Ferricrete between the colluvial soil and the underlying clays. The ferricrete comprises sand and sub-angular to sub-rounded fine to course gravel of quartz and ironstone in pervasive ferruginous cement. Discontinuities in the ferricrete are predominately horizontal suggesting that the ferricrete has a lower vertical rather than horizontal permeability. At depths of between 6 m and 15 m, the iron oxide cementation of the ferricrete diminished to the point where the material was recovered as silty gravelly sand. This layer was conservatively represented in a seepage model as 5 m depth of 1 x 10-8 m/s of ferricrete.
Lacustrine Sediments Zone B	The lacustrine sediments are essentially very stiff, high plasticity clays. Therefore, the proposed TSF location has a low permeability clay horizon of thickness anywhere between 5 m and 18 m thick from approximately 18 m depth.	Clay: lacustrine clays were encountered in four of the five drill holes at the TSF, at depths of between 17.5 m and 36 m. In the remaining drill hole, kaolinite clay was present from 24 to 29 m. Therefore, the proposed TSF 2 location has a thick low permeability clay horizon anywhere between 5 m and 18 m thick. This is represented in the seepage model as having a hydraulic conductivity of 1 x 10-5 m/s of alluvial sand.
Residual Lithology Zone C	The residual profile consists of extremely to distinctly weathered mafic rocks and glimmerite with very low to low strength.	No description recorded
Bedrock Lithology Zone D	High strength mafic rock	No description recorded

5.1.5 Soil and Mine Waste Characteristics

Mt Weld mine is located on an alluvial plain that comprises deposits of highly oxidised, quartz and ironstone sand/gravel. There has been minimal development of soil profile within the alluvial plain. Organic material is incorporated in surface sand directly beneath isolated mulga shrubs and thickets, otherwise organic material is sparse. Leaf litter and seeds concentrate around generally dormant, ground hugging, *Eremophila* shrubs and sparse wanderrie grass. It has been observed that during the infrequent sheet-flood events, surface water up to 10 centimetres (cm) deep, lifts the organic debris and washes it across the Project area to form thick banks and tidemarks in the stream system to the west and south (Stantec 2017c).

The present day alluvial plain upon which the Project is located is composed of highly oxidised, recently transported and deposited quartz and ironstone comprised sand/ gravel alluvium. The alluvial plain has not developed a structured soil profile as usually occurs from in-situ weathering of underlying rocks, and/or the effects of strong vegetation growth.

The alluvial sequence over the rare earths deposit has been modified to some extent by groundwater which has resulted in largely weakly consolidated alluvium below the water table and strongly cemented alluvium above (i.e., in the upper 14 m of the alluvial sequence).

In diamond core samples, it is very difficult to discern any difference in the structure or composition of the vertical profile from around 14 m depth to the surface, except that the strong cementing, which is evident in most of the profile is weaker in the top half metre or so closest to the surface. The hundreds of shallow pits constructed and backfilled during the course of exploration and definition drilling attest to the homogeneity of the surface alluvium profile across the entire 5 km by 4 km area of the Mining Leases.

The mine site intersects one regional soil unit, the BE15 unit (ASRIS 2014). This soil unit is characterised by gently undulating bedrock with stony and gravelly pavements intersected by seasonal streams. The main soils are shallow earthy loams (Um5.3) with shallow red earths (Gn2.12), both underlain by red-brown hardpan. Within this unit it is also common to have inclusions of soils from adjoining units.

5.1.5.1 Mine Waste Characteristics

The mine waste materials present within the WRL consist of non-carbonatite overburden. The main waste rock mineralogy types include bauxite, haematite, goethite, limonite, calcite and clay. The entire deposit and its overlying sediments have formed at or near the surface in a strongly oxidising, supergene geochemical environment. Both gangue and ore minerals are therefore chemically stable and do not undergo any appreciable weathering or alteration when exposed to surface conditions in WRLs. No sulphides or other minerals capable of producing acidic run-off water or otherwise deleterious products occur in the deposit or overburden. The ironstone and other regolith components are geochemically stable and insoluble when exposed at the surface (Environ 2006).

5.1.5.1.1 Radiation

Given the nature of the rare earth ores at the Mt Weld Project, with both thorium (Th) and uranium (U) present, the mineralised waste displays low levels of naturally occurring radiation. The average concentration of Th and U from the CLD resource at the Mt Weld Project is 660 ppm and 25 ppm, respectively, yielding a specific activity in the order of 3.0 Bq/g (**Table 5-5**) (Lynas 2014a). The lake clay and calcrete waste streams have previously been mis-reported as having levels of naturally occurring radiation above the threshold for radioactive classification (1 Bq/g), additional testing on site during 2020 has confirmed that both these waste streams are below the threshold and are therefore non-Naturally Occurring Radioactive Materials (non-NORM) (A. Cargill and K. McElroy, pers. comm, Lynas 2020).

The background radioactivity in the vicinity of the Mt Weld Project averages at around 0.12 µSv/hr ranging up to a maximum around 0.2 µSv/hr (Calytrix Consulting Pty Ltd, 2011).

The Th and U concentrations in the concentrate are approximately 1,495 ppm of Th and 25 ppm of U, which have a specific activity in the order of 6.4 Becquerel per gram (Bq/g). The average thorium oxide (ThO_2) and uranium oxide (U_3O_8) levels in the concentrate do not vary significantly as they are a function of concentrate %REO grade, which is maintained between approximately 32 to 36% REO.

The average Th and U levels in the tailings are approximately 440 ppm and 25 ppm, respectively (Lynas 2014a).

Table 5-5: Thorium and Uranium Levels in Mt Weld Project Ore, Concentrate and Tailings (Lynas 2014a)

Material		Concentration (ppm)				Specific Activity (Bq/g)		
		ThO_2	U_3O_8	Th(nat)	U(nat)	Th-232	U-238	Sum
Ore	Average	750	30	660	25	2.71	0.31	3.02
	Maximum	1,800	60	1,580	51	6.48	0.64	7.12
Concentrate	Average	1,700	30	1,495	25	6.13	0.31	6.44
Tailings	Average	500	30	440	25	1.80	0.31	2.11

As displayed in (**Table 5-5**) the Mt Weld Project ore, concentrate and tailings all contain radionuclides from primordial thorium and uranium series which emit gamma radiation, and as such are a naturally occurring radioactive material (NORM). The external dose rate depends primarily on the specific activity of thorium and uranium, the volume of the material and geometry factors (distance from a source, the source area, etc.) (Lynas 2017).

As part of ongoing radiation monitoring of the site, Gamma radiation surveys are conducted across the project site. Typical measurements within the TSF boundary are 0.24 µSv/hour (Lynas 2017), slightly elevated above the background levels reported above.

The Western Australian Mines Safety and Inspection Regulations 1995 (MSIReg.16 (2) (b), 16.7 and 16.8) recommends:

- a maximum permissible exposure limit of 20 milliSieverts per annum (mSv/yr) for workers; and
- a dose limit of 1 mSv/yr for the public.

If the occupational exposure of an employee might exceed 5 mSv/yr, then that employee is classified as a "designated employee" (MSIReg.16.1) and higher levels of monitoring and reporting of exposure are required. As demonstrated from the gamma radiation measurements of the TSF boundary above, no such designation has been required at The Mt Weld Project.

The Mt Weld Project Radiation Management Plan outlines the adequacy of a 300 mm to 500 mm layer of inert material to ensure gamma radiation does not exceed background levels (Lynas 2017). Mt Weld Mining are proposing to conduct trials within the next three years to confirm the depth of capping material required to eliminate gamma radiation above background levels. The proposed trials are presented in **Section 5.1.11.4**, the knowledge gap and associated tasks to address and close out are outlined within **Section 9.4.12**.

5.1.5.1.2 Physical and Chemical

A summary of the physical and chemical characteristics of the varying waste streams at Mt Weld is presented below. This information is sourced from the Stantec (2020) materials characterisation report presented in **Appendix C**, unless referenced otherwise.

The alluvium waste materials are characterised as silty sand to sandy loam, with a high percentage of coarse content. The material is considered non-acid forming (NAF) and has the chemical characteristics of moderate alkalinity, slight salinity, and sodicity. While having low clay content, the material had a high cation exchange capacity and is predominantly low in nutrients. Structurally the material is unstable, displays low strength, has rapid drainage through the material and has low effective plant available water, all due to its low clay content. This material is encountered between the surface and 30 m depth (425 – 395 mRL).

Lynas has observed a difference in the gravel content of the alluvium dependent on the depth from which it is mined, site personnel refer to 'blocky alluvium' as the material that is within the upper 14 m of the alluvium profile, and the more weakly cemented 'sandy alluvium' component, as material that is typically located below the water table (A. Cargill, pers. comm, Lynas, 2020). Ferricrete has been mentioned in previous reports to describe material which is now described within the alluvium lithology.

The calcrete – soft (previously calcrete clay) waste materials are characterised by its bleached clay to medium heavy clay texture, with high percentage of course content (Stantec 2020a). The material is considered NAF but has heightened elemental concentrations of cadmium. Its chemical characteristics are strongly alkaline, non to slightly saline, and non-sodic. Structurally the material has variable stability, it displays tendencies for hard setting, has moderate drainage speed and moderate effective plant available water. This material is encountered between 25 and 50 m depth (400 - 375 mRL).

The calcrete – coarse (previously calcrete limestone) waste materials are characterised by its bleached loamy texture, with high percentage of coarse content (Stantec 2020a). The material is considered NAF but has heightened elemental concentrations of zinc. Its chemical characteristics are moderately alkaline, slightly saline, and sodic. While the material has a high cation exchange capacity, it is low in nutrients. Structurally the material is predominantly stable, it displays tendencies for hard setting, has slow drainage and moderate effective plant available water. This material is encountered between 50 and 60 m depth (375 – 365 mRL). This material could potentially be utilised as a source of rock armouring material during rehabilitation of the landforms.

The lake clay (previously lacustrine clay) waste materials are characterised by its medium to heavy clay and lack of course material, though when hard panned resembles gravel (Stantec 2020a). The material is considered NAF but has heightened elemental concentrations of arsenic. The chemical characteristics are moderate alkaline, non-saline, and highly sodic. While the material had a very high cation exchange capacity it is predominantly low in nutrients. Structurally the material is unstable, it is characterised by clays that shrink and swell, strong hard setting tendencies, extremely slow drainage and moderate effective plant available water. This material is encountered between 25 and 35 m depth (400 – 390 mRL).

The mineralised waste materials are characterised by clay to medium heavy clay, with a moderate percentage of course content (Stantec 2020a). The material is considered NAF but is NORM and has heightened elemental concentrations of arsenic and zinc. Chemical characteristics are moderate alkalinity, and non- to slight salinity. The material has moderate to high levels of nutrients. Structurally the material is predominantly stable, has tendencies for hard setting, has slow drainage through the material and has moderate effective plant available water. This material is encountered throughout the profile.

The Outback Ecology (2014) report presented sample results from ore stockpiled on the ROM pad. Similar to the mineralised waste materials, the stockpiled ore was characterised by highly elevated concentrations of arsenic, as well as high concentrations of zinc. The above information is relevant due to further testing which has occurred on the tailings leachate (as outlined in **Section 5.1.5.4**). The tailings leachate was shown to display below detection limits of arsenic and below ANZECC Livestock drinking water trigger levels for zinc. The implications of this data on the treatment of waste streams found to display elevated concentrations of metals are discussed in **Section 5.1.5.6**.

5.1.5.2 Acid Generation Potential

Total sulphur values were reported to be less than 0.12% for all mine waste streams derived from testing conducted on existing mine waste material and stockpiled ore samples, well below the 0.25 to 0.3% considered to indicate a potential for generation of acid metalliferous drainage (AMD). Negative Net Acid Production Potential (NAPP) results and alkaline Net Acid Generation (NAG) pH (ox) results were reported for all of the existing mine waste materials and stockpiled ore samples analysed. These results therefore indicate that the mine waste and ROM materials are classed as NAF and may be considered geochemically benign (Outback Ecology 2014).

5.1.5.3 Topsoil / Subsoil Characteristics

A physical and chemical characterisation of topsoil and mine waste materials was conducted by Outback Ecology in 2014. Soils were analysed from five undisturbed sites (located in potential future disturbance areas), as well as from six existing topsoil / subsoil stockpile sites.

This investigation classified areas of undisturbed topsoils as sandy loams to clay loams. Soils displayed rapid hydraulic conductivity and moderate water holding capacity. Despite being predominantly classed as partially dispersive with low coarse material content (<17%), the undisturbed topsoils are also considered to have a relatively low erodibility potential, due to their rapid hydraulic conductivity and predominantly non-saline and non-sodic nature. Although non-hardsetting, the undisturbed topsoils exhibited an increase in soil strength with depth.

The average soil microbial biomass carbon values reported in the topsoils on site is low compared to agricultural soils, although they are within the range found for other arid zone soils in WA (Outback Ecology 2014). Microbial biomass carbon results were higher in the surface 0 to 0.05 m and decreased with depth at 0.1 to 0.2 m; they were higher in undisturbed topsoils than stockpiled topsoils at the same depths, reflecting a decline in microbial biomass following vegetation removal, soil salvaging and stockpiling.

The stockpiled topsoil materials on site were classed as moderately to strongly acidic, non-saline and non-sodic, with low to negligible total metals. These soils reported variable concentrations of plant-available nutrients and low organic matter, considered typical for soils from arid regions. The chemical characteristics of the stockpiled topsoil materials are considered unlikely to be problematic from a rehabilitation and plant growth perspective (Outback Ecology 2014).

The chemical properties of the undisturbed topsoil materials were found to be very similar to the stockpiled topsoils and are also unlikely to be problematic from a rehabilitation and plant growth perspective. The pH of the undisturbed topsoils was classed as slightly to moderately acidic and was slightly more neutral than the stockpiled topsoils. The majority of the undisturbed topsoils were classed as non-saline, though some individual samples varied from slightly saline to moderately saline (Outback Ecology 2014).

Further work is expected to be completed in 2021 to assess the chemical properties of topsoil at ten (10) sites within the existing topsoil stockpiles, in addition to three reference sites. Within the stockpiles, it is proposed that there will be two depths sampled, (surface and 0.5 – 1 m), while at the reference sites only the surface will be sampled. The chemical analysis will examine the stockpiles for their ability to support plant growth. The current vegetation coverage in the survey areas will also be assessed.

5.1.5.4 Tailings Characterisation

Tailings produced at the project are NAF and are slightly to moderately saline (ATC Williams 2017). Monitoring test results for 2013 and 2014 show that the total dissolved solids (TDS) content of the tailings supernatant water displays a range of 2,500 to 6,000 mg/L TDS and averages around 3,000 mg/L TDS, with a typical pH of around 10. Final Tailings filtrate was sampled on 3rd January 2021 with TDS of 2,959ppm.

Based on geochemical testing, the tailings have been classified as chemically benign, however, the dry tailings typically contain up to 450 ppm Th and 30 ppm U, which is equivalent to a radiation specific activity of 1.6 Bq/g and 0.3 Bq/g respectively. This total exceeds the limit of 1.0 Bq/g set for non-radioactive tailings set by the DMP (now DMIRS) (Knight Piesold 2011a). With respect to the International Atomic Energy Authority guidance on waste classification (IAEA 2009), the tailings materials may be considered as low-level NORM waste, suitable for above ground disposal in a tailings facility subject to satisfactorily meeting appropriate safety requirements. The typical mineral distribution of tailings produced at the project is described in **Table 5-6**. The approximate concentrations of the residual chemicals in the tailings liquor are as follows:

- 3.5 kg/t of feed ore of fatty acid collector;
- 3.5 kg/t of feed ore of caustic soda (sodium hydroxide);
- 4.5 kg/t of feed ore of sodium silicate; and
- residual amounts of polyacrylamide flocculant.

Table 5-6: Typical Mineral Composition of Tailings produced at the Mt Weld Project

Species	Weight	Unit
Rare Earth Oxides	7.0	%
Iron Oxide	56	%
Phosphorous Oxide	3.9	%
Aluminium Oxide	5.9	%
Calcium Oxide	5.9	%
Silica	8.5	%
Magnesium Oxide	0.9	%
Manganese Oxide	2.7	%
Thorium Oxide	400	ppm
Uranium Oxide	25	ppm

Recent leach tests on the tailings, carried out in accordance with the Australian Standard Leaching Procedure (ASLP) demonstrated a very low leaching potential and associated low environmental risk (**Table 5-7**). These ASLP tests were done using acetic acid (pH 2.9) and with de-ionised water (DDW) (pH 7) to better reflect the high pH of the tailings. Results of these tests are compared against the DER's Landfill Waste Classification (DEC 1996 as cited in KASA 2014), the Australian and New Zealand Environment Conservation Council (ANZECC) guidelines for livestock drinking water (2000), and for radionuclides, the derived water concentrations for drinking water for members of the public (DMP 2012 as cited in KASA 2014).

Note that DMP (2012) derived concentrations are applicable only for individual radionuclides. The contribution from multiple radionuclides and decay products would require these dose limits to be lowered. However, several of the parameters (elements) tested for during ASLP testing were below detection limit (BDL). In summary, the leach tests conducted on Mt Weld Project tailings show a very low leaching potential, which is further decreased by the alkaline conditions of the tailings for many parameters of interest, including 228 Ra (Radium), U, Arsenic (As), Zn (zinc) and Mn (manganese). Therefore, it can be concluded that leaching from the tailings represents a low environmental risk.

The ultrafine goethitic tailings stream produced from the rare earth concentrator have been characterised by poor consolidation, due to their mineralogy, very fine particle size, high clay content (in excess of 30%) and addition of dispersant during the processing cycle. The fine clay size particles (approximately 80% passing 10 to 15 microns) has precluded the effective use of conventional tailings thickening and the slurry has been discharged at a relatively low solids concentration between 9 to 11% (ATC Williams 2017).

Typical densities of 0.7 t/m^3 were achieved, when using enhanced tailings deposition (ETD) and passive management (thin layer deposition and allowing time for consolidation and desiccation). The consequence of poor consolidation of Mt Weld tailings included rapid filling of Tailings Storage Facilities (TSF's), insufficient strength to enable inboard wall raises and/or closure, and potential risks to maintaining a licence to operate (Lynas 2019b).

In September 2018, Mt Weld formally commenced mechanically assisted dewatering of the deposited tailings via mudfarming and subsequent dozer compaction to aid consolidation. Mudfarming is undertaken using a specialised Archimedes screw tractor (also known as an amphirol) and a D6 swamp dozer for final levelling and compaction. The key points from a review of the Mudfarming performance include (Lynas 2019b):

- initial 24-48 hours (hr) drained densities of deposited fresh tailings are approximately 0.68 t/m^3 or 37% solids equivalent based on survey data. This aligns well with measured values of beached tailings after 24-48 hr drainage from flocculated spigot discharged (ETD);
- proactive mudfarming (i.e., deposition occurred on a consolidated floor) has achieved dry densities of 1.5 t/m^3, with a vane shear stress of >20 KPa;
- dry densities of 1.5 t/m^3 has been achieved in both summer and winter farming cycles;
- the summer farming cycle is approximately four months and the winter cycle approximately six months; and
- proactive mudfarming results in a 134% increase in tailings dry densities when compared to passive tailings management.

Current solids concentration range between 12.3 – 14.1%, however, Lynas has also significantly improved their ability to recover the supernatant liquor, this is temporarily stored in the Return Water Pond (RWP) before being sent to the Recycled Water Treatment Plant (RWTP) (A. Cargill, pers. comm, Lynas, 2020). Once the supernatant water is removed, the tailings is then mudfarmed to release the pore water from beneath the tailings crust. Lynas propose to continue mudfarming at Mt Weld, and optimising the farming cycles to enable reduction in the required TSF area (Lynas 2019b).

Table 5-7: Results of the Australian Standard Leaching Procedure Tests on Mt Weld Project Tailings sampled November 2012 (KASA 2014)

Parameter (Element)	ASLP pH 2.9	ASLP DDW	Class I Landfill Leachable Concentration	Derived water concentration for the general public (exposure limit=1 mSv/year)	ANZECC Livestock drinking water trigger level (low risk) (mg/L)
Arsenic	BDL	0.0034 mg/L	0.5 mg/L	N/A	0.5 mg/L
Cadmium	0.00152 mg/L	0.00004 mg/L	0.1 mg/L	N/A	0.01 mg/L
Chromium	0.02 mg/L	0.05 mg/L	0.5 mg/L (Hexavalent)	N/A	1 mg/L
Cobalt	0.0213 mg/L	0.001 mg/L	N/A	N/A	1 mg/L
Copper	BDL	BDL	N/A	N/A	0.4-5 mg/L (depending on type of livestock)
Iron	0.03 mg/L (Fe-Sol)	0.54 mg/L (Fe-Sol)	Not stated	N/A	Not sufficiently toxic
Lead	BDL	0.0032 mg/L	0.1 mg/L	N/A	0.1 mg/L
Manganese	4.91 mg/L	0.13 mg/L	N/A	N/A	Not sufficiently toxic
Mercury	BDL	BDL	0.01 mg/L	N/A	0.002 mg/L
Nickel	0.02 mg/L	BDL	0.02 mg/L	N/A	1 mg/L
Selenium	BDL	BDL	0.5 mg/L	N/A	0.02
Thorium	0.000324 mg/L	0.001596 mg/L	Not stated	N/A	Not stated
Uranium	0.009867 mg/L	0.004091 mg/L	Not stated	N/A	0.2 mg/L
Zinc	0.55 mg/L	0.32 mg/L	N/A	N/A	20 mg/L
Final pH	4	9.1	N/A	N/A	N/A
U-238 (as ^{234}Th)	BDL (< 0.3 Bq L^{-1})	BDL (< 0.3 Bq L^{-1})	N/A	49 Bq L^{-1}	0.2 Bq L^{-1}
Th-230	BDL (< 3 Bq L^{-1})	BDL (< 3 Bq L^{-1})	N/A	13 Bq L^{-1}	Not stated
Ra-226	0.235 ±. 059 Bq L^{-1}	BDL (< 0.2 Bq L^{-1})	N/A	6 Bq L^{-1}	5 Bq L^{-1}
Pb-210	BDL (< 0.3 Bq L^{-1})	BDL (< 0.2 Bq L^{-1})	N/A	2 Bq L^{-1}	Not stated
Ra-228	0.94 ± 0.21 Bq L^{-1}	BDL (< 0.3 Bq L^{-1})	N/A	2 Bq L^{-1}	2 Bq L^{-1}
Th-228	BDL (< 0.2 Bq L^{-1})	BDL (< 0.2 Bq L^{-1})	N/A	20 Bq L^{-1}	Not stated

5.1.5.5 Rehabilitation Materials Inventory

Competent waste materials will be required for armouring the slopes of the constructed landforms, lining of drainage features and in construction of the abandonment bund and permanent water diversion structures developed during the mining sequence. Lynas anticipate that the stockpiled blocky alluvium material will be utilised for this purpose, if deemed suitable for the application.

A summary of the current rehabilitation material volumes for the site, not contained within the WRL, are presented within **Table 5-8**, in addition to an estimation of the quantity of material to be generated from the Stage 4 mining campaign. An accurate inventory of the current topsoil stockpiles is presented in **Section 9.4.10.2**.

Table 5-8: Site Rehabilitation Materials Volumes

Rehabilitation material	Volume	
Topsoil/ subsoil	~ 505,021 m^3 currently ~ 648,971 m^3 after stage 4	
Lake clay capping	~ 37,000 m^3 currently ~ 249,000 m^3 after Stage 4	
Alluvium	~266,000 m^3 currently	86,000 m^3 blocky alluvium
		180,000 m^3 sandy alluvium
	~ 2,406,000 m^3 after Stage 4	813,000 m^3 blocky alluvium
		1,593,000 m^3 sandy alluvium

Lynas have estimated that approximately 350,121 m^3 of topsoil will be required to rehabilitate all the features presented within this MCP, that are affiliated with the Stage 4 open pit mining campaign. This is utilising an application depth of between 100 to 200 mm dependent on the area. Consequently, the anticipated volume of topsoil to be stockpiled (~ 648,971 m^3 after stage 4) is greater than the estimated requirement for the Mt Weld rehabilitation prescription,

However, the suitability of the blocky alluvium as a source of armouring material has been identified as a knowledge gap on the upper embankments of the WRL, lining of drainage features and in construction of the abandonment bund and permanent water diversion structures. This knowledge gap will be addressed via further testing of the waste material to verify its hardness and resistance to erosion.

Due to the higher fines content within the sandy alluvium, it is recommended that it is stockpiled separately to the blocky alluvium, (higher gravel content) within the temporary stockpile to avoid potential issues with sourcing these materials separately during the reclamation process. Where stockpiling separately is unavoidable, Lynas will maintain detailed spatial information to record location within the stockpile and avoid using material in transition areas from blocky to sandy during reclamation process (A. Cargill, pers. comm, Lynas, 2021).

5.1.5.6 Soil and Waste Characterisation Summary

Key aspects related to soil and waste characterisation that may impact closure outcomes being achieved successfully have been identified in **Table 5-9**.

Table 5-9: Soil and waste characteristics and implications for closure

Aspect	Implication
Radiation	It was previously noted that the lake clay materials contained elevated radiation (Stantec 2017c), however, the materials that have displayed these properties have been contained within the WRL and further assessment has noted the radioactive properties are below the threshold for NORM classification (<1 Bq/g).
	It was also noted previously that the lake clay and calcrete waste stream contained low levels of radioactive properties (Stantec 2017c), further investigation confirmed these materials contain naturally occurring radionuclides below the threshold for NORM classification (<1 Bq/g).

Aspect	Implication
	Due to elevated levels of radiation anticipated from the tailings, it is currently proposed that the TSF will be capped with a soil cover to a minimum thickness of 300 mm to 500 mm, or an alternative depth as demonstrated by trials, to attenuate gamma radiation.
Encapsulation of waste streams	The calcrete has recently been further classified into calcrete – soft and calcrete – coarse (Stantec 2020a). This report recommended that the calcrete – soft material should continue to be encapsulated within the WRL, as depicted in **Figure 5-7**, due to its high clay content and dispersivity leading to a high erosive potential. However, the calcrete – coarse material could potentially be utilised as a source of rock armouring material during rehabilitation of the landforms. There is still remaining capacity in the WRL to accept additional waste to cover the 354,000 m^3 of calcrete, depicted in **Figure 5-7**, with alluvium.
	The lake clay materials are not suitable for placement near the surface of a landform. This material type is characterised by a lack of coarse content, extremely slow drainage, and hard setting properties, coupled with a tendency for erosion due to its sodicity and structural instability. These characteristics indicate that it is not suitable as a surface material. It is therefore recommended that the lake clay material either be buried in a constructed landform or used as an impermeable liner for tailings dam construction (Stantec 2020a). Lynas has recently constructed a separate stockpile, containing ~37,000 m^3 (**Section 9.4.8**), of this material, and is proposing the construction of an additional temporary stockpile, within the ROM Pad expansion area. If all the lake clay material within these temporary stockpiles is not utilised prior to closure it will be required to be encapsulated in the approved WRL footprint, away from the surface due to it physical and chemical characteristics. To date approximately 609,047 bank cubic metres (BCM) of calcrete and lake clay material has been encapsulated within the WRL (A. Cargill, pers. comm, Lynas, 2020).
	If all the mineralised waste material is not processed prior to closure it will be required to be encapsulated in the approved WRL footprint, away from the surface due to its radioactive properties. Additionally, the soil fraction (<2 mm) of this material was found to be partially dispersive and highly susceptible to erosion. Due to these two factors, Lynas may backfill this material within the open pit or encapsulate it at the surface (using a minimum of 2 m cover of mine waste). If backfilling is determined as the final closure option, a sterilisation report will be submitted to the DMIRS Geological Survey Division for approval, with the methodology presented in a revised MCP.
	All waste materials on the Mt Weld site have been found to be NAF, therefore, no encapsulation or selective placement of water materials is required for stored acidity.
Elevated metal concentrations	Two of the waste streams (mineralised waste and lake clay) both have measured elevated metal concentrations; however, these do not trigger a requirement for encapsulation in specifically designed cells. Although there is elevated total metal concentrations within the ore and waste samples, the levels recorded within the tailings leachate (representing the "worst case scenario" for metals mobility) is not elevated. Elevated arsenic concentrations were recorded within the ore of the stockpiles sampled by Outback Ecology (2014) that were four

Aspect	Implication
	times that of the next highest waste stream. The concentrations of arsenic in the tailings leachate, however, were below detection limits. This highlights the lack of mobility of the metals and is likely due to the lack of acid forming materials that act to increase metal mobility.
Tailings	The tailings contain a high percentage of fine clay particles, with approximately 80% passing 10 to 15 microns. Capping will prevent dusting of the TSF at closure. Dusting presents a low risk, due to the high clay content and hard setting nature of the tailings. Capping will occur as soon a safe and practicable to do so, following sufficient drying of the tailings to allow machinery access. Due to the low leaching potential as evidenced in **Table 5-7**, no encapsulation of the tailings to prevent water infiltration is required.
Rehabilitation materials	Currently 266,000 m^3 of alluvium is available, and it is expected that ~2,406,000 m^3 will be available after Stage 4. **Table 5-8** presents the volumetric composition of the proposed stockpile. The fine fraction of this material has been characterised as having some susceptibility to erosion, which has led to the recommendation to only utilise this material on the lower slopes of the WRLs.
	Due to the structural stability of the coarse calcrete material and the potential to utilise it as a source of rock armouring material (during rehabilitation of the landforms), Lynas will explore the opportunities to stockpile this material separately during the Stage 4 mining campaign.
	The required quantity of competent rock armour required for the post closure landforms has been identified as a knowledge gap in **Section 9.4.12**, due to the extended LoM. If required, competent rock may be sourced from GSGM, located approximately 10 km from the mine.

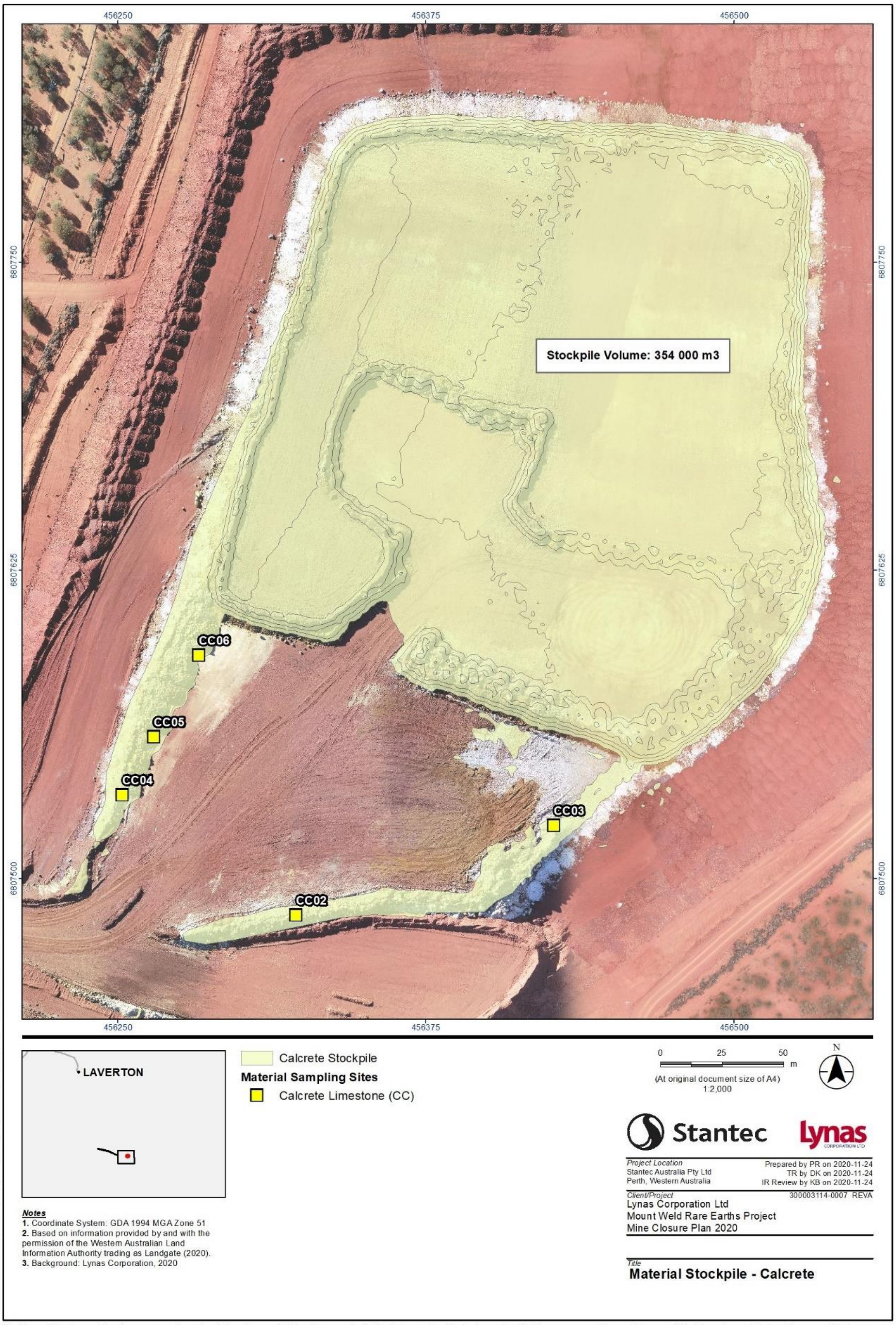

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Figure 5-7: Calcrete Stockpile within the Stage 3 WRL

5.1.6 Local Water Resource Details

Regional drainage comprises three broad parallel drainage systems which flow to the southeast towards the Nullarbor Bioregion.

The alluvial plain, in which the mine site occurs, has well-defined drainage as the land gently slopes west-southwest, at a very consistent slope of 1:250, from the ranges northeast of the site towards Lake Carey. The plain lies at the foot of a slightly steeper drainage gradient averaging 1:200 steadily rising to low escarpments 10 to 13 km to the east where perennial rainfall and run-off is actively eroding weathered granitic and mafic basement rocks. Windich Brook is located approximately 8 km west of the Project area.

Lake Carey is a Salt Lake, approximately 17 km, to the west of the mine (**Figure 5-8**), creeks drain toward, and often reach, Lake Carey where they evaporate due to the large surface area of the lake. Lake Carey is generally dry for most of the year, although small pools persist at the lower elevations on the lake surface following rainfall runoff. Following normal rainfall events, the floodwaters soak into the surface over and around the Project area and eventually enter the groundwater system (AECOM 2019).

Even in the case of major rain events such as cyclonic rains, the gradient is too low and the flow rate of the sheet-flood too slow to maintain material in suspension, and it drops out on the plains around the Project area.

There is a large catchment to the east of the Project this area is characterised by undulating topography; run-off leaves the area via a system of natural channels. The lower portion of the catchment is much flatter and natural channels are poorly defined, indicating that surface run-off during extreme floods will occur as sheet flow, with fairly even covering of water over the ground flowing to the west (Knight Piésold, 2003). This makes the landscape sensitive to water starvation, ponding and erosion, where the natural flow of the water is impeded (Pringle, Van Vreeswyk, & Gilligan, 1994). However, except following very heavy downpours, very little surface water movement is present over the Project area (Rankin, 1985).

These intermittent stream flows carry eroded detritus (mainly quartz sand and gravel) westwards, but before reaching the Project area, the reduced transport energy from the gradual break in slope, results in the sediment load dropping out and dissipation of the stream flow into a coalesced sheet-flood. It is evident from numerous diamond drill cores taken over the mine area, that this system of slow accretion has raised the topographic surface from a former underlying lake sediment deposit through 24 m of transported alluvium layers to the present land surface (KASA 2014).

5.1.6.1 Local Surface Water Hydrology

In 2017, AECOM delineated four Mt Weld catchments based on the publicly available 30 m resolution digital elevation model. The delineated catchments that report directly to the Flood Control Bund (previously referred to as the Eastern Flood Diversion) total about 90 km^2. An additional catchment which reports just to the north of the Mt Weld Aquifer totals an additional 88 km^2 (**Figure 5-9**) (AECOM 2017b).

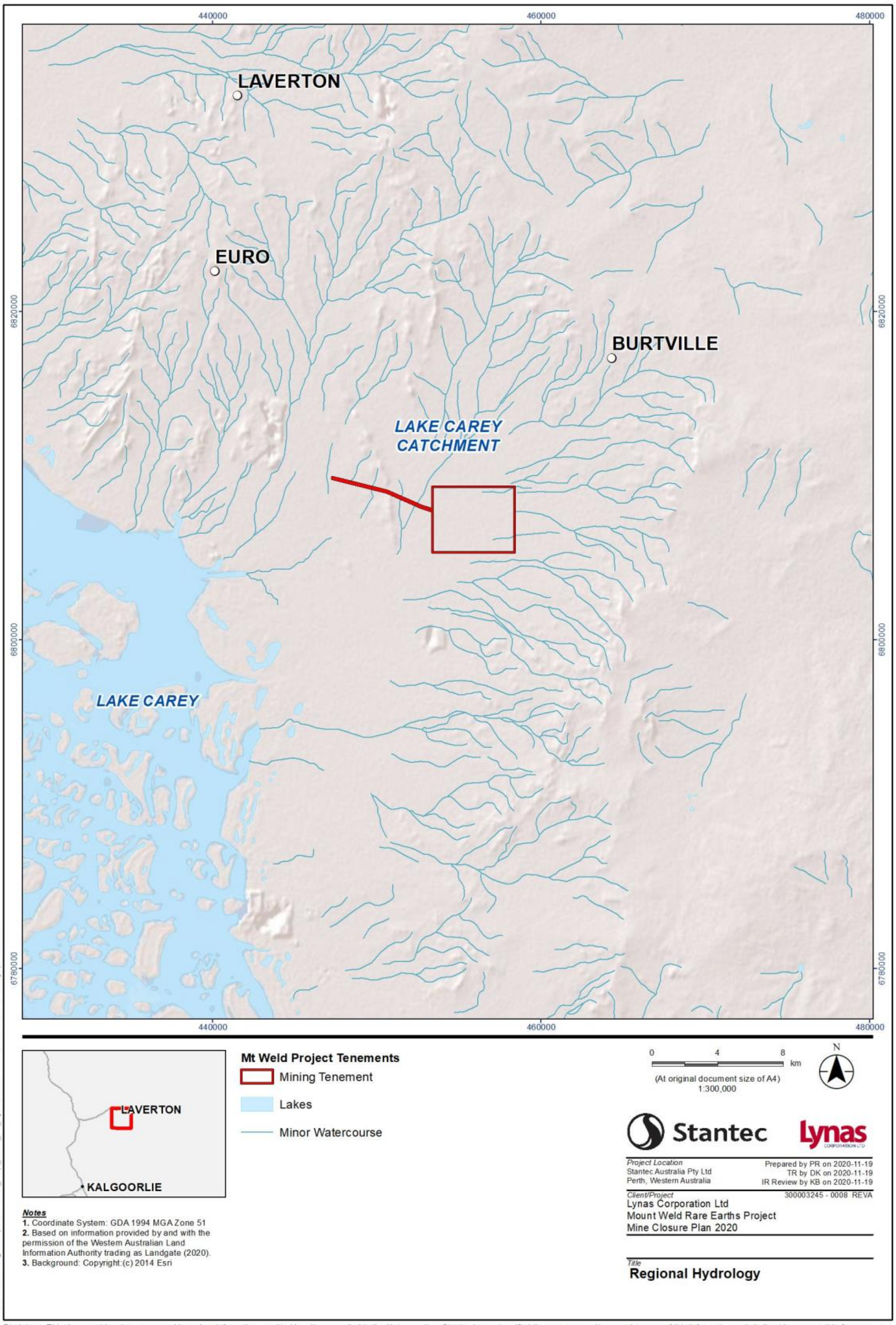

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Figure 5-8: Regional Hydrology

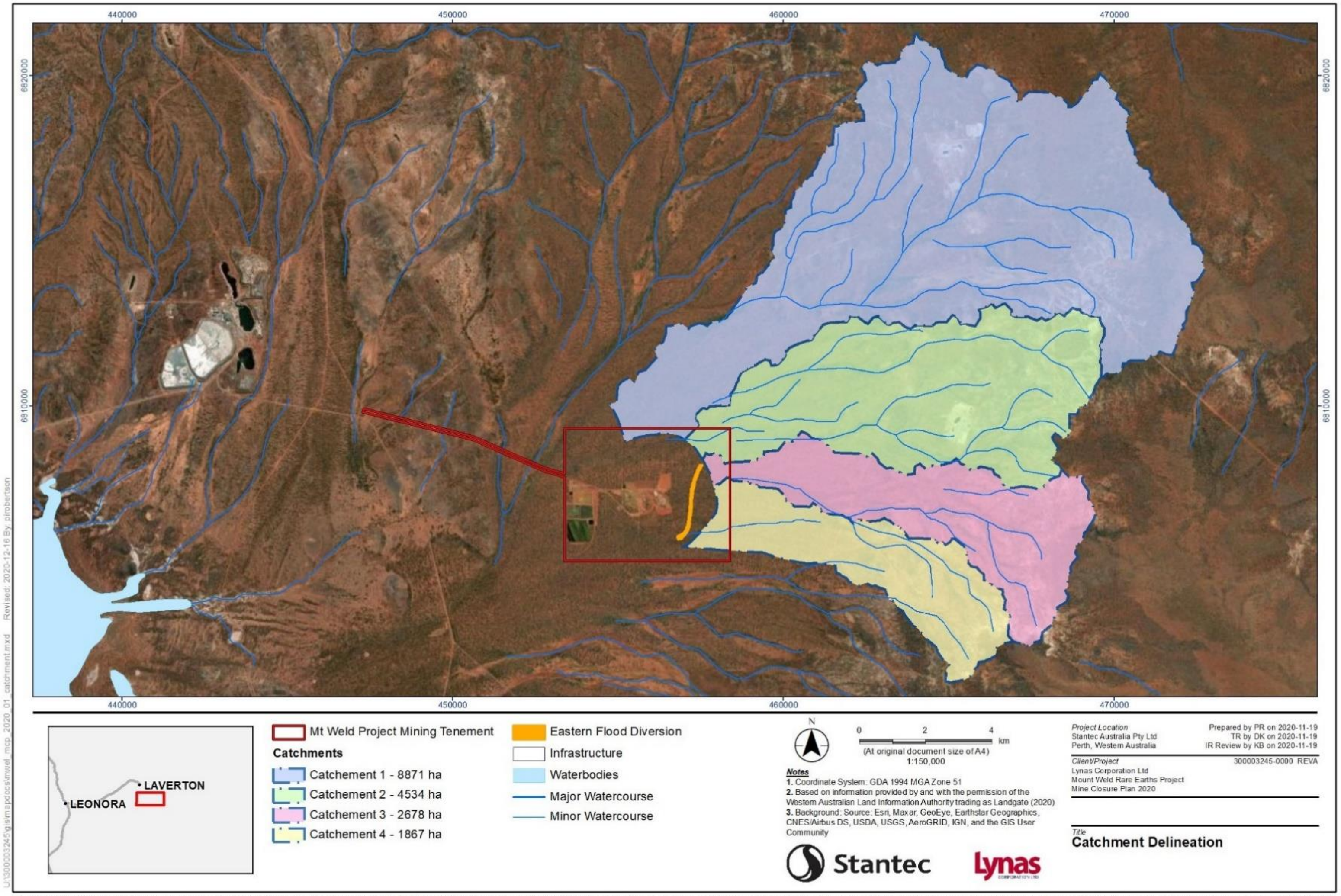

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Figure 5-9: Catchment Delineation (AECOM 2017b)

The Project area falls at an average gradient of 0.3%, management of surface water is via protection measures including bunding and diversion channels. The existing surface water diversions include:

- the Flood Control Bund (**Section 9.7.4** and **Figure 2-3**);
- the Northern Cut-off Drain (**Section 9.7.6** and **Figure 2-3**);
- the Stormwater Diversion Channel (**Section 9.7.11** and **Figure 2-3**);
- Haul Road Drain (**Section 9.9.4**); and
- Managed Aquifer Recharge drains (**Section 9.8.7**).

5.1.6.2 Site Flood Assessment

In 2016, the adequacy of the existing flood containment structures was assessed by Hatch. The Flood inundation modelling identified that the process plant is likely to be inundated in the event of a 1 in 100 AEP storm under current conditions, with sheet floodwaters flowing from the northeast of Mt Weld towards Lake Carey in the southwest. The report recommended that a detailed survey be completed within the area of the proposed infrastructure to confirm modelling outcomes prior to any construction works. The outcomes of the survey may impact the recommended bund height, length and associated costs. Formal design drawings would need to be generated to ensure construction was performed to the correct levels and post-construction certification could be provided (Hatch 2016).

5.1.6.3 Post Closure Surface Hydrology

Consultation on what drainage and infiltration features will remain post closure has not yet occurred. Post closure, where feasible, it is proposed to reinstate natural drainage through the Project area: this will primarily consist of sheet flow moving to the west–southwest. Where the access road crosses minor drainage channels, these channels will be reinstated to mimic pre-mining hydrological conditions.

Lynas anticipate that two of the existing surface water diversion structures will remain in-situ (A. Cargill, pers. comm, Lynas, 2020):

- the MAR infrastructure: which includes the Flood Control Bund, sump and infiltration drains, (as it promotes passive aquifer recharge); and
- the Stormwater Diversion Channel - east of the TSFs; this will be required to protect the TSFs and evaporation ponds (EPs) from sheet flooding.

A diversion bund constructed from competent material will also need to remain to divert the sheet flow to the south around the post closure landforms. Additional features may be constructed during the development of the operation that may also be retained.

5.1.6.4 Hydrogeology

Regional groundwater flow is southwest towards Lake Carey and the Carey Paleodrainage System. Three main regional groundwater flow systems are located in the area:

- an unconfined superficial aquifer, of regional extent, formed within surface alluvium;
- a confined/semi-confined weathered carbonatite aquifer, formed by the carbonatite regolith, located to the east of the TSF; and
- a confined/semi-confined regional weathered bedrock/fresh bedrock aquifer.

The superficial and weathered carbonatite aquifers are separated by discontinuous beds of low permeability lake clays. Vertical leakage occurs between the aquifers in areas where the lake clays are absent and via bedding features, structural features and the many boreholes within the carbonatite area, however, limited connectivity is thought to occur.

The confined/semi-confined weathered carbonatite aquifer contains a valuable, but limited resource of brackish groundwater. Since late 1989, the GSGM has used this resource for mine process water supplies. Access for both companies to the Mt Weld groundwater resource is governed by two separate DWER Licences to take water (refer to **Section 5.2.1.1**).

The fresh bedrock is also known to locally form a fractured rock aquifer, though limited data is available to define its characteristics or extent. Fractures may extend into the country rock surrounding the carbonatite, enhancing the regional flow of groundwater into the carbonatite.

5.1.6.5 Local Hydrogeology

The Mt Weld Carbonatite is a sub-circular stock of carbonate-rich granitoid, intruded into Achaean volcanogenic basement rocks (URS 2010). A northwest trending dolerite dyke transects the intrusive, sub-dividing it into two approximately equal parts (western and eastern). The dyke appears to act as a semi-impermeable barrier to horizontal groundwater flow (AECOM 2017a).

The two aquifer systems that overlie the carbonatite bedrock at The Mt Weld Project are:

- an unconfined aquifer (superficial aquifer) of regional extent formed by the superficial formations, with local basal elevation of about 400 metres Relative Level (mRL). The natural water table was originally at an elevation of 410 to 411 mRL, about 15 m below the ground surface. The superficial formations are approximately 30 m thick and comprise of a sequence of layers of transported alluvial sands, calcrete and lake clays; and
- a confined/semi-confined aquifer (weathered carbonatite aquifer) formed by the carbonatite regolith. This aquifer is known to occur from 315 to 395 mRL but is of limited extent below 355 mRL. Natural groundwater levels were originally similar to the water table elevations within the superficial aquifer.

The regional groundwater flow direction is southwest away from the carbonatite and towards Lake Carey and the Carey Palaeodrainage System. However, groundwater abstractions made since 1989/90 from the carbonatite complex (URS, 2012) have created a sink whose hydraulic influence extends into the surroundings including the TSF and EP locations (Ultramafix, 2011).

A hydrogeological assessment (Ultramafix 2011) indicates that the groundwater now flows towards the weathered carbonatite to the east of the TSF and EP locations. This groundwater configuration was confirmed by an assessment conducted by URS in 2014 (2014a) and applies to both the superficial and carbonatite/bedrock aquifers (URS 2012).

A conceptual groundwater model was developed to support the development of TSF 3; the model was designed to account for the expected tailings and wastewater deposition rates over the remaining life of the Project. The variation in groundwater mounding due to infiltration was assessed along three cross-sectional lines representing the groundwater flow-path from the EPs, TSF 1, TSF 2 and TSF 3. (AECOM 2018).

Further confirmation of this URS (2014) assessment was presented in AECOM (2018), which identified that:

- following commencement of pit dewatering a hydraulic groundwater sink has been created with the superficial formation dewatered within the confines of the open pit;
- flow down-gradient of the open pit is now from west to east and back to the open pit;
- the boundary of this groundwater capture zone is approximately 5 km southwest of the open pit and 2.5 km southwest of the TSF area; and
- potentially contaminated water entering the groundwater table is captured by this hydraulic sink with no water leaving the confines of the immediate mine area.

5.1.6.5.1 Aquifer Infiltration Capacity

Based on historical aquifer tests and more recent mini-injection tests, the infiltration capacity of the main carbonatite aquifer is high with estimated permeability's averaging 27 m/day (coarse clean sand) over 47 historical aquifer tests (AGC, 1989 as cited in URS 2014). Following a number of abstraction verse drawdown assessments, the porosity (specific yield) of the carbonatite regolith zone has been reported to range up to 0.4 (i.e., 40 percent open area) (URS, 2014).

The above values demonstrate the transmissive characteristics of the aquifer to accept water due to its composition of weathered carbonatite. Furthermore, an extensive layer of calcrete was reported to provide hydraulic connection in the southern area of the Mt Weld Aquifer (AECOM 2017b).

5.1.6.6 Groundwater Quality

Groundwater quality of the Mt Weld Carbonatite Aquifer is classified as generally brackish to weakly saline, with concentrations ranging from 5,000 to 5,800 mg/L total dissolved solids (TDS) in the western half of the volcanic structure and fluctuating between 3,500 and 7,000 mg/L TDS in the eastern half (URS 2010). The pH across the aquifer is generally neutral to slightly alkaline and ranges between 7.6 and 8.2.

There are low levels of radioactivity naturally present in the groundwater abstracted from the Mt Weld carbonatite aquifer (e.g., 0.179 ± 0.094 Bq L-1 228 Ra measured in October 2011). These levels are not unusual in areas of thorium mineralisation and are consistent with 228Ra levels measured in Australian drinking waters (ATC Williams 2017). Concentrations of thorium and uranium are likely to be below detection limits. (AECOM 2018).

The cattle station bores, located on the pastoral lease of the Mt Weld Station, draw groundwater from an alternate superficial aquifer and are not influenced by abstraction from the Mt Weld Aquifer (AECOM 2020).

ANZECC (2000) Livestock Drinking Water Guidelines for beef cattle recommend an upper limit of 4000 mg/L TDS for 'no adverse expected effects on animals expected'. Salinity levels within the carbonatite aquifer exceed the Livestock Drinking Water Guidelines, hence this water is not deemed suitable as drinking water for cattle.

There are no known Groundwater Dependent Ecosystems (GDEs) near the borefield.

The superficial aquifer has comparatively elevated concentrations of all major ions, except for silica. Average concentrations of uranium and thorium tend to be relatively similar in both water sources (approximately 0.003 to 0.07 mg/L). However, thorium concentrations are generally below detection levels. These values are not considered unusual in areas where mineralisation of thorium occurs (KASA 2013).

5.1.6.7 Post Closure Hydrogeology

Confirmation is required as to what pit lake hydrological system will develop post closure, however, due to the climatic conditions and other factors within which the Project is situated, it is expected that the open pit will act as a groundwater sink. If this proves to be the case, it is likely that evaporation may serve to concentrate salts and minerals within the pit lake, and it is likely that these concentrations will increase over time. A hydrological study to determine the function of the pit lake post closure has been identified as a task addressing this knowledge gap in **Section 9.6.4**.

At this conceptual stage of closure planning, due to the 24 year plus remaining mine life, the closure strategy includes capping any exposed mineralised waste material in the open pit floor with a benign capping layer. Further studies are required to assess the effectiveness of this proposed methodology and this has been identified as a knowledge gap in **Section 9.6.4**. Additionally, further predictive analysis of the post closure pit lake water quality has been identified as an investigative task required to inform closure planning.

5.1.7 Local and Regional Ecological Information

5.1.7.1 Terrestrial Flora and Fauna

Flora and Vegetation Surveys of the Mt Weld Project Area were undertaken by Mattiske Consulting Pty Ltd (Mattiske) in 2003, with previous surveys undertaken prior to project approval in 1991. A subsequent flora and vegetation study was completed by Outback Ecology in 2011 which encompassed the entirety of the Mining Leases, which are the subject of this MCP (Outback Ecology 2011). In 2012 a further Level 1 Vegetation, Flora and Fauna assessment was undertaken encompassing a 217-ha clearing envelope required for further development of mining operations (Outback Ecology 2013). In 2014, an additional Level 1 Flora and Fauna assessment over an area of 492 ha (was conducted by MWH, in a parcel of land immediately to the west of the Project (MWH 2014). In 2020 Stantec performed an additional, two-phase Level 2 and Targeted Terrestrial Fauna survey (Stantec 2020c) and a Level 2 two phase Detailed Flora and Vegetation survey (Stantec 2020b) both covering 3,254 ha within tenements associated with, and adjacent to the Mt Weld mine site (Survey Area).

The following **Section 5.1.7.1.1** summarises the findings of the above surveys, which cover the tenements which are the subject of this MCP.

A baseline fauna assessment was conducted by Ninox Wildlife Consulting in April 1991, which consisted of a three-day opportunistic fauna assessment of the Project Area and extensive foot and vehicle transects across all vegetation communities and fauna habitats. This was followed up by a further three days in mid-December 1991 where more detailed targeted sampling was done including trapping using 100 Elliott box traps for two nights within minor variations of the mulga communities, two nights of head-torching for nocturnal vertebrates and one-night mist-netting for bats. During surveys, all active vertebrates were recorded, and tracks, scats, diggings and nests were noted and identified. Results were reported in Ninox Wildlife Consulting (1992).

The Fauna assessment undertaken in 2012 (in conjunction with the Vegetation and Flora assessment), aligned with the same survey areas assessed above (Outback Ecology 2013). Targeted, opportunistic and spotlighting surveys were undertaken within each of the four habitat types within the Project Area. Targeted searching techniques included searching for tracks, scats, diggings. Avifauna census and spotlighting surveys were carried out in areas of interest within the Project Area and opportunistic sightings of animals were recorded. Motion sensor cameras were used to identify presence of fauna that are unlikely to be observed during targeted searches and SM2 bat echolocation recorders were used to capture information about the presence and activity of bats within the Project Area.

The objective of Stantec's 2020 Fauna survey(Stantec 2020b) was to understand the vertebrate and short-range endemic (SRE) invertebrate values of the Survey Area employing methods consisting of four systematic sites with 2,912 trap nights utilising pitfall, small Elliott, funnel and cage trapping, as well as avifauna census, motion-sensor camera, echolocation recorder, systematic searching and spotlighting methods. Non-systematic methods comprised targeted searching, motion-sensor camera deployment, opportunistic recording, acoustic bird call recording and bat echolocation recording.

Stantec's 2020 Flora survey(Stantec 2020b) aimed to provide a comprehensive understanding of the flora and vegetation values through a desktop assessment, and by conducting a dual season field survey. A total of 38 sample sites (35 quadrats and three relevés) were assessed during this Survey. Sixteen of these quadrats represent previously sampled relevés from surveys occurring in 2014 or 2018. The remaining 19 quadrats were installed during Phase 1 and re-sampled in Phase 2 to ensure adequate replication of quadrats within vegetation types, spatial distribution, and areas of particular interest were sufficiently surveyed. An additional two relevés were installed during Phase 2 to assist in vegetation mapping refinement. The lack of rain preceding the 2020 survey means it is unknown if a complete species list has been recorded; the potential unidentified species are likely herbaceous annual species that germinate after rainfall events.

In 2017, a Flora and Fauna review was conducted by Stantec (2017b) which combined a desktop study assessing the previous surveys completed in the area, updated database searches to ensure currency and included a targeted site visit for the previous singular recorded instance of the Priority 3 species *Goodenia lyrata*. The 2020 Flora and Fauna surveys conducted by Stantec incorporated and built upon the data combined in the 2017 review.

5.1.7.1.1 Terrestrial Flora

A total of 41 families, 99 genera and 208 plant taxa (including varieties and subspecies) have been recorded within the Survey Area. Fabaceae, Chenopodiaceae and Scrophulariaceae, and *Eremophila* and *Acacia* and were the most represented families and genera respectively (Stantec 2020b).

Three vegetation communities were identified within the Survey Area by Outback Ecology (2011). Mattiske (2003) identified six vegetation communities, which were restricted to the access Haul Road. The open pit area, WRL, stockpiles, EP, TSF and ore Haul Roads consisted of a fine scale mosaic of Mulga woodlands, shrublands and grasslands. The two exceptions were several small patches of either *Hakea preissii* tall shrubland or succulent *Chenopodiaceae* dominated depressions along the existing access road. Stantec (2020b) identified eight vegetation types (**Figure 5-10**), none of which represent a threatened ecological community or priority ecological community. Vegetation was mapped using a combination of data collected from quadrats along with reconciling the previously described vegetation types, with refinements made as necessary.

Stantec (2020b)described the condition of the majority of the vegetation as 'Very Good'(90.15%); areas where there had been previous vegetation clearance and land disturbance for mining activities the condition was mapped as 'Completely Degraded'(9.85%). Previously cleared land accounted for approximately 10% of the Survey Area.

No Threatened flora were identified in the Survey Area (Mattiske 2003, Outback Ecology 2011, Stantec 2020b). Based on habitat preference for species identified in desktop reviews three significant species were identified which may occur within the Survey Area (**Table 5-10**). However, only a single individual of significance has been previously observed in the Survey Area, namely *Goodenia lyrata* (Priority 3); currency of the conservation status of this species was confirmed as Priority 3 (Stantec 2020b). This species has previously been recorded within the Project Area (Outback Ecology 2011) but has since been confirmed as cleared during subsequent targeted searches for this species conducted by Stantec (2017, 2020b).

Table 5-10: Conservation significant species with habitat preference for the project area (adapted from Stantec 2020b)

Species Name	Conservation Code	Likelihood of Occurrence
Goodenia lyrata	Priority 3	**Previously recorded within Survey Area**: suitable habitat and land system present in Project Area. One individual located.
Calandrinia sp. Menzies (F. Hort et al. FH 4100)	Priority 3	**Possible:** suitable habitat occurs in the Survey Area and records within close proximity.
Calytrix hislopii	Priority 3	**Possible:** suitable habitat occurs in the Survey Area and records within close proximity.

Three introduced species of flora were recorded in the Survey Area, **Sonchus oleraceus*, **Malvastrum americanum* and **Acetosa vesicaria* (Outback Ecology 2011, Stantec 2020b). None of these species are Declared Plants under the *Agriculture and Related Resources Protection Act, 1976.*

There is no broadscale mapping in the Survey Area, other than Beard's vegetation association mapping, from which to put the relative impacts of any clearing of this vegetation in context, however, the Survey Area is mapped as Beard Association 18, of which the majority of its pre-European extent is still uncleared. No measure of the condition of this association across its range is available although most is utilised for pastoral activities. Thus, the more detailed vegetation communities described by this survey cannot readily be contextualised given a lack of access to unpublished data, but nonetheless appear to be well represented outside of the Survey Area (Outback Ecology 2013, Stantec 2020b).

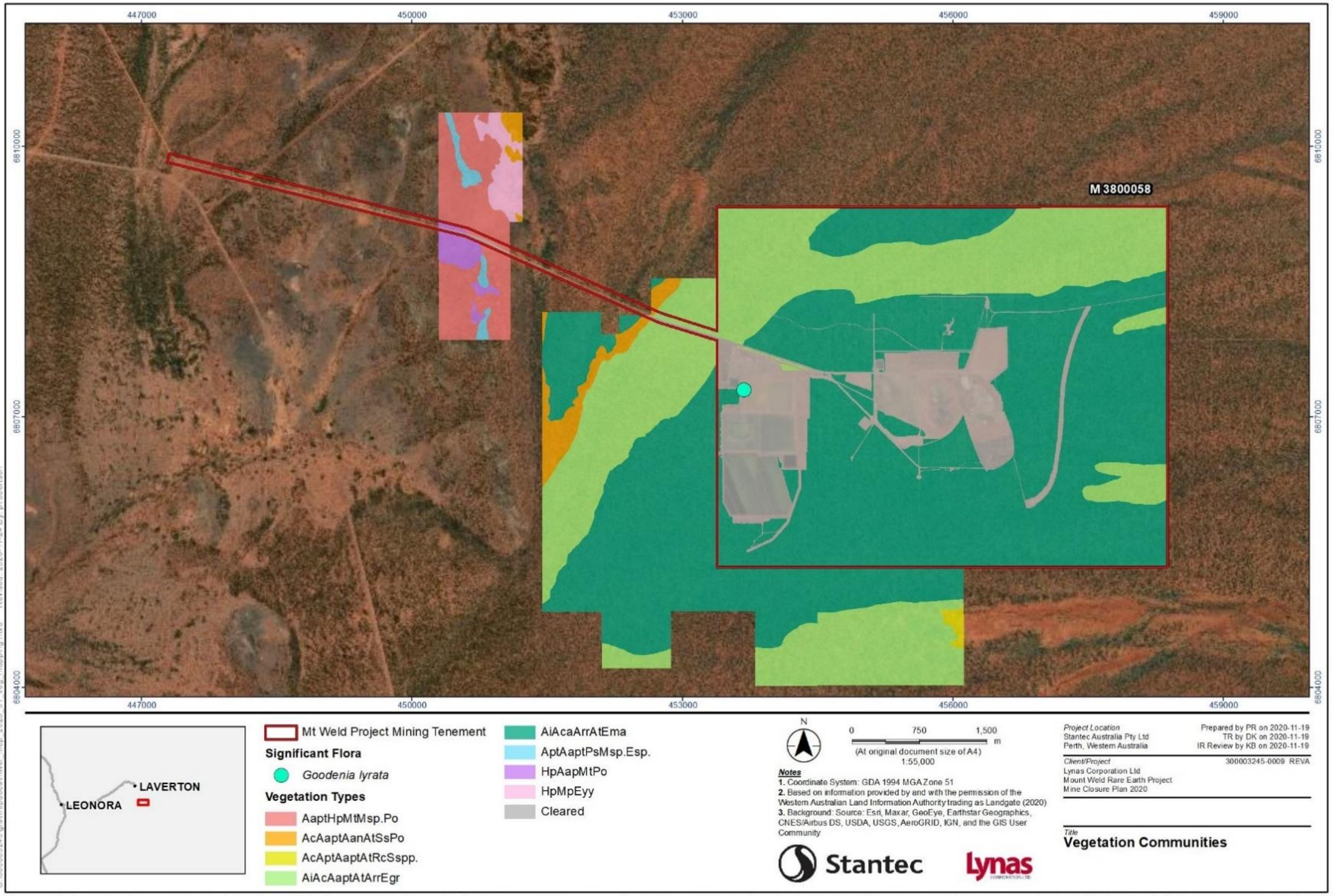

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Figure 5-10: Vegetation communities within the Mt Weld Survey Area

5.1.7.1.2 Terrestrial Vertebrate Fauna

The Project area lies in the Eyrean sub-region and is characterised by a range of vertebrates adapted to an arid climate, which follow the pattern of bird distributions, although most birds have a much wider geographic range. The extreme harshness and size of the Eyrean sub-region has resulted in the evolution of many specialised vertebrates and a high level of endemism in the region and the Goldfields (Ninox 1992).

Seven broad types of fauna habitat were identified within the Project Area (**Figure 5-11**):

- Mulga woodland on clay loam;
- Mulga woodland on stony plain;
- Sparse shrubland on heavy clay;
- Low Mulga Woodland on Clay Loam;
- Mulga on Stony Plain;
- Stony Rise; and
- Shrub Plain.

The fauna habitats identified above are consistent with those known to occur elsewhere in the Murchison bioregion, none are considered significant. Of the vertebrate fauna of conservation significance that may occur in the Survey Area, none are likely to be solely reliant on habitat patches within the area, and the regional impacts of the Project on species of conservation significance are likely to be negligible.

Thirty-five species of bird were recorded during the Ninox surveys with a further eight noted during previous surveys in 1990. As determined by a review of databases and existing literature, a further 77 species of birds, including four conservation significant species could possibly be recorded in the Survey area. Three species, namely Peregrine Falcon (*Falco peregrinus* – Schedule 4, WA Wildlife Conservation Act [WC Act]), Grey Falcon (*Falco hypoleucos* – DEC Priority 4 fauna), and Scarlet-chested Parrot (*Neophema splendida*) have wide distributions throughout Australia and are only likely to be present within the Project area as very occasional visitors, nomadic species or following an uncommon ephemeral event.

Twenty-two of the 77 unrecorded bird species are waterbirds and are only likely to be present following heavy rainfall resulting in flooding. The birds of the Project area can be classified into the following four categories:

- migratory species (e.g., Rainbow Bee-eater (*Merops ornatus*);
- nomadic species (e.g., honeyeaters and waterbirds);
- dispersive species (e.g., honeyeaters, wood swallows, young birds forced out of their parent's home range); and
- resident species (e.g., fairy wrens, thornbills).

A total of 19 native and nine introduced mammal species potentially occur in the Mt Weld Survey Area as determined by a review of databases and existing literature; of these four native and four introduced mammal species have been recorded in the Survey Area. Bats and small terrestrial native mammals (e.g., *Pseudomys*, *Sminthopsis* and *Ningaui* species) are rarely recorded without intensive trapping effort using a variety of techniques. However, the opportunistic trapping conducted in December 1991 did record one small carnivorous marsupial *Sminthopsis dolichura* and several bats (*Nyctophilus geoffroyi*). No rare mammals are predicted to occur within the Survey Area or its immediate surrounds. The Numbat was (*Myrmecobius fasciatus*) recorded in the eastern Goldfields in 1918 and the Bilby (*Macrotis lagotis*) last recorded in the region in 1924. The possibility of these two species still occurring in the Goldfields as a whole, or the Survey Area is remote and has been discounted (Ninox 1992).

Seven reptiles were recorded during the 1991 field surveys with four additional species noted by Martinick & Associates (Martinick & Associates 1990 as cited in Ninox 1992). Based on the habitat types and a review of databases and existing literature, a further 45 reptile species could potentially occur in the Survey Area. No frogs have been recorded to date, but six frog species may be present in the types of habitat present. No rare reptile or amphibian species are expected to occur within the Survey Area (Ninox 1992).

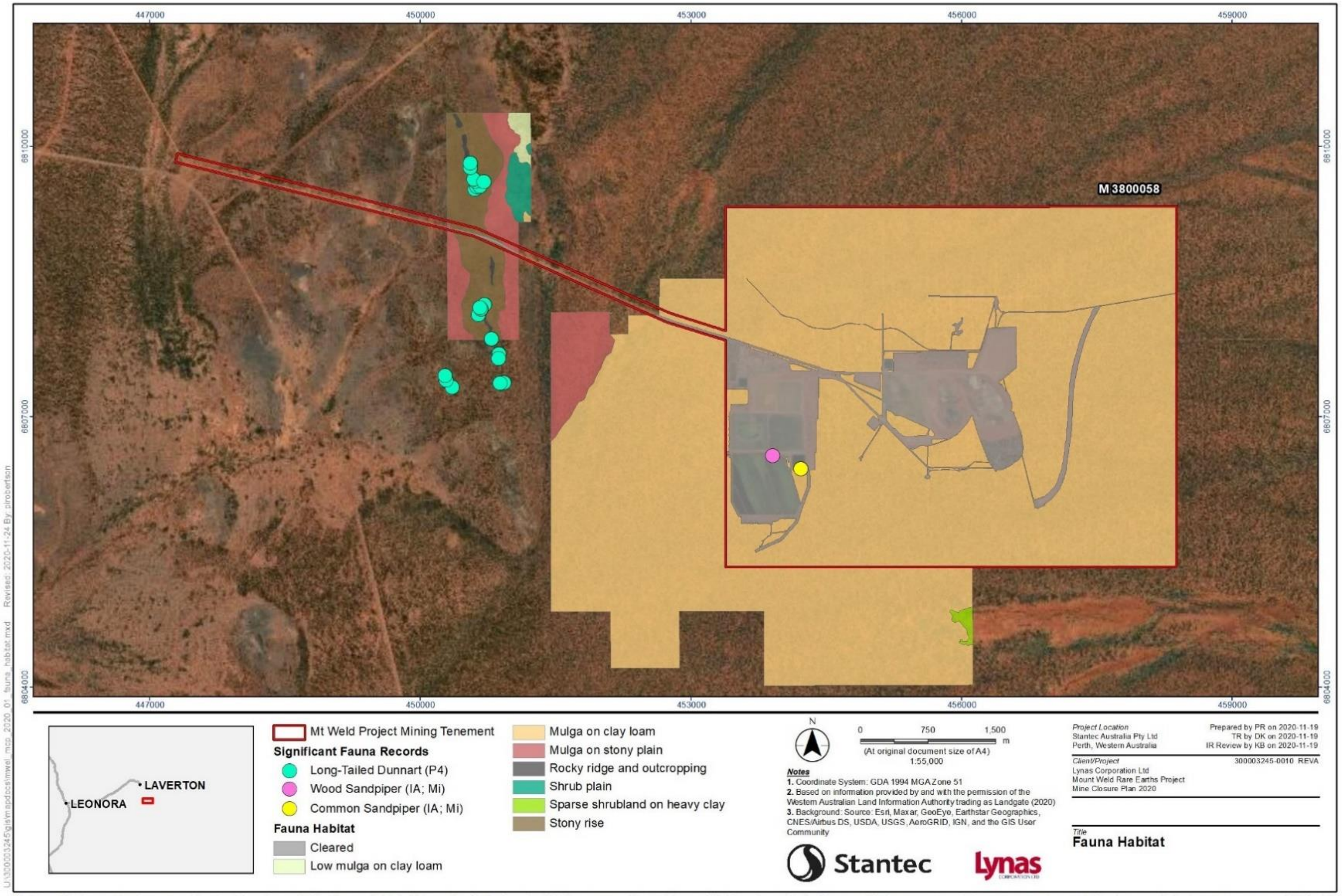

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Figure 5-11: Fauna habitats within the Mt Weld Survey Area

A total of 22 vertebrate fauna species were recorded during a field survey conducted by Outback Ecology in 2013, comprising 11 mammals (eight native) and 11 bird species. No amphibian or reptile species were recorded during this survey, most likely due to the cool and dry conditions experienced (Outback Ecology 2013). Although no conservation significant species were recorded during the 2013 survey, a Level 1 survey in 2014 by MWH recorded the Rainbow Bee-eater (*Merops ornatus*, listed as a Migratory species of conservation significance under the EPBC Act) (MWH 2014).

The desktop assessments in Stantec (2020c) identified 25 significant fauna species with the potential to occur within the Survey Area comprising six mammals, 18 birds and one reptile. Three of these species were confirmed as occurring during the survey, comprising:

- Long-tailed Dunnart (P4);
- Wood Sandpiper (Mi; IA); and
- Common Sandpiper (Mi; IA).

Based on the desktop assessment (Stantec 2020c) and habitats identified within the Survey Area, an additional 11 species were assessed as possible and eight were assessed as unlikely to occur. The Long-tailed Dunnart was recorded on four occasions during the 2020 Survey within the stony rise habitat, its preferred habitat. The species has been recorded during previous surveys on 12 occasions in the vicinity of the Survey Area. The Long-tailed Dunnart was recorded at 25 locations (212 records) on stony rises to the north of the Survey Area from regional deployments of motion-sensor cameras, confirming that the species is present on other stony rises in the region.

Of the species recorded or likely to occur, the Wood Sandpiper and Common Sandpiper are listed as migratory under the EPBC Act and are therefore considered a Matter of National Environmental Significance (MNES). The Survey Area was determined not to contain any important habitat nor support an ecologically significant proportion of the population of the Wood Sandpiper and Common Sandpiper, due to limited aquatic habitat.

Fauna habitats found in the Mt Weld Survey Area were consistent with those known to occur elsewhere in the Murchison bioregion and none were considered significant. Of the vertebrate fauna of conservation significance that may occur in the Survey Area, none are likely to be solely reliant on habitat patches within the Survey Area, and the regional impacts of the Project on species of conservation significance are likely to be negligible (Outback Ecology 2013).

5.1.7.1.3 Terrestrial Invertebrate Fauna and SREs

The broad fauna habitat of low Mulga woodland over clay loam is not considered to be a potential Short-Range Endemic (SRE) Invertebrate fauna habitat and is considered to be widespread, well connected and typical of the Murchison bioregion. The habitat appears relatively uniform and flat and does not correspond to typical SRE habitats (Outback Ecology 2013, Stantec 2020c). One potential SRE species is known to occur in the region surrounding the Project. This species, *Aganippe* `MYG017`, is found in the Wilson land system. This land system does not occur within the Survey Area.

Surveying for SRE invertebrate fauna was conducted during all active searches in 2012, 2014 and 2020, with microhabitats searched include: leaf litter, beneath logs, bark and rocks, crevices, at the bases of shrubs, trees and grass tussocks. Burrows suspected to be those of mygalomorph spiders or scorpions were excavated and occupants were collected.

The 2014 survey yielded six invertebrate specimens from groups prone to short range endemism comprising five mygalomorph spiders and one scorpion (MWH 2014). These specimens could not be identified beyond genus level as they were of an inappropriate sex (female) for morphological identification; however, they have the potential to represent SRE species as they are from genera that are known to have species with restricted ranges. All invertebrate specimens were collected from the Low Mulga Woodland over Clay Loam habitat which is considered to be widespread and not restricted to the vicinity of the Project. Using this habitat type as indicative of species' distributions, it is therefore assumed that these specimens are likely to belong to species that are widespread in the surrounding landscape and are unlikely to represent SRE species. The broad fauna habitat found in the Survey Area was consistent with those known to occur elsewhere in the Murchison bioregion (MWH 2014).

Stantec (2020c) identified 20 specimens from groups prone to short-range endemism that were collected during the Survey. Of these, 13 were identified to morphospecies and seven taxa were only able to be identified to genus. Although none were known SRE species, the following were considered to represent potential SRE species and were classified as data deficient.

- the mygalomorph spider specimens from the genus *Idiosoma* sp.;
- the mygalomorph spider specimens from the genus *Idiopidae* sp.;
- the mygalomorph spider specimen from the genus *Proshermacha* sp.;
- the slater specimen from the morphospecies *Buddelundia* '103';
- the slater specimen from the morphospecies *Buddelundia* '106'; and
- the pseudoscorpion specimen from the morphospecies *Synsphyronus* 'weld'.

The slater specimens were collected from within the shrub plain habitat which was assessed as having a medium potential to support SRE taxa. The remaining potential SRE specimens were collected from within the widespread mulga on clay loam habitat, which held a low potential to support SRE taxa. To understand their lineage and distribution within the Survey Area and in the broader regional context, more specimens would need to be collected and genetic analysis would be required in some instances.

5.1.7.2 Subterranean Fauna

Stygofauna are subterranean fauna which live in groundwater. They are highly endemic species, which lack resistance to drying (EPA 2003). Species adaptations to the surrounding environment typically include lack of pigmentation and loss of eyes, which is commonly compensated for by elongated appendages and enhanced sensory organs such as antennae.

Stygofauna communities are generally found within the upper 100 m of a groundwater profile and favour slight alkaline conditions with low salinity values. They tend to favour habitats that are typically porous or fractured in nature such as calcrete and limestone.

The groundwater in the Mt Weld ore body is brackish and largely isolated from freshwater influx and nutrient input, probably since deposition of the aquiclude lake clays in the early Tertiary. Dewatering of the Mt Weld Project deposit began in 1989 (when little was known about stygofauna in Western Australia) and the water used for GSGM operations. Stygofauna are therefore not expected to occur within the rare earths deposit as it has been largely dewatered for more than 30 years.

5.1.8 Heritage

5.1.8.1 Aboriginal Heritage

A number of Aboriginal heritage surveys (both archaeological and ethnographic) have been undertaken over M38/58 to date by Mt Weld Mining (and former tenement holders, for which Mt Weld Mining has copies of all related heritage reports), together with two 'salvage' operations which relocated (removed) several identified Aboriginal archaeological sites. A search of the Aboriginal Heritage Inquiry System identifies two sites as being presently located within M38/58, namely DPLH site 2029 and DPLH site 30188. However, it is confirmed that DPLH 2029 (which was originally located by Dr Peter Veth in 1983) was removed as part of a salvage operation in 1990, which was also undertaken by Dr Veth. All the artefacts within these two sites have been collected and are stored at the W.A. Museum.

The concentrations of Aboriginal archaeological material detailed above were all investigated during the course of a single fieldtrip that took place from 21st to then 22nd October 2013, inclusive. The site inspection and survey of the tenement in 2003 by archaeologist/anthropologist Wayne Glendenning, further confirmed that no archaeological material was present at this location. Thus site 2029 no longer exists within M38/58.

DPLH site 30188 was formally registered as DPLH site 20601 and is also known as 'Mt Weld 7 (relocation site)'. This site was previously identified and located near the centre of M38/58, though following Ministerial Consent under Section 18 of the *Aboriginal Heritage Act 1972* (received in October 2003), 20601 was relocated to a position on the edge of the south-western boundary of the tenement in 2011. This was undertaken by archaeologist Wayne Glendenning and representatives of the Kurrku people. The location of the salvaged artefacts of site 30188 will not be impacted by any future ground disturbing works by Mt Weld Mining and are protected in situ (KASA 2014).

In May 2019, the Nyalpa Pirniku Native Title claim which encompasses the Mt Weld area was formally registered. In October 2019, an archaeological and ethnographical survey of the Mt Weld's LoM disturbance envelope was performed with Nyalpa Pirniku Traditional Owners who participated in all aspects of the survey and site recording. During the field trip, five new aboriginal archaeological sites (MW19-01, MW19-02, MW19-03, MW19-04 and MW19-05) were identified and recorded (Archae-aus 2019). Mt Weld has afforded protection to these recorded sites until they are formally assessed as to be considered as a Registered Site under the Aboriginal Heritage Act, 1972. No ethnographical sites were recorded during the 2019 field survey.

Mt Weld Mining has an on-going relationship with the Nyalpa Pirniku people as previously demonstrated and will continue to consult in good faith regarding the Mt Weld Project on an on-going basis.

Mt Weld Mining has previously held cultural awareness training on site with traditional owners of the Laverton area. Mt Weld are also active in the local indigenous community facilitating swimming lessons at the Laverton community swimming pool for the local children, conducting winter clothing drives and providing flights for the Doctor based in Laverton.

5.1.8.2 European Heritage

The Mt Weld Project is located within the Shire of Laverton, approximately 35 km southeast of the town of Laverton and 250 km northeast of the City of Kalgoorlie-Boulder. According to the 2011/ 2012 census information on the Australian Bureau of Statistics Website (Australian Bureau of Statistics 2015), the Shire of Laverton has a population of 1,339, of which approximately 29% are of indigenous descent, while the mining industry is the largest employer in the Shire employing 55.3% of the working population.

Gold was discovered in 1896 near the present-day town of Laverton, which was established in 1900. The town declined when surface gold was depleted but revived in the 1970s following the discovery of nickel at nearby Windarra. A search of the Heritage Council of WA online database and the Australian Heritage Commission's Register of National Estate Database indicated that there are no known listed sites of European or Natural Heritage significance in or near the Mt Weld Project area.

5.1.9 Contaminated Sites

Suspected or known contaminated sites are deemed a closure issue as well as an operational issue, consequently, Mt Weld Mining will investigate the potential for contamination over the LoM so that the contamination can be removed, treated, contained or managed to meet the purposes of the agreed post-mining land use and where practicable, to maximise the beneficial use(s) of the land after mining.

To ensure compliance with the CS Act and Contaminated Sites Regulations 2006, the closure implementation tasks incorporate investigation of the potential contaminated sites, which will subsequently facilitate the development of a remediation plan for the contaminated areas.

The Mt Weld Potentially Contaminated Sites Register (MTW-EN-REG-0006) (Lynas 2019a) contains a record of incidents that have occurred onsite since 2015. A total of 36 incidents have been recorded since this time. The majority of incidents have been classified internally as not requiring further investigation as a result of the volume, type and immediate action taken to contain and clean up the spill (removing the contaminant) such that any remnant contamination was deemed negligible.

At the time of writing, three incidents have been reported externally to the DWER through a Section 72 Waste Discharge Notification, and internal investigations and remediation had been undertaken. A summary of the reported incidents is outlined in **Table 5-11**.

Table 5-11: Waste Discharge Notifications

Mt Weld Event ID	Incident Date	Description	Actions Undertaken
5996	1/12/2015	Waste stream of raffinate and clarified water discharged 124,000 litres of water outside bunded area.	Investigative water and soil sampling were undertaken. Gamma ray monitoring was undertaken at water and soil sample locations. Proposed remedial action to visually monitor vegetative health monthly and notify DWER should a notable decline be observed (Lynas 2015).

Mt Weld Event ID	Incident Date	Description	Actions Undertaken
			Monitoring was undertaken and no further remediation was required. Lynas anticipate that this area will be developed to accommodate infrastructure required to support future tailings storage (A. Cargill, pers. comm, Lynas, 2020).
12461	23/12/2018	Spillage of up to 1,164 litres of diesel fuel within bunded area of workshop	Contaminated soil removed to bioremediation facility. This area is within the Stage 4 open pit envelope and will be excavated with overburden and stockpiled in the WRL.
12512	3/4/2019	Oil container split resulting in up to 1,000 litres of oil discharged within bunded operational area	Contaminated soil removed to bioremediation facility and replaced with clean fill. This area is within the Stage 4 open pit envelope and will be excavated with overburden and stockpiled in the WRL.

Mt Weld Mining are committed to undertaking a Preliminary Site Investigation (PSI) to progress the mine closure planning and to ensure potentially contaminated sites identified at the Mt Weld Project are managed in accordance with the CS Act. The PSI will be prepared in accordance with the DWER Contaminated Sites Guidelines document titled 'Assessment and Management of Contaminated Sites' (December 2014), and in accordance with the *National Environmental Protection (Assessment of Site Contamination) Measure, as amended 2013*. Mt Weld will consult with DWER to identify where a formal PSI submission is required relating to the areas identified in **Table 5-11**.

5.1.10 Rehabilitation

The Mt Weld Project is currently utilised for operational purposes with several mining campaigns proposed during the LoM.

Construction areas and vehicular tracks are currently utilised for operational purposes and have not become redundant for the purpose of rehabilitation to post-mining land use. The Mt Weld Project is currently in its early operational phase with limited opportunity to undertake progressive rehabilitation, however, Mt Weld Mining is committed to undertaking progressive rehabilitation throughout the LoM wherever practicable. Annual reviews will identify areas which may be eligible for rehabilitation the following year.

Two rehabilitation trials have been undertaken on the WRL, as described in **Section 5.1.11**. As the WRL sits partially over a potential resource earmarked for future mining any works furthering rehabilitation of the WRL have been suspended, however, monitoring of the rehabilitated trial areas to further inform closure planning will continue.

5.1.11 Investigation and Trials

5.1.11.1 Exploration Rehabilitation Trial

Historical exploration activities at The Mt Weld Project have been undertaken since the 1980s. All exploration drill holes, and tracks have been rehabilitated as per the requirements of the DMIRS and outlined in the programme of works (POW) for each drilling program.

An exploration rehabilitation trial was established in December 2015 which identified areas where natural revegetation of drill tracks was less successful. The trial involved the ripping of selected drill tracks without any seed application (Lynas 2016b). Results of the exploration rehabilitation trial are summarised in **Table 5-12** and discussed in more detail in **Section 5.2.3.2.**

5.1.11.2 Waste Rock Landform Western Batter Rehabilitation Trial

A rehabilitation trial on the western batter of the WRL, in an area which correlated to ~1.8 ha, was completed during February to April 2008 (Lynas 2016a). The area was battered back to an approximate slope angle of 14°; it is estimated that a 1 m deep layer of alluvium was applied. The alluvium was originally sourced from a broad drainage system (Monk Land system) and was not treated with any competent armouring materials. The slope comprises a single lift to approximately 10 m in height, and no crest bund was installed. The area was not seeded, emergent vegetation is from seed within the topsoil or windblown seed that has germinated (**Plate 5-1**).

Plate 5-1: Rehabilitated Western Slope of the Waste Rock Landform (February 2015)

In October 2017, access to the top of the WRL was required to tip waste overburden and a ramp was installed in the centre of the rehabilitated section the western face of the WRL (Plate 5-2). This resulted in 0.69 ha of disturbance to the rehabilitated face (Lynas 2020a).

No detailed design report exists which documents the 2008 rehabilitation trial, however, from this cut into the WRL it appears that 'sandy alluvium' has been placed on the outer batter, then topsoiled, prior to ripping on the contour. It is feasible that the topsoil would have only been stockpiled for approximately one year, prior to its application on the WRL. There is no discernible difference in the sandy alluvium and topsoil, which forms a layer of between 400 to 600 mm (A. Cargill, pers. comm, Lynas, 2020).

Plate 5-2: Rehabilitated Western Slope of the Waste Rock Landform (January 2021)

This rehabilitated area has been the subject of Ecosystem Function Analysis (EFA) monitoring since 2017, when two transects were established, with an aim to assess the employed rehabilitation techniques and further aid closure planning and develop completion criteria.

In the initial monitoring in 2017 vegetation establishment on the slope was regarded as successful with the perennial vegetative cover below 3 m in height record at 45% and 50% (Stantec 2017a). More recently, in 2019, the perennial vegetative cover below 3 m in height record was 31% and 32% (Stantec 2019b), these values are lower than the 2017 cover, however, significantly higher than the Monk average of 6% and the Brooking average of 12%.

Both transects established on the rehabilitated slope displayed substantial slope erosion. It is suggested that this is primarily due to the depth of 'sandy alluvium' applied, the lack of an erosion resistant fraction in the 'sandy alluvium', lack of water management measures (no crest bund), and potential depth of topsoil. This combination of factors means that some gully erosion to the depth of the growth medium is not unexpected (Stantec 2019b).

5.1.11.3 Waste Rock Landform Eastern Batter Rehabilitation Trial

A rehabilitation trial on the eastern embankment and upper surface of the WRL was constructed in February 2020, over an area of 3 ha. The trial utilised topsoil from a variety of stockpiles of differing ages to determine the viability as a rehabilitation resource.

Rehabilitation consisted of reprofiling the slopes of the lower, middle, and upper batters to 18°, establishing five (5) m berms, armouring the three batters with approximately 300 mm of blocky alluvium, which was also pushed up to create crest bunds and drainage cells. A dedicated crest bund was not established on the final top crest as three back sloping drainage cells were installed to control surface water drainage at the crest.

Topsoil was applied at a depth of 200-300 mm on the berms and batters, and at a depth of 200 mm over underlying alluvium on the upper surface. Topsoil was sourced from three separate topsoil stockpiles, as detailed in **Table 5-12**. No quantitative data on the application of topsoil was collected during construction of the trial, dozer operator observations were recorded (A. Cargill, pers. comm, Lynas, 2020).

Vegetative material was mixed in with the topsoil and the batters deep ripped on the contour with a winged tyne. Sediment traps were established on the lower batter by the dozer ripping several lines parallel to the deep contour rips, remaining topsoil was then pushed up to establish a bund row in lieu of a toe bund (Lynas 2020b). No seed was applied to the rehabilitated area. Further detail on the topsoil application trial component is discussed in **Section 0**.

The blocky alluvium utilised during the 2020 WRL trial was observed to break up under pressure from the dozer, during the application of the topsoil, vegetative material and the ripping (A. Cargill, pers. comm, Lynas, 2020), identifying the need to gain a better understanding of the durability of this material, and the increase in the volume of sediment that may be generated from it.

Table 5-12: Rehabilitation trial outcomes, rehabilitation implications and Research, Investigation and Trial tasks

Trial/Year	Design/Assessment	Outcome	Rehabilitation Implications	Research, Investigation and Trial Tasks
Exploration Rehabilitation Trial 2015	Rip existing tracks, no seed application	Predominately germination of annual species, with some establishment of *Acacia* sp. Ripping was found to curb water flow erosion on some tracks, however, had limited success on the east - west tracks.	Erosion control may be required on east-west tracks.	• Project wide assessment to identify which tracks would benefit from additional rehabilitation works and priority be given to those which pose an erosion risk. • Investigate alternative measures to slow water flow including cross bunding with competent material and spreading of vegetation.
Western Batter of the WRL 2008	• slope angle of 14°; • single lift to approximately 10 m in height; • 1 m deep layer of sandy alluvium, no competent armouring material; • thick topsoil; • ripped on the contour: • no crest bund; and • the area was not seeded.	Although 2008 Is performing well in some indices, Lynas are cognisant of the need to improve surface armouring and water management, in order to mitigate the level of erosion (A. Cargill, pers. comm, Lynas, 2020)	Structurally the fine fraction of alluvium material is unstable (see **Section 5.1.5.1.2**), hence surface armouring and water management are critical to rehabilitation success.	• Review the emergent vegetation along the WRL transects against the baseline flora surveys, as a component on seed list development. • Review topsoil depth against the 2020 trial depth and extent of erosion, taking into account the absence/ presence of upstream water controls

Trial/Year	Design/Assessment	Outcome	Rehabilitation Implications	Research, Investigation and Trial Tasks

Eastern and Upper Surface of the WRL
2020
	• slope angle of 18°.
	• Topsoil Stockpile 01 (TS01):
	  ○ stockpiled in 2007, not seeded.
	  ○ spread at 200-300 mm on upper batters on northern half of trial area.
	• Topsoil Stockpile 02 (TS02):
	  ○ stockpiled in 2007, not seeded.
	  ○ spread at 200-300 mm on complete lower batter of trial area.
	• Topsoil Stockpile 16 (TS16):
	  ○ stockpiled in 2017, not seeded.
	  ○ spread at 200-300 mm on upper batters on southern half of trial area.
	• tree mulch applied to all batters after the application of topsoil and prior to ripping on the contour.
		Outcomes have not yet been assessed. Rehabilitation monitoring transects scheduled for installation and monitoring in April 2021 (Lynas 2020b).	The results of the trial will assist in determining seed viability within the current topsoil stockpiles for future rehabilitation works.
			The trial will also assist in:
			• ascertaining the effectiveness of applying blocky alluvium to the upper slopes.
			• the extent of sediment that accumulates within the berms.
			• the effectiveness of five-meter berms with no crest bund.
			• ascertaining a preferred depth of topsoil to apply to slopes.
				• Compare the level of erosion on the 14-degree slope against the 18-degree slope, taking into consideration the depth and type of alluvium.
				• Analysis the physical and chemical parameters of the topsoil stockpiles to assess their ability to support plant growth. The current vegetation cover in the survey areas will also be assessed.
				• Assess the volume of mulch utilised and quantity remaining in stockpiles prioritise the application of the remaining mulch.

5.1.11.4 Proposed Tailings Cover Trial

Lynas anticipate commencing a laboratory column experiment in quarter one 2021 to investigate the mobilisation of salts and metals from the tailings into various capping layers. Results from the laboratory trials will inform the designs of a larger field trial that will investigate salt and metal migration in the field, along with vegetation establishment, and radiation blanketing.

The aim of the tailings capping trial is to define the parameters for an appropriate rainwater store / release cover design which minimises both downward movement of rainfall into the tailings mass, and upward movement of salts and other contaminants to the cover surface. For this to occur, the cover materials must have sufficient water-holding capacity to store incident rainfall prior to evapotranspiration and be deep enough to prevent the upward migration of salts and contaminants from the underlying tailings material. In the case of the tailings materials at Mt Weld which contains NORM, the cover depth must also be effective in attenuating gamma radiation to background levels. The trial will also investigate the current recommendations for a 50-centimetre coarse rock capillary break (A. Cargill, pers. comm, Lynas, 2020).

5.1.11.4.1 Column Experiment Treatments

It is proposed that the column experiment will be established in the site Geology laboratory and conducted for a period of at least three months to allow sufficient time for multiple wetting / drying cycles, with a maximum soil material depth of 1.1 m.

It is proposed that five treatments and a control will be tested and will include varying combinations of tailings, 'sandy and blocky' alluvium as a soil cover recommended for capping radiation (**Table 5-13**).

Topsoil is included in Treatment Five (T5) to investigate a complete capping column. The added thickness of topsoil will investigate if the trial designs rainfall event of receiving 50 mm volume, will seep into tailings and provide saturated conditions for capillary action/salt migration.

The treatments will be subject to identical conditions to assess leachate (if produced) and residual material characteristics, the vertical flux of water and salts through cover combinations following application of average summer rainfall events, and the upward movement of salts from tailings into cover materials. The experiment would include three replicates of each column treatment (A. Cargill, pers. comm, Lynas, 2020).

Table 5-13: Proposed Column Trial Treatments

Treatment ID	Number of Replicates	Material (cm)					Number of Soil Analysis*
		Tailings	Blocky Alluvium	Sandy Alluvium	Topsoil	Total Depth	
Control	1	30	-	-	-	30	1
T1	3	30	30	-	-	60	6
T2	3	30	10	30	-	70	9
T3	3	30	50	30	-	110	9
T4	3	30	-	60	-	90	9
T5	3	30	-	50	20	100	9

* Total number of soil samples for analysis is 47.

5.1.12 Baseline knowledge gaps, associated risk and closure implementation tasks

A summary of the knowledge gaps, the associated risk and closure implementation tasks for the Baseline data is presented in **Table 5-14**. The tasks required to address the gaps and associated risks are research, investigation tasks unless otherwise specified. All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

Table 5-14: Baseline knowledge gaps, associated risk and closure implementation tasks

Knowledge Gap	Associated Risk	Research, Investigation and Trials	Timeframe	Responsibility
Soil and Waste Characterisation				
Adequacy of the 'blocky alluvium' as a source of armouring material that can be utilised on the upper slopes of the WRL, or on features that will remain post closure.	• slope erosion is not mitigated. • narrow berms fill with sediment, overtop and fail. Inadequate volumes of competent material for: • abandonment bund construction. • permanent water diversion structures. • successful armouring of slopes preventing erosion.	Undertake durability testing on the blocky alluvium to determine the hardness and abrasion characteristic i.e., ability to resist degradation due to imposed wheel load.	2021-2023	Environment Department
The quantity of alluvium required for the construction of the TSF 4 embankment, and If all the alluvium material (~ 2,406,000 m³ after Stage 4) proposed to be stockpiled in the ROM Pad expansion area will be utilised (sandy and blocky).	• remaining material (potentially containing a higher percentage of sandy alluvium) is applied as a source of rehabilitation material on the final landform embankments. • erosion of slopes due to inadequate armouring material. • inadequate closure provisioning. • increase cost.	• determine volume of material needed for construction of the TSF 4 embankments. • discontinue stockpiling of the sandy alluvium and blocky alluvium together in the same stockpile once the required volume for TSF 4 construction is attained.	2021-2026	Environment Department
Hydrology				
Impact of 1 in 100 AEP storm event under current site conditions.	• the Flood inundation modelling identified likely process plant inundation in the event of a 1 in 100 AEP storm under current conditions. • increased costs as a result of potential bund design changes.	• undertake a detailed survey within the project area of the proposed infrastructure to confirm modelling outcomes and confirm changes to bund design.	2020-2026	Environment Department

Knowledge Gap	Associated Risk	Research, Investigation and Trials	Timeframe	Responsibility
Post closure features (e.g., roads) which may impede surface water flows have not yet been defined, in addition to if these features have been designed and/ or constructed with post closure in mind.	Given the flat topography, roads and other post-mining features will act as surface water diversion or containment structures, impacting surface water flow patterns, and drainage lines discharging surface water flows to Lake Carey.	• develop surface water management measures that can be progressively implemented during operations to minimise impacts on landforms, hydrological regime and receiving environment, including Lake Carey post closure; and • the surface water assessment should be revisited when an agreement is reached on features remaining post-closure. Including an assessment on extent of work required (e.g., further stripping back of roads, further armouring, maintenance of permanent features).	2020 -2026	Environment Department
Hydrogeology				
The rate of return of groundwater back into the open pit and the pit lake hydrological system that will develop post closure is not understood.	The proposed development of the open pit, infiltration volumes and monitoring data are not captured in a groundwater model; hence an understanding of the system response is limited.	Development and regular recalibration of a regional scale numerical model and sub-regional groundwater flow model, with current data is required, in order to understand the groundwater system response to dewatering and to groundwater rebound once dewatering ceases.	2020 -2023	Environment Department
	Groundwater flow directions in a post-mining landscape are not understood.		2020 -2023	Environment Department
Local and Regional Ecological				
No current closure related knowledge gaps were identified in relationship to Local and Regional Ecological Information.			NA	
Indigenous and European Heritage				
No current closure related knowledge gaps were identified in relationship to Indigenous and European Heritage.			NA	
Rehabilitation				
The variances in the seed mixes proposed for specific areas is undefined.	• inadequate closure provisioning; and • rehabilitation failure.	• ascertain the average height of emergent species in the topsoil stockpiles.	2020 -2023	Environment Department

Knowledge Gap	Associated Risk	Research, Investigation and Trials	Timeframe	Responsibility
		• develop a register of species and their average height, as shallow rooted species are proposed for the TSF. • determine the seed species suitable for different features, and an appropriate seed ratio / mix. • ascertain the required volume of the specific seed species. • ascertain the recommended treatment / cleaning and storage of specific seed species to ensure sufficient time for seed collection and management is allocated.		
Incomplete data for 2008 rehabilitation prescriptions	Inability to replicate successful rehabilitation, increase propensity to replicate unsuccessful rehabilitation.	Commence monitoring to ascertain vegetation species in rehabilitated areas and incorporate data into rehabilitation prescriptions.	Ongoing	Environment Department
Closure criteria regarding rehabilitation outcomes not determined (qualitative not quantitative).	• inadequate closure provisioning; and • rehabilitation failure.	Commence monitoring against analogue sites and incorporate data into rehabilitation criteria.	2020 -2023	Environment Department
Contaminated Sites				
Contaminated sites data is incomplete	• inadequate closure provisioning; and • potential risk posed to ecological receptors.	In consultation with DWER, complete site-wide PSI (as required).	2020 - 2023	Environment Department

5.2 Operational Data

Mt Weld reports annually to the DMIRS and DWER in the form of an AER. Site operational protocols are in place to ensure the AER meets the relevant guidelines and monitoring requirements set out in the with the current Prescribed Premise Licence 8141/2007/2.

5.2.1 Groundwater Abstraction and Monitoring

The Mt Weld Borefield lies within the Goldfields Groundwater Area and the Lake Carey sub-area-Combined- Fractured Rock- West Aquifer, which are proclaimed under the Rights in Water and Irrigation Act 1914 (WA). An overarching groundwater management plan or allocation plan has not been prepared for the Goldfields area and the current and proposed mine site areas are not included within a DWER Water Resource Management or Allocation plan.

The Mt Weld Borefield is owned and operated by GSGM. The Borefield is located on Mt Weld Mining leases M38/58, M38/59, M38/326 and M38/327. In 2001 tenement holders Mt Weld Mining and Wesfarmers CSBP entered into a legal agreement with Barrick Granny Smith (BGS), which enabled access to the Mt Weld Aquifer within the listed tenements. Since then, Mt Weld Mining has bought out Westfamers CSBP tenements, and GSGM have bought out BGS, subsequently the Water Access Agreement now exists between Mt Weld Mining and GSGM (URS 2014).

5.2.1.1 Groundwater abstraction

Groundwater abstraction at Mt Weld is regulated by DWER via a Groundwater Well Licence (GWL), which covers abstraction from the borefield and the open pit prior to mining, an overview of the Mt Weld GWL is provided below in **Table 5-15**.

Table 5-15: Groundwater licence summary

Licence No	Licence expiry	Borefield/source ID	Annual allocation (kL/year)	Monitoring requirements
171310(3))	3- Dec 2029	• Goldfields • Combined - Fractured Rock West – Fractured Rock • Location - M38/326, M38/327, M38/58 & M38/59	2,800,000 kL	• Annual ground water summary report • Triennial groundwater report

Regulatory conditions of the Mt Weld abstraction and dewatering operations (GWL 171310 (3)) enables the abstraction of up to 2,800,000 kL (2.8 gigalitres (GL)), of groundwater from the confined/semi-confined weathered carbonatite aquifer to support open pit dewatering and provide a suitable water supply for utilisation in the processing plant, dust suppression and in dam construction projects. The GSGM also have a separate GWL which enables abstraction of 1.2 GL per annum from the same aquifer.

The site Groundwater Operating Strategy (AECOM 2019) was updated in October 2019 and approved by DWER in December 2019, at the time the GWL was renewed. The strategy aims to update the description of the proposed water use and abstraction regime, and address issues associated with the abstraction of water for pit dewatering under GWL 171310. It also updates Lynas's responsibilities in terms of monitoring and managing the impacts of taking water and reporting to the DWER.

The total abstraction volume during the past water year (2019-2020) was 2,194,949 kL (2.2 GL), which incorporated 911,642 kL (0.9 GL) from the dewatering bores and 1,283,307 kL (1.3 GL) from the water supply production bores (AECOM 2020). Currently the two operators, GSGM and Mt Weld Mining, are using the same production bores (B9 and B13), the combined abstraction was 55 per cent of the combined annual allocation (4,000,000 kL/annum) during the 2019–20 water year. A summary of the dewatering, monitoring, and production bores is presented in **Sections 9.8.3, 9.8.4** and **9.8.5** respectively.

A network of transfer pipelines moves abstracted water to both operations. Mt Weld Mining has access to water abstracted from the Mt Weld Borefield via a diversion off a pipeline and standpipe from the production bores, which discharges into the Raw Water Storage Tank. All water volumes diverted to the Raw Water Storage Tank are recorded through a flow meter located at an isolation connection point (AECOM 2020).

5.2.1.2 Groundwater Monitoring

Mt Weld Mining are responsible under GWL 171310 and the associated Groundwater Operating Strategy (AECOM 2019), for groundwater monitoring directly related to their mine dewatering operations, and tailings deposition. The groundwater monitoring program that Mt Weld Mining are responsible for is presented in **Table 5-16**.

Table 5-16: Mt Weld Groundwater Monitoring Program (AECOM 2019)

Monitoring Frequency	Monitoring Time	Monitoring Parameters	Production bores	Monitoring Bores
Monthly	End of Month	Groundwater Level	LWB1, LWB2, LWB3, LWB4, LWB17, LWB22, LWB23 and LWB24	P01, P03 (RC00191), P06 (RC00136), P11 (RC00188), B03, P29 (RC00031) and P30 (RC00106)
Quarterly	1 July to 30 Sept; 1 Oct to 31 Dec; 1 Jan to 31 Mar	Field pH, TDS, B, Al, Cu, Co and Se		
Annually	1 Apr to 30 June	Field pH, TDS, Na, K, Ca, Mg, Cl, CO3, HCO3, SO4, NO3, B, Al, Cd, Cu, Co, Mn, Ni, Se and Fe		

Prior to abstraction from the Mt Weld aquifer in 1984, groundwater levels were reported at approximately 17 mbgl (477 mAHD) with both the superficial and carbonatite aquifers reporting similar levels (AECOM 2017a). With a significant part of the superficial aquifer now dewatered, recent groundwater elevations (as of June 2020), were measured at approximately 400 mAHD for the superficial aquifer in the western zone and 405 mAHD in the eastern zone.

Following implementation of dewatering in 2007, in addition to abstraction for water supplies, groundwater levels within the western carbonatite aquifer, ranged from 365.4 mAHD (RC242L) to 399.5 mAHD (RC101). Groundwater elevations on the eastern side of the dolerite dyke ranged from 369.1 mAHD (RC156) to 370.1 mAHD (RC173L) and indicate dewatering is approaching steady-state conditions due to a relatively stable abstraction trend (AECOM 2020).

A network of 32 groundwater monitoring bores extending across the carbonatite aquifer are monitored by GSGM. These bores are used to monitor drawdown responses due to abstraction in the superficial and weathered carbonatite aquifers. Bores that were not monitored for all or part of the water year because they were dry (as a result of dewatering) include: RC31, RC76, RC 98, RC198U, RC210, RC242L, RC242U, RC121, RC49, RC60, RC138, RC173U, B2, B4 and B8 (AECOM 2020). four production and seven dedicated monitoring bores are monitored by Lynas (A. Cargill, pers. comm, Lynas 2020).

Groundwater in the vicinity of the Mt Weld EPs and the TSFs is monitored via a network of 16 bores, the layout of which is displayed in **Figure 5-12**. As part of TSF3 construction three new monitoring bores LMW14, LMW15 and LMW16 were installed in September 2018 (Lynas 2020a).

The standing water levels (SWLs) in the Mt Weld TSF and EP monitoring bore are recorded monthly. Overall, from when SWLs were first reported in 2012 there has been a general increase in SWLs across most TSF and EP monitoring bores, indicating some mounding beneath the TSFs and EPs. In 2018, groundwater levels within the superficial formations beneath the TSF area were approximately 8 m below pre-development conditions. In 2018, the groundwater levels measured in the deeper aquifers beneath the TSF and EP area had been dewatered by about 37 m (373 mAHD) (AECOM 2018).

Monitoring in 2019 shows a general decline across the monitoring network with water table dropping, potentially attributed to a significant decrease in the volume of water within the EPs. Since monitoring commenced in 2011, SWLs across the Mt Weld monitoring network remain well below the DWER licence limit of 4 m below ground level (bgl), no SWLs were higher than 13 mbgl (Lynas 2020a).

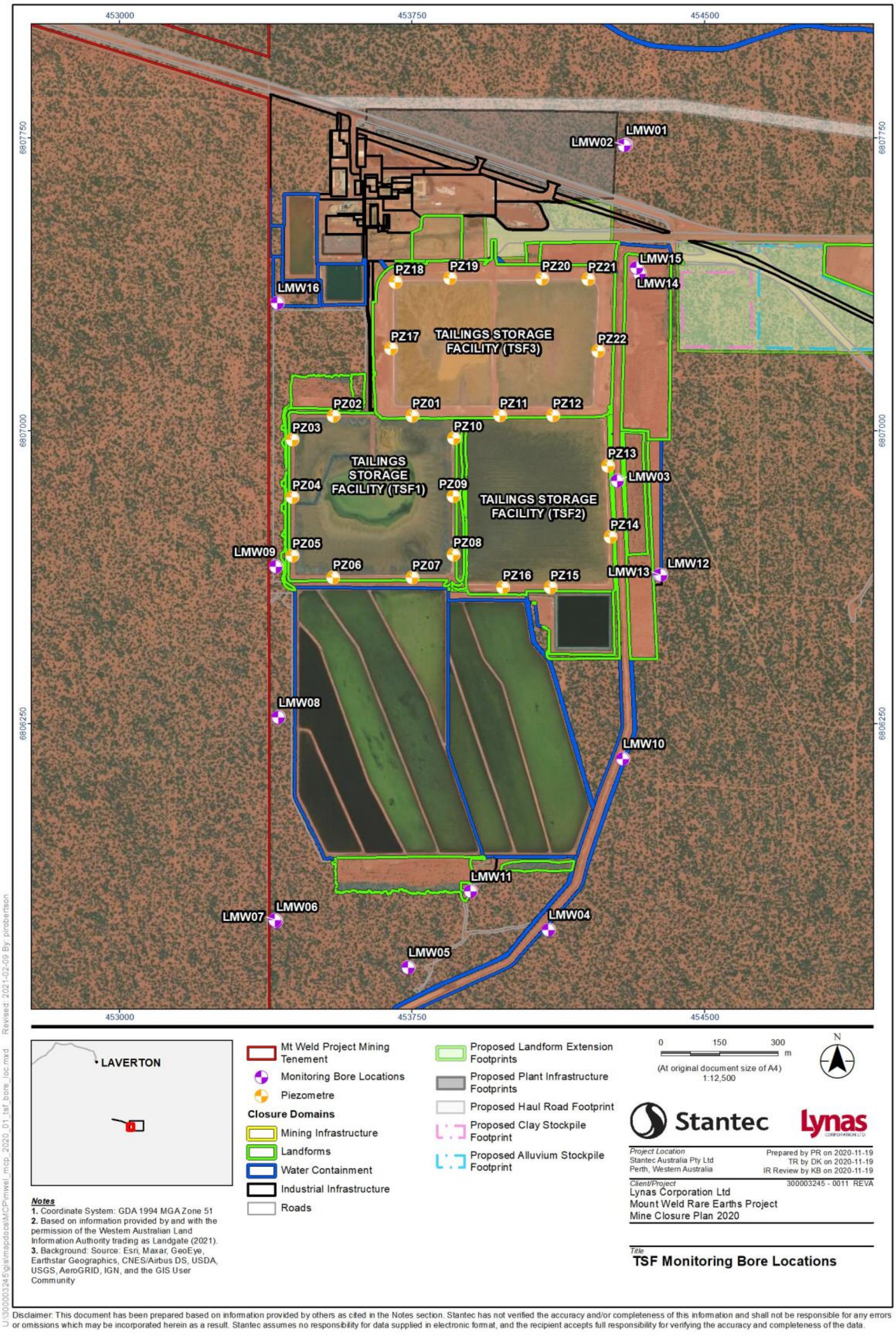


Figure 5-12: TSF Monitoring Bore Locations

To June 2020, approximately 54 GL of groundwater has been abstracted from the Mt Weld carbonatite aquifer, overlying superficial formations, and surrounding fractured bedrock aquifer. It has been reported up to 1 GL/annum is from regional rainfall recharge and throughflow (AECOM 2020).

Intermittent pumping from dewatering bores has limited sample collection, however, the annual review incorporates all sampling from both Mt Weld Mining and GSGM bores. In summary:

- pH readings continue to remain steady at between pH 7.80 (B9) to pH 8.02 (B13);
- bicarbonate concentrations have generally declined since the 2017 rainfall event and have remained steady, albeit a slight declining in 2020, with concentrations up to 300 mg/L (LWB17); and
- the concentrations of chloride, sulphate, magnesium, potassium and sodium have remained stable since the 2017 rainfall event (AECOM 2020).

LMW02, LMW03, LMW12, LMW13, LMW14 and LMW15 were reported as dry in the Mt Weld 2019 AER. Chemical samples for LMW16 were taken in January, April and July. However, due to there being minimal amount of water for LMW16 in October, only field measurements were able to be taken. A possible cause for LMW02 and LMW13 becoming dry is increased drawdown from the aquifer associated with mine dewatering and abstraction requirements to Mt Weld and GSGM (Lynas 2020a).

Potential seepage water quality has previously been assessed (URS, 2014) using chemical modelling and the results indicated very little change in the chemical composition of either the superficial or bedrock aquifers from addition of seepage water. Overall, it was reported there may be a slight dilution due to the addition of seepage waters with a comparatively higher water quality. These changes are likely to be less than natural fluctuations in water quality within the superficial and bedrock aquifers. Low levels of natural radioactivity are present in groundwater at Mt Weld, both in the carbonatite aquifer and in the superficial aquifer surrounding the TSF area. No additional radiological impacts from operations at Mt Weld are currently evident in groundwater (ATC Williams 2017).

Groundwater TDS concentrations in 2019 ranged from 2,400 mg/L to 3,920 mg/L, which is well under the ANZECC Livestock Drinking Water Guideline of 5,000 mg/L (Lynas 2020a). Groundwater quality monitoring does not indicate contamination of groundwater.

All analytes measured in dewatering bores are generally within long-term trends and reported baseline values. Groundwater quality has remained relatively stable since mining commenced, except in production bores B11 and B12 where salinity concentrations continue to show short-term, seasonal fluctuations overlying a historical increasing trend. Production bore B12 has now been decommissioned due to casing failure, however, B11 continues to report observed salinity up to 20,000 mg/L. This is indicative of stratification within the deeper zones of the aquifer with salinity concentrations at depth up to 20,000 mg/L TDS (B11); future abstraction in this area may be a constraint on usability for some mining activities (AECOM 2020).

5.2.2 Tailings Storage Facilities

Four different types of monitoring instrumentation are used at the TSFs: metrological, settlement, piezometers, and groundwater bores (see **Figure 5-12**).

Lynas commissioned an on-site weather station in March 2019 to record rainfall. Calculated evaporation functionality was added in October 2019.

TSF embankment settlements are monitored quarterly using 26 survey prisms (Spin1 - Spin26). Four of the prisms became redundant following TSF 3 construction completion. The location of survey prims and TSF cell movement results are presented in the 2019 Audit report. The biggest average movement recorded since installation in April 2017 was at SPIN1 and SPIN24, both indicating movement of about ± 4mm. The movements were not considered a concern.

In 2020, the TSFs had a total of vibrating wire twenty-two (22) piezometers, monitored on a monthly basis. Only four piezometers (1, 2, 4, 12) indicated water level readings, which ranged between 4–5 m head, likely due to tailings deposition taking place in that area. The remainder of the piezometers were dry (Coffey 2020).

5.2.3 Monitoring

Rehabilitation and operational monitoring is conducted at Mt Weld, the operational monitoring is discussed within this MCP as the results have an influence on the rehabilitation design presented.

5.2.3.1 Vegetation Health

Nineteen (19) photo monitoring points are monitored annually to assist in identifying changes or disturbances to vegetation health that may occur between monitoring events, or that may not be detected at analogue transects, 17 of these were installed prior to 2017. In October 2018 an additional two vegetation health photo monitoring points (MP13D and MP14D) were installed, and baseline photographs taken, to monitor potential impacts to vegetation from the Managed Aquifer Recharge (MAR) project, which was installed in the eastern Flood Control Bund in late 2018.

The 19 photo monitoring points, as depicted in **Figure 5-13**, include:

- along the access road near surface water drainage structures;
- along the stormwater diversion channels, upstream of the intakes, and downstream of the outflow points;
- upstream (nominally northeast) of the plant area/WRL;
- downstream (nominally southwest) of the plant area/open pit;
- upstream and downstream of the concentration plant, TSFs, EPs and ancillary infrastructure;
- adjacent to the west and east sides of the TSFs; and
- a control site in similar vegetation away from the influence of the Project area or access road.

An internal Vegetation Health Monitoring Procedure (MTW-EN-PRO-0015) has been implemented to ensure photographs will be taken from the same point and height (nominally 1.5 m) in four directions (including upstream and downstream) and should not include more than one-third above the horizon. Reference to previous photographs taken will assist in consistently framing the photograph, so common features can be identified from year to year. Photographic records are presented in the consolidated Annual Environmental Report (AER) (Lynas 2020a).

Photographic point monitoring will continue throughout the life of mine until alternative methods are identified to assess potential drainage shadow effects (Lynas 2020a). The data collected from these analogues will be used to inform and continuously revise completion criteria targets for rehabilitation in subsequent revisions of the Mt Weld Rare Earths Project MCP, to assess the success of future rehabilitation efforts, and to develop a seed mix for future rehabilitation activities.

5.2.3.2 Rehabilitation Baseline Monitoring

Rehabilitation monitoring commenced in April 2017 via establishment of two rehabilitation transects on the 2008 rehabilitation trial (on the western face of the WRL) and 12 analogue transects using EFA (Stantec 2017a). The majority of the Project is located within the Monk land system, however, the established transects represent the six land systems which occur over the Project area including the Haul Road (**Figure 5-13**).

Transects were selected to provide indicative targets of achievable completion criteria based on the post mining landform. From the initial EFA monitoring in 2017, monitoring has occurred annually, with the exception of 2020, due to COVID-19, and is expected to continue in 2021 to continue to inform completion criteria targets.

An initial species list was compiled from the data collated on the WRL transects, a review of the species intersected will inform the development of a species list for future rehabilitation activities. As noted in **Section 0**,the western face of the WRL was not seeded, emergent vegetation is from seed within the topsoil or windblown seed that has germinated.

Overall, the Mt Weld analogue suite continued to provide a good representation of the different vegetation communities found throughout the Mt Weld region. Changes between the 2018 and 2019 monitoring events, particularly those related to soil stability and infiltration and lower storey cover, highlighted how rainfall can affect both soil and vegetation parameters and the importance of annual monitoring when developing a comprehensive data set.

Landscape function indices on the Western WRL rehabilitation showed little change between assessments, suggesting that the rehabilitation may have reached a stable ecological state. Lower storey cover on the rehabilitation continued to exceed that recorded across the analogues and had increased between assessments at one of the transects, despite the below-average rainfall. There were no weeds recorded on the rehabilitation in 2019, and the rehabilitation was dominated by Acacia species and *Ptilotus obovatus*. Erosion on the landform continued to be considered moderate, with the proportion of slope eroded declining slightly at both transects (Stantec 2019a).

Stantec (2019a) recommended that the analogue suite at Mt Weld continues to be monitored annually to capture the inter-annual natural variability in vegetation and soil parameters in the region. Annual monitoring of the rehabilitation transects on the western face of the WRL is also recommended, to track erosion on the landform and to determine when/whether the landform becomes stable and self-sustaining. As more analogue data is collected, consideration could be given to refining the data set used to calculate analogue ranges (as specified in the performance criteria) to exclude extremes related to very high or very low rainfall years.

Lynas propose to monitor the transects in 2021 prior to analysing the collected data and developing proposed completion criteria targets for future rehabilitation works. The rainfall received over the life of the rehabilitation has generally been below average, hence the performance of this first rehabilitation trial may be a guide to the minimum performance that could be expected (Stantec 2017a, Stantec 2019b).

5.2.3.3 Topsoil Stockpile Monitoring

In January 2016, topsoil stockpiles generated as part of TSF construction were seeded with native provenance seed. Four topsoil photographic monitoring points were installed to monitor success of the 2016 seeding program (**Figure 5-13**). Photographic monitoring of these stockpiles occurred in May, September 2016, and February 2017. Visual observations suggest that rainfall events during 2016 may have promoted seed germination of long-lived species which have established since initial seeding. Photo monitoring will continue to occur on a biannual basis to monitor vegetation establishment on the topsoil stockpiles (Lynas 2016a). This type of monitoring will be undertaken as required to monitor performance of topsoil in accordance with the Internal Mt Weld Topsoil Management Plan.

Twenty vegetation quadrats were established and monitored across seven topsoil stockpiles located around the Mt Weld mine in 2019. These stockpiles were established in different years and the purpose of the monitoring was to assess vegetation development across the stockpiles in relation to age and treatments applied (such as seeding). Within each quadrat, the cover and density of each species present was recorded, as well as other assessments including litter cover, presence/evidence of fauna and vegetation health. By tracking vegetation development on topsoil stockpiles over time, the quality of the topsoil seedbank can be determined and the communities likely to establish when the topsoil is used for rehabilitation.

The seeded topsoil stockpile monitoring quadrats had a higher mean total plant cover in comparison to the non-seeded quadrats, regardless of age, although mean plant density was similar across all quadrats. Non-seeded quadrats displayed a pattern of increasing mean plant cover and density as stockpile age increased. Of the 12 vegetated quadrats, shrubs were the dominant functional group, and included *Acacia aptaneura*, *A. ramulosa*, *Ptilotus obovatus*, and *Solanum lasiophyllum*. Ongoing monitoring of the topsoil stockpile vegetation quadrats is recommended in order to track vegetation development over time and the status and sustainability of the soil seedbank (Stantec 2019a).

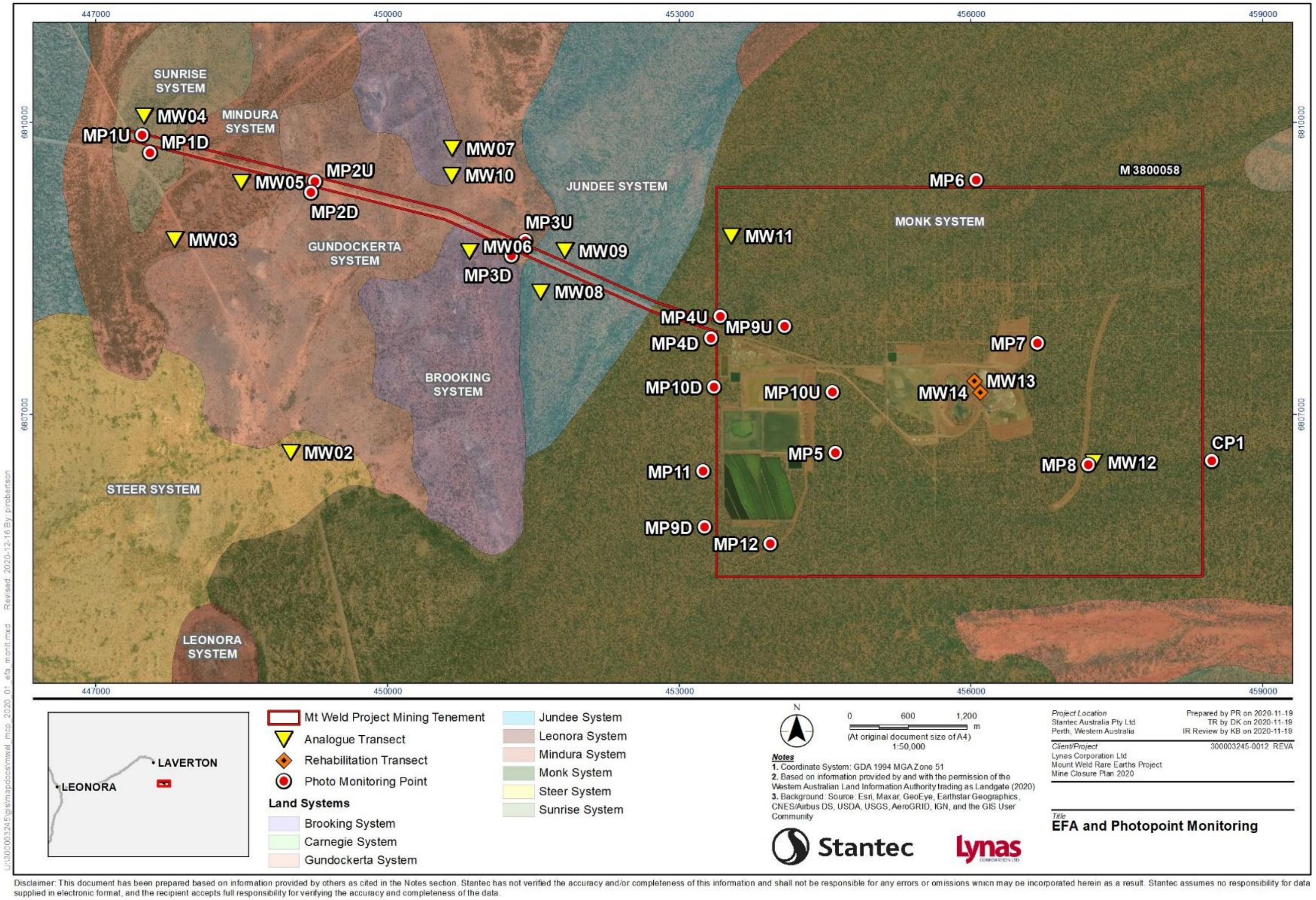


Figure 5-13: Location of transects and vegetation health photo monitoring points

5.2.3.4 Monitoring of the Exploration Rehabilitation Trial

Photo point monitoring was conducted on the sections of exploration drill tracks which were ripped as part of the December 2015 trial outlined in **Section 5.1.11.1** (Lynas 2016b). Photographs were taken prior to the rehabilitation works and nine months after completion in August 2016. As expected, mature shrubs which had established along the drill tracks were turned into the soil. Some tracks, particularly those that run east - west were the subject of minor gully erosion along the drill line.

The photo monitoring conducted nine months following completion of the trial revealed some establishment of *Acacia* sp., however, the majority of observed germination consisted of annual species. Ripping was found to curb water flow erosion on some drill tracks, however, monitoring indicated limited success on the east - west drill tracks.

The trial recommended that a site wide assessment is undertaken to determine which tracks would benefit from additional rehabilitation works, with priority given to those which pose an erosion risk. An audit was subsequently undertaken between December 2018 and August 2019 (Lynas 2020c) and covered 21 monitoring locations. Tracks were classified as either:

- track to be closed with no rehabilitation;
- track to be closed and rehabilitated; or
- tracks to remain open with no further rehabilitation.

Further detail on classification and proposed actions for each classification is outlined in **Section 9.10.4.1.**

Alternative measures to slow water flow, including cross bunding with competent material and spreading of oversize vegetation may also be investigated. The investigative tasks identified through the original trial have been outlined as knowledge gaps in **Section 9.10.5**.

5.2.3.5 Monitoring of Surface Water Erosion and Downstream Sedimentation

A Surface Water Monitoring Inspection Standard Operating Procedure (MTW-EN-SOP-0003) has been developed to ensure monitoring addresses specified requirements. Areas identified as being susceptible to erosion and downstream sedimentation include:

- exit points of drainage culverts established beneath the mine access road;
- exit points at and downstream of the stormwater diversion drains;
- along the batters and inactive faces of the WRL;
- along open pit walls;
- disturbed and rehabilitated areas; and
- any other stormwater discharge points within the Project area.

The WRL, EP and TSF batters, Haul Roads, Access Tracks and the Main Access Road to the mine are inspected and managed for excessive erosion that would potentially cause a safety hazard. Visual inspections (including the use of photographic evidence) are undertaken as needed following significant rainfall events likely to cause surface run-off.

Erosion management techniques will continue to be utilised to address any observed scarification or gullying. This will include either diverting stormwater flows and/or reducing the velocity of surface flows in the affected area. Rehabilitation of eroded sites will be undertaken as soon as practicable.

In the event that ongoing mine operations appear to be causing unacceptable erosion of the landscape and downstream sedimentation, and clear evidence of environmental impacts are observed, Mt Weld Mining will develop and implement a semi-quantitative erosion and sedimentation monitoring programme that may include the use of fixed monitoring stakes in key drainage zones to observe water level marks, sediment deposition marks, gullying or erosion trends, following substantial rainfall events (Lynas 2020a).

5.2.3.6 Water Containment Monitoring

Permanent natural water sources are not present within the Project boundary envelope.

Monitoring is conducted via regular inspections to identify any significant erosion, gullying and downstream sedimentation around water containment facilities such as the TSF, EPs, Treated Water Pond, Flood Control Bund, Stormwater Diversion Channel and drains as per Environmental Management Plan requirements.

Monitoring is conducted following significant rainfall events and current monitoring records indicate surface water drainage systems were functioning as designed with some minor erosion to water containment facilities which will be monitored in the future.

The above indicates adequate armouring using competent material will be required on relevant structures which may be subject to water erosion. Post closure monitoring and mitigation measures have been further discussed in **Section 10**.

6. Post-Mining Land Use

Prior to mining, the majority of the land that the Project is located on, was classified as 'Pastoral Land'. Mt Weld Mining anticipates that the post mining land use for the majority of the Project will be pastoral. This is consistent with the current dominant land use in the Murchison subregion, 85% of which is grazing (Cowan *et al.* 2001). Mt Weld Mining are committed to the rehabilitation of all disturbed areas to the agreed final land use(s).

The proposed post mining land use has been discussed with key stakeholders throughout the life of the Project. Further consultation with the key stakeholders, including the pastoralist will take place as the mine progresses to ensure that pastoral use remains the most suitable post mining land use.

This MCP identifies all known potential environmental legacies (including contaminated sites) which may restrict final achievement of the post mining land use and activities.

The existing WRL and TSFs will be permanent features of the post mining landscape. Once final production has ceased, a closure team will be appointed to oversee closure of the Project. This team will focus on:

- infrastructure decommissioning and removal (or if appropriate, disposal on-site of plant and infrastructure);
- contaminated site identification; and
- remediation and rehabilitation.

Immediately upon closure, the land use will be 'mine site rehabilitation' until the rehabilitated areas are demonstrated to be sufficiently resilient to handle grazing pressure, and the site is relinquished.

It is possible that some elements of the Project area post closure will not be suitable for the return to pastoral rangeland. Primarily this includes the open pit void, however, may extend to the WRLs and TSF area. However, with the exception of the open pit void, Mt Weld Mining propose to encourage vegetative growth and rehabilitate these landforms to achieve functioning ecosystems. As ongoing monitoring informs realistic achievable criteria for these domains, post-mining land use will be updated.

7. Closure Risk Assessment

7.1 Identification of Closure Risks

Consistent with a risk-based approach, Mt Weld have a structured risk management process to identify, assess and manage the potential risks associated with closure.

7.2 Risk Management Processes

Mt Weld's structured risk management allows a systematic review and analysis of risk and cost benefit in both engineering and environmental terms, as well as identification of opportunities associated with closure.

7.3 Risk Assessment Approach

The risk matrix employed by Mt Weld Mining for use in Mine Closure Planning closely aligns with the example presented in the 2020 Statutory Guidelines for Preparing Mine Closure Plans which incorporates five classifications of consequence, ranging from negligible to catastrophic, and five classifications of likelihood, ranging from rare to almost certain (**Appendix D**). These classifications were used to assign a consequence and likelihood rating to each identified unwanted event.

7.4 2021 Residual High Risk

A risk assessment was undertaken for the 2021 MCP. A structured risk management process was utilised that identifies, assesses, and manages the potential risks associated with closure issues. This approach allows a systematic review and analysis of risk and cost benefit in both engineering and environmental terms, as well as identification of opportunities associated with closure. This included a review of all the 2017 high risks.

A summary of the 2021 inherent high risks, mitigation strategies, the revised residual risk, and the responsible parties for implementing the risk reduction strategies for these closure activities are presented in **Table 7-1**.

Table 7-1: 2021 Residual High Risks Identified in the 2021 MCP

No	Unwanted Event	2021 Inherent Risk	2021 Current Controls	2021 Residual Risk	Proposed Control	Responsible Department
Landforms - Tailings Storage Facilities						
1	TSF 1, 2 and 3 Members of public exposed to elevated levels of radiation exceeding 1.0 mSv/yr	High	• TSF Operating Manual. • Radiation Management Plan. • Approved 2017 MCP.	High	• Continual revision of the site Radiation Management Plan. • TSF Operating Manual. • TSF cover design. • Proposed Cover Trials. • 2021 MCP.	• Environment Department/ Radiation Safety Officer
2	TSF 1, 2 and 3 Excessive tailings drying time	High	• TSF Operating Manual. • MudMaster mud farming trial. • Approved 2017 MCP.	Moderate	• TSF Operating Manual. • 2021 MCP. • Continued use of the MudMaster to achieve in-situ consolidation and enhance recovery of supernatant water.	Processing Department
Mining Infrastructure – Open Pit						
7	Open Pit COMMUNITY - unacceptable closure outcome	High	Radiation Management Plan	High	• Formation of a pit lake or 1 m cover of waste material on the floor of the open pit. • Ongoing stakeholder consultation.	• Environment Department • Radiation Safety Officer
8	Open Pit GROUNDWATER – Insufficient information	High	• Radiation Management Plan. • Monitoring bore network.	Moderate	• Radiation Management Plan. • Monitoring bore network. • analysis of capping material effectiveness. • post closure pit lake hydrogeological study.	• Environment Department • Radiation Safety Officer

No	Unwanted Event	2021 Inherent Risk	2021 Current Controls	2021 Residual Risk	Proposed Control	Responsible Department
9	Open Pit WATER - alteration of pit lake water quality	High	• Groundwater Management Plan (within Environmental Management Program). • Groundwater Operating Strategy. • Dewatering, confined aquifer - unlikely to affect downstream users, monitoring.	Moderate	• Groundwater Management Plan (within Environmental Management Program). • Groundwater Operating Strategy. • Pit lake water monitoring.	Environment Department

8. Development of Closure Outcomes and Completion Criteria

8.1 Closure Outcomes

The EPA's Guidance for the Assessment of Environmental Factors - Rehabilitation of Terrestrial Ecosystems provided the basis of rehabilitation objectives for the Mt Weld Project. The primary EPA objective for rehabilitation and decommissioning is to ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.

Minimising environmental impacts requires the return of rehabilitated areas to self-sustaining and functional ecosystems, comprising local provenance species. The EPA Guidance requires that rehabilitation plans are based on clear objectives and targets which can be effectively monitored and audited to confirm objectives are achieved (EPA 2006).

Specifically, rehabilitated areas should have the following attributes:

- safe, stable and resilient landforms and soils;
- appropriate hydrology;
- suitable for agreed land uses;
- where appropriate, resilient and self-sustaining vegetation comprised of local provenance species;
- achieves agreed numeric targets for vegetation recovery; and
- habitats capable of supporting all types of biodiversity.

In 2017 closure objectives were proposed in the context of the following six aspects:

- compliance;
- radiation;
- landforms;
- rehabilitation function;
- key stakeholders; and
- mining infrastructure.

A comprehensive review of the 2017 proposed closure objectives (outcomes) and completion criteria has resulted in Mt Weld combining the landforms and rehabilitation function aspects, in order to present a revised structure of sequential 'Rehabilitation Phases' under the landforms and rehabilitation aspect.

The 2021 MCP closure objectives are proposed in the context of the following five aspects:

- compliance;
- radiation;
- landforms and rehabilitation;
  - planning and landform construction
  - vegetation establishment and monitoring
- key stakeholders; and
- safety.

8.2 Completion Criteria

A set of qualitative completion criteria and performance indicators have been developed to match the proposed closure objectives (**Table 8-1**). Mt Weld is committed to ensuring that the current completion criteria become more comprehensive and detailed in future revisions of the MCP, through the inclusion of quantitative standard values as they are developed.

Following feedback from DMIRS, received in the approval letter for the 2017 iteration of the MCP, the 2017 closure objectives and completion criteria have been further refined and developed. A comparison and justification of changes to the closure objectives and completion criteria between the currently approved 2017 MCP and the version presented in this MCP is presented in **Section 13** (**Table 13-2**).

Mt Weld continue to use recognised monitoring methodologies and standards (**Table 8-1**), and reference trends against expected or predicted performance, based on agreed closure criteria. The proposed post-closure monitoring program, including the type and frequency of monitoring against relevant completion criteria is presented in **Section 10**.

All completion criteria will be reviewed as related monitoring data becomes available to inform appropriate standards for revegetation. Mt Weld propose to develop preliminary quantitative rehabilitation completion criteria over the next few years of rehabilitation monitoring. Justification for these values will be discussed in the Collection and Analysis of Data section. It is proposed that they will include consideration of soil surface stability, including erosion gullies, and a range of vegetation parameters. Rehabilitation completion criteria will be measured against local target analogues, which will form the basis for the quantitative standard values.

An initial suite of analogue sites has been selected to represent the natural environment surrounding the mine, and desirable outcomes for rehabilitation. The current selection of analogue sites will continue to be reviewed as appropriate, to ensure alignment with final approved proposed outcomes for rehabilitation.

The success of the rehabilitation trials on site has been variable, and strongly influenced by the characteristics of the soil materials and geometry of the constructed landforms (slope characteristics and surface water management). Surface erosion has the potential to be exacerbated by inappropriate landform design and concentration of surface water flow. A summary of trials and successful rehabilitation techniques undertaken to date is presented in the Collection and Analysis of Data Section (5.1.11). This information has been used to support the rehabilitation techniques proposed within this MCP.

Given that the post-mining land use for the Project will largely be for pastoral land, the palatability ('desirability') of plant species will likely be considered when setting quantitative completion criteria for rehabilitation. The proportions and biomass of 'desirable' plant species in an area are directly linked to the carrying capacity of the land for livestock grazing. Data on palatable ('desirable') species, present carrying capacity (PCC) of the Goldfields Region, and stocking rates for different vegetation communities is available from the WA DPIRD (or equivalent); this data will be used to inform any related completion criteria.

Table 8-1: Mt Weld Project Closure Objectives and Completion Criteria

Closure Objectives 2021		Completion Criteria 2021	Type of monitoring	Performance Indicators
1	Compliance			
1.1	All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	Auditing by Mt Weld Mining responsible person, or suitably qualified specialist.	• All closure related conditions and commitments identified in the current Legal Obligations Register are achieved. • Audit report is available for review.
1.2	To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characteristics, site conditions and the constraints of the post-mining environment. As-constructed reports and rehabilitation records are available for review.	Audit the outcome of the rehabilitation techniques used at the Mt Weld Project against the outcome of current mine rehabilitation techniques used in comparable environments by Mt Weld Mining responsible person, or suitably qualified specialist.	• Evidence of successful historic rehabilitation, rehabilitation trials, and/or other successful rehabilitation techniques used in the local region is available to support the use of the applied rehabilitation techniques. • As constructed reports are provided as evidence of performance.
1.3	Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	• surface drainage to downstream environments is retained or reinstated where possible. • no obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas. • surface water diversion structures to remain post closure are constructed in accordance with approved engineered designs.	• Review against MCP and/or appropriate management plan. • Auditing by Mt Weld Mining responsible person, or suitably qualified specialist.	• Confirmation of compliance with MCP and/or appropriate management plan. • Evidence of a surface drainage assessment on a biennial basis for ten years (as per monitoring management plan).
1.4	Contained surface water chemistry to reflect agreed post closure water chemistry as much as practicable.	Contained surface water chemistry not to exceed agreed levels.	Monitoring of contained surface water chemistry via an approved sampling plan. Review against MCP and/or appropriate management plan.	• Confirmation of compliance with agreed surface water chemistry levels after closure. • Evidence of surface water quality monitoring data on a biennial basis

Closure Objectives 2021		Completion Criteria 2021	Type of monitoring	Performance Indicators
				for ten years (as per monitoring management plan).
1.5	Groundwater levels to reflect agreed post-closure levels as much as practicable.	Groundwater standing water levels not to exceed agreed levels.	• Monitoring of groundwater standing water levels via monitoring bores. • Review against MCP and/or appropriate management plan. • Continued development of a site wide groundwater model to assist with predicting levels.	• Confirmation of compliance with agreed groundwater levels post closure. • Evidence of annual monitoring over a ten-year monitoring period (as per monitoring management plan).
1.6	The Mt Weld Project is compliant with the requirements of the CS *Act 2003* in order to achieve relinquishment.	• areas of potentially contaminating activities which may restrict the post mining land use have been identified in a Preliminary Site Investigation (PSI) report, the MCP or the site register. • a Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements. • where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.	• Monitoring and remediation to be undertaken in accordance with the DSI findings and remediation requirements. • Auditing by Mt Weld responsible person, or suitably qualified specialist.	• Evidence of a completed PSI and DSI at the time of closure. • Evidence of monitoring in accordance with the site specific DSI and remediation requirements.

Closure Objectives 2021		Completion Criteria 2021	Type of monitoring	Performance Indicators
2	Radiation			
2.1	Radiation levels contained within surface soils, groundwater and air-borne particles around rehabilitated areas will be as close to the natural background as practicable.	• Post mining radiation levels will be compatible with agreed post mining land uses. • TSFs and WRL- Radiation levels contained within surface soils and airborne around rehabilitated areas will not exceed background levels. • Annual radiation dose to members of the public does not exceed 1 mS/yr.	Monitoring to be undertaken as per the current approved Radiation Management Plan. • Environmental Radiation Surveys: a) boundary of the mining pit; b) site boundary; and c) post operational area surveys • Dust Monitoring • High-Vol TSP sampling. • Groundwater sampling of seven bores for (Ra-228 and Ra-226). • Occupational Radiation Monitoring during closure activities, as per the approved RMP at time of closure activities.	Post closure monitoring until relinquishment displays radiation levels and radioactive analytes analogous with background levels as defined in **Section 5.1.5.1.**
3	Landforms and rehabilitation			
Planning and Landform Construction				
3.1	Appropriately manage mine waste throughout the life of mine.	Mined waste materials with potential for adverse environmental impact have been identified and managed appropriately.	Audit confirmation by Mt Weld responsible person, or suitably qualified specialist, that sufficient waste characterisation has been undertaken and material has been appropriately managed during construction, and at completion of works.	Reporting of compliance with placement and cover specifications in landform planning and engineering designs*.
3.2	Design landforms within the constraints of the waste material properties, to ensure they are physically (geo-technically) stable, (geo-chemically) non-	• Landform design incorporates water and drainage management measures to mitigate erosion off final surfaces and slopes.	• Monitoring of surface stability and erosion features on the landform using a combination of: ○ permanent erosion assessment transects;	• Confirmation that the landform design complies with approved design specifications*. • Erosion monitoring data demonstrates that features are

Closure Objectives 2021		Completion Criteria 2021	Type of monitoring	Performance Indicators
	polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.	• Final surfaces develop resistance to erosive forces and are non-polluting.	○ erosion pins; ○ Digital Elevation Model (DEM) assessment; ○ remote sensing; or ○ other suitable monitoring methods that quantify stability and erosion. • Audit by Mt Weld responsible person, or suitably qualified specialist, of constructed landform for compliance against the most recent approved design specifications.	stable over multiple years, and erosion does not threaten the integrity of stored mine wastes nor impede post-closure management of the landform over the long term.
3.3	Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	• Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	Audit of areas planned for revegetation, as identified in the current MCP, by Mt Weld Mining responsible person, or suitably qualified specialist.	Evidence of the application of topsoil or growth medium, and volume applied is available for review.
3.4	Compliance with appropriate TSF Guidelines and tenement conditions.	• Compliance with relevant ANCOLD guidelines for TSF safety and stability. • Compliance with TSF inspection, auditing and reporting requirements, as stipulated in the tenement conditions.	Compliance audit inspections of TSFs for a minimum of three years post deposition.	Submission of an annual audit to the DMIRS for three years post deposition ceasing into a TSF. Confirmation of compliance with regulatory guidelines and reporting requirements.
Vegetation establishment and monitoring				
3.5	Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	• Vegetation is comprised of local provenance species. • Vegetation cover values are similar to that of the target analogue. • Revegetation demonstrates persistence through propagule	• Vegetation cover (%) and species composition is assessed. • Visual inspection during rehabilitation monitoring.	• Evidence of values that are similar to those/ or trending towards the assigned target analogue in terms of plant cover and key structural species composition. • Evidence of reproduction has been observed and recorded, for mature plants (e.g., fruit, seed or

Closure Objectives 2021		Completion Criteria 2021	Type of monitoring	Performance Indicators
		development and seedling recruitment.		flowers) and native perennial seedlings (second generation) on rehabilitation and is available for review.
3.6	Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	• Weed (introduced) species do not dominate in rehabilitated areas. • Weed abundance is not above that of relevant analogues. Appropriate weed management techniques (specific to the weed species) are implemented.	• Weed surveys (cover (%), density and species composition) undertaken annually for three years post closure in areas planned for revegetation, or weed presence visually assessed on rehabilitated areas that were not planned for revegetation. The monitoring frequency will be reviewed after three years.	• Evidence of monitoring on an annual basis for three years post closure, then less frequent monitoring until relinquishment. • Confirmation that the cover (%) of weed (introduced) species does not exceed the total native perennial vegetation cover (%). • Weed (introduced) species does not include seeded pastoral species.
3.7	The final landscape will have the ability to withstand post mining land use pressures.	• Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates. • Revegetation demonstrates sustainability through propagule development and seedling recruitment.	• Vegetation cover (%) and species composition is assessed.	• Evidence of monitoring in accordance with the monitoring management plan. • Evidence of development of plant density targets for 'intermediate' and 'undesirable' plant species. • Evidence that reproduction has been observed (e.g. fruit, seed or flowers) and native perennial seedlings (second generation) are present on revegetated areas.
3.8	Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	• Rehabilitation reports include documented consideration of the seed mix and the proportions applied, in regard to plant palatability and potential disturbance pressures by grazing animals.	• Documented seed lists, rates and proportions of each species are available for review, for each rehabilitation area; in addition to evidence that palatability of the species was taken into account when developing a seed mix**.

Closure Objectives 2021		Completion Criteria 2021	Type of monitoring	Performance Indicators
			• Auditing by Mt Weld responsible person, or suitably qualified specialist.	
4	Key Stakeholders			
4.1	Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	• Confirmation by Mt Weld responsible person of compliance with stakeholder agreements. • Biennial review of the stakeholder consultation register, and consultation strategy to ensure appropriate stakeholder engagement has occurred, agreements are being maintained and concerns addressed.	• Confirmation of compliance with stakeholder agreements. • Evidence is available for review that demonstrates that key stakeholders have been informed on the Project status, and any proposed changes to the Project and MCP. • The updated MCPs demonstrate that priority outcomes of community and stakeholder consultation in relation to closure have been taken into consideration in the development and reviews of the MCP. • the Stakeholder Consultation Register and Strategy that includes Mt Welds responses to stakeholder comment is updated at least biennially.
4.2	Infrastructure will be retained or removed in accordance with agreed post mining land use in consultation with relevant key stakeholders and with approval granted where required.	• Retained infrastructure will be left in a safe condition and transferred via an appropriate asset transfer agreement to a legally responsible entity. • Liabilities associated with any infrastructure to be retained are defined, and approved by relevant key stakeholders, prior to any asset transfer taking place.	• Inspections of retained infrastructure prior to handover by Mt Weld responsible person. • Signed asset transfer agreement in place prior to transfer of legal responsibility. • Review against Decommissioning Plans by Mt Weld responsible person.	• Confirmation that all infrastructure not agreed to be retained is removed. • Confirmation that the transfer of retained infrastructure assets and their associated liabilities is completed. • Confirmation of compliance with MCP and relevant Decommissioning Plans.

Closure Objectives 2021		Completion Criteria 2021	Type of monitoring	Performance Indicators
		• Infrastructure and equipment that is not to be retained will be removed to allow rehabilitation to the approved post mining land use.		
5	Safety			
5.1	Inadvertent public access to open pits will be prevented as far as is practicable.	Abandonment bunds are constructed around all open pits that exceed 5 m in depth, in accordance with current guidance.	• Audit against the Department of Industry and Resources (DoIR) *Safety Bund Walls Around Abandoned Open Pit Mines Guideline 1997* (or equivalent).	Confirmation of compliance with regulatory guidelines and MCP.

*As-constructed reports and rehabilitation records should detail construction, include a survey pick up, and an assessment of whether construction was according to the committed parameters, e.g., Mining Proposals.

**Palatable ('desirable') species are defined by the Western Australian Department of Agriculture and Food, DAFWA (or equivalent).

9. Closure Implementation

9.1 Project Domains and Features

To facilitate effective mine closure planning, the Project has been divided into a number of physically distinct 'domains' and 'features'. The seven closure domains applicable to this Mt Weld MCP and a summary of the total number of features within each domain is provided in **Table 9-1**. The domains are comprised of features that have similar rehabilitation, decommissioning and closure requirements and objectives. This structure has enabled Mt Weld to develop broad closure strategies for each domain in addition to developing feature specific gaps for the individual features.

An inventory of the 55 features addressed within this MCP, along with the respective domain and Project Area is presented in **Table 9-1.**

Only two additional features have been added to the 2020 iteration of the MCP, however, eight features have been expanded or modified to support the proposed development of the Stage 4 open pit.

Table 9-1: Summary of project domains and numbers of features

Domain	Number of Features
Landforms	9
Industrial Infrastructure	25
Mining Infrastructure	1
Water Containment Infrastructure	11
Groundwater Infrastructure	5
Roads	2
Exploration Disturbance	2
Total	**55**

Table 9-2: Detailed inventory of Project Domains and Features

Domain	Existing Features
Landforms	Tailings Storage Facility (TSF) 2
	Tailings Storage Facility (TSF) 2
	Tailings Storage Facility (TSF) 3
	Waste Rock Landform (WRL) (expansion)
	Blended Ore Stockpile (BOS)
	Lake Clay Stockpile
	Mineralised Waste Stockpile (MWS)
	Run of Mine (ROM) Pad (expansion)
	Topsoil and Subsoil Stockpiles
Industrial Infrastructure	Administration Offices (including First Aid Room) and Car Parks
	Bioremediation Facility
	Concentrate Drying and Bagging Area

Domain	Existing Features
	Concentrate Handling and Storage Area
	Concentrator Plant (expansion of this area)
	Contractor's Maintenance Workshop
	Emergency Response Training (ERT)Yard
	Exploration Shed
	Explosives Magazine
	Fuel Storage Facilities
	Laboratory and Sample Store
	Landfill
	Laydown Areas
	Mining Contractor's Office and Maintenance Shed
	Powerlines
	Power Plant
	Process Control Room
	Reagent Storage Facilities
	Recycled Water Treatment Plant (RWTP) (modified layout)
	Reverse Osmosis (RO) Plant
	Sea Container Laydown Yard
	Septic Tank and Leach Drain System
	Steam Generation Plant
	Tailings, Supernatant and Raffinate Pipelines
	Workshop and Maintenance Shed
Mining Infrastructure	Mt Weld Open Pit (expansion)
Water Containment Infrastructure	Evaporation Pond
	Flood Control Bund
	Northern Cut-off Drain
	Plant Run-off Pond (modified layout)
	Raw Water Storage Tank
	Return Water pond
	Southwest Transfer Pond
	Stormwater Diversion Channel
	Surge Pond (constructed within the Plant Run-off Pond footprint)
	Treated Water Pond

Domain	Existing Features
	Turkey's Nest
Groundwater Infrastructure	Dewatering Bores
	Monitoring Bores
	Production Bores
	Borefield pipeline
	Managed Aquifer Recharge(expansion)
Roads	Access Roads and Tracks
	Haul Road (expansion)
Exploration Disturbance	Drill Holes and Drill Pads
	Exploration Tracks

9.2 Closure Strategy

The information presented within the closure implementation section has been separated according to the Project domains identified in **Section 2.6** (**Table 2-3**), and **Table 9-1**.

The following information is provided at the beginning of each domain section:

- a table listing the features contained within each domain;
- a table listing which closure objectives and completion criteria are applicable to the features within the domain; and
- broad closure approach.

Similar features may be grouped together in the tables listing the applicable closure objectives and completion criteria.

Information detailed within each domain section also includes:

- feature-specific knowledge base; and
- a closure implementation table, which incorporates the timeframes for the closure of the overarching and feature specific knowledge gaps, in addition to specific closure tasks and associated timeframes.

9.2.1 Feature-Specific Knowledge Base

A knowledge base has been developed for each feature (within each domain section). The knowledge base provides a summary of what is currently known about each feature and forms the foundation for the closure planning process. For most features this information has been derived from approval documentation. Applicable landform designs, where available, are incorporated along with information on the construction of the landform in relation to the design.

The knowledge base for the features has been updated with the results of the completed Research, Investigation and Trial Tasks. Mt Weld also propose to incorporate into future MCPs any information gathered during implementation of the risk mitigation strategies.

9.2.2 Knowledge Gaps and Associated Risk

A critical review of the knowledge base for each feature was undertaken to identify any potential 'knowledge gaps', which may limit the development of the final rehabilitation strategies. This review has led to the development of a number of overarching (site-wide) and domain specific tasks, which are presented in **Section 9.3**.

9.3 Schedule of Work - Closure Implementation Tasks

A set of overarching (site wide) and domain specific closure implementation tasks have been developed, relating to:

- research, investigation and trials required to address knowledge gaps;
- progressive rehabilitation;
- premature closure; and
- decommissioning.

The current site wide gaps and the associated risk are presented in **Table 9-3**, in addition to how and when these gaps will be addressed. The closure implementation tasks, required to mitigate/close the identified gap, are Research, Investigation and Trials, unless specified otherwise.

Future MCPs will be updated with the results of the completed Research, Investigation and Trial Tasks. If the tasks are still ongoing a timeframe for when they will be completed will be provided. Information collated from the risk mitigation strategies will also be incorporated into future MCPs.

Progressive rehabilitation involves the staged treatment of disturbed areas during exploration, construction, development and mining operations as soon as these areas become available, rather than undertaking large-scale rehabilitation works at the end of planned exploration and/or mining activities. The site wide progressive rehabilitation tasks are presented in **Table 9-4**. Opportunities for progressive rehabilitation consistent with the post-mining land use(s) and closure objectives will be optimised.

Not all of the above closure implementation tasks are applicable to all domains or features. For example, limited opportunities currently exist for progressive rehabilitation at the Project, due to the expanding operational status and the relatively long mine life (>25 years).

Areas of potential environmental contamination requiring investigation and subsequent management under the MCP will be addressed in a progressive manner by Mt Weld, to ensure resources and materials required for remediation are available to undertake the required work.

Premature closure (permanent or suspended operations under care and maintenance) may arise from economic, environmental, safety or other external pressures. In planning for these scenarios, Mt Weld can now confirm that contingencies are provided to make landforms such as TSFs and WRLs secure and non-polluting/ non-contaminating in the event of premature closure. In the event of premature closure Mt Weld will undertake the tasks presented in **Table 9-5** as a priority.

Closure/decommissioning tasks include, but are not limited to the following key activities:

- demolition and removal of infrastructure;
- contaminated sites investigation and reporting;
- re-shaping of remaining landforms (if required);
- completing rehabilitation and remediation tasks;
- monitoring and measuring the performance of closure activities against the agreed standards and criteria;
- inspections, consultation and reporting to stakeholders on progress; and
- progressive community and government sign-off on rehabilitated areas.

A closure implementation schedule outlining the timeframes for the closure of the identified knowledge gaps and the implementation of closure tasks is presented as **Appendix E**. This schedule includes an update on progress made over the last three years on the research and investigation task, where applicable. This register is intended to be a 'live' workbook, able to be updated as new information becomes available, and as tasks are closed out; **Appendix E** is a snapshot exported at the time of submission.

Table 9-3: 2020 Overarching (site wide) Knowledge Gaps and proposed Research and Investigation Tasks

Knowledge Gap	Associated Risk	Research, Investigation and Trials	Responsible Department	Timeframe
Stakeholder interest in infrastructure, and liability handover, in particular site roads and bores.	Residual liability for remnant infrastructure due to lack of clarity regarding ownership and responsibility for removal of infrastructure.	• obtain signed agreements for the responsibility for any infrastructure or features such as roads to remain post closure. • written acceptance from all applicable parties to take responsibility for any remaining infrastructure or features will have to be provided in the MCP prior to closure.	Corporate	5 Years from Closure
Environmental legacies and compliance with the *CS Act 2003*	Potential risk posed to ecological receptors via uptake of potential contaminants in soil/groundwater (vegetation used for rehabilitation) limiting rehabilitation success, and potential migration of contaminants to groundwater and surrounding vegetation.	• develop a register of point source contaminants, including their location. • develop a sampling analysis and quality plan (SAQP) in accordance with the CS Act, CS Regulations and the DER Assessment and Management of Contaminated Sites Guidelines 2014 and remediate areas where required. • continue to update the contaminated soils inventory.	Environment Department	2020-2023
Species to be utilised in rehabilitation	• post mining landscape not returning to a functioning ecosystem. • failure to relinquish site due to inability to achieve completion criteria.	Continue analogue and rehabilitation monitoring to finalise seed mixes.	Environment Department	2020-2023
The viability of seed within the topsoil stockpiles is unknown due to stockpiling for extended periods	Inability to rely on the topsoil stockpiles as a seed resource	• collect local provenance seed, clean and store appropriately, or identify a source for a suitable locally-provenance seed mix. • determine quantity of seed or plants required, and sources of these, for revegetation of entire Project site.	Environment Department	5 years from closure
Management of material hazardous to human health during closure works	Contaminated / hazardous materials that could be deemed hazardous during closure works are not identified.	Develop a comprehensive hazardous material register for the mine. This includes (but not limited to): Naturally Occurring Radioactive Materials (NORM), Synthetic Mineral Fibre's (insulation)	Environment Department/	2020 to 2026

Knowledge Gap	Associated Risk	Research, Investigation and Trials	Responsible Department	Timeframe
		hydrocarbons (including quantities), polychlorinated biphenyls (PCB's) (including quantities), asbestos and any other identifiable contaminated/hazardous material that could be deemed hazardous during closure works.	Safety Department	
Final Surface Water Management strategy	Incorrect drainage across the project area leading to erosion scour and water ponding causing a decline in vegetation health from shadowing and/ or ponding.	• develop a site Mine Closure Surface Water Management Plan, focused on re-establishing the natural drainage lines and sheet flow. • continued photo monitoring of vegetative health.	Environment Department	2020 to 2023

Table 9-4: Site Wide Progressive Rehabilitation Tasks

Site Wide Progressive Rehabilitation Tasks	Responsible Department	Timeframe
All buildings and structures, no longer required, are to be dismantled and removed from site or buried.	Site Services	Life of Mine
Plug all bore holes no longer required.	Site Services	Life of Mine
Remove all mining dewatering discharge pipelines and associated infrastructure no longer required.	Site Services	Life of Mine
Remove all turkeys nest infrastructure, including associated infrastructure, no longer required.	Mining Department	Life of Mine
Remove loose debris, litter and other non-hazardous substances to landfill or off-site recycling.	All Departments	Life of Mine
If required, take validation samples below where impacted soils have been removed to prove no residual impact.	Environment Department	Life of Mine
If required, undertake additional contaminated sites investigations in accordance with the CS Act and Regulations.	Environment Department	Life of Mine
If required, remove all potentially contaminated soils (hydrocarbons) and dispose of appropriately in a designated active bioremediation facility.	Environment Department	Life of Mine
Identify areas where contaminated material can be disposed of for treatment (on or off-site depending on status of on-site bioremediation areas and other designated disposal facilities).	Environment Department	Life of Mine
Identify and maintain all active bioremediation facilities on site that have the capacity and / or requirement to receive the contaminated material from the Project areas.	Environment Department / Mining Department	Life of Mine
Source local provenance seed (for the areas identified), clean and store appropriately.	Environment Department	Life of Mine

Site Wide Progressive Rehabilitation Tasks	Responsible Department	Timeframe
Verify placement and construct abandonment bunding as required, (in accordance with recommendations in the latest MCP.	Mining Department	Life of Mine
Define the full extent of the road network and responsibility for rehabilitation.	Environment Department	Life of Mine
Develop a Care and Maintenance (C&M) Plan.	Environment Department	Life of Mine

Table 9-5: Site Wide and Domain tasks for Premature Closure

Premature Closure Tasks	Responsible Department	Timeframe
Overarching (site wide)		
Implement the site-specific Care and Maintenance (C&M) Plan.	Environment, Mining and Processing Departments	Within two months of going into C&M.
Remove stored reagents (including excess fuel) and other chemicals.	Processing Department	Within two months of going into C&M
All services: • isolate and purge all service lines (air / water / gas etc.); • physically disconnect the service as close to the proposed demolition site boundary as possible; • provide temporary service connection points at the proposed demolition site boundary if possible; • ensure that there are no services running through the site that feed other areas that need to remain live; and • attain written signoff for all disconnected services.	Site Services	Within three months of going into C&M
All Vessels / Pumps / Motors (where applicable): • ensure all fuels and oils are removed from all storage vessels; • ensure all fuels and oils are purged from any service lines that run within the sites; • ensure all fuels and oils are purged from any pumps, motors or the like; • as the site will remain operational, before demolition commences in the relevant areas, all storage vessels will need to be cleaned and a gas free certificate provided; and • attain written signoff for all purged vessels, motors and pumps from the various services trades.	Site Services	Within three months of going into C&M
Miscellaneous: • dispose of any drums, containers or the like containing any remnant chemicals or hazardous substances.	All Departments	Within two months of going into C&M

Premature Closure Tasks	Responsible Department	Timeframe
Landforms		
Install bund across the WRL ramp.	Mining Department	Within three months of going into C&M
Install sediment bunds around the TSFs, WRL, alluvium and clay stockpiles as required.	Mining Department	Within six months of going into C&M
Mining Infrastructure		
Install abandonment bunds around the non-operational open pit void in the required location.	Mining Department	Within three months of going into C&M
Install a bund across the open pit ramp and minimise, where possible, the risk of inadvertent (vehicular) public access to the site.	Mining Department	Within three months of going into C&M
Exploration		
Seal any open drill holes.	Environment Department	Within one month of going into C&M

9.4 Landform Domain

9.4.1 Overview

The nine features within the Mt Weld Landform Domain is comprised of three Tailings Storage Facilities (TSFs), a Waste Rock Landform (WRL), Stockpiles, and Run of Mine (ROM) Pad areas. These Landform features are listed in

Table 9-6 and depicted in the site plan presented as **Figure 2-3**.

Table 9-6: Landform domain features

Type	Feature Name
Tailings Storage Facility	Tailings Storage Facility 1 (TSF 1)
	Tailings Storage Facility 2 (TSF 2)
	Tailings Storage Facility 3 (TSF 3)
Waste Rock Landform	Waste Rock Landform (WRL) (proposed expansion)
Run of Mine Pads, Stockpiles and Hardstand Areas	Blended Ore Stockpile (BOS)
	Lake Clay Stockpile
	Mineralised Waste Stockpiles (MWS) (Located at southern tip of WRL)
	ROM Pad
	Topsoil and Subsoil Stockpiles

9.4.2 Landform Objectives and Completion Criteria

Mt Weld's key proposed closure objective is to design all landforms within the constraints of the waste material properties, to ensure they are physically (geo-technically) stable, (geo-chemically) non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use. The application of the Project's closure outcomes and completion criteria to the Landform Domain is outlined in **Table 9-7.**

Due to the proximity of the three TSFs to each other, the closure strategy for the three TSFs is presented at the end of the knowledge base on TSF 3, as they are implicitly interlinked.

Three generic decommissioning tasks that are imperative in managing surface water off all the landforms that will remain post closure, and ensuring that these key closure objectives can be met are described below:

1. Construction of crest bunds and top surface cells

The crest bunds are to be constructed by a dozer pushing up excess material from the top of the WRL as the top is progressively shaped and dozed. The shaping requires sloping the surface away from the crests. If there is sufficient competent material within the Mt Weld landforms to undertake the required works, this will be utilised as a source. Alternatively, competent materials segregated through the mining sequence will be utilised. The crest bund needs to be approx. 1 m high, 3 m wide and the outer face aligned with the angle of the regraded slope.

The top surface cells are created in a similar way as the crest bunds with the centre of each cell ending up as a low point. The size of the top surface cells on the WRL is discretionary based on the size of the landform and material type, however, it is recommended that approximately four cells per hectare are constructed.

2. Installing Surface drainage

The financial provisioning allowance for surface drainage on landforms includes costs for shaping drain lines, screening of fresh rock to obtain rip rap material to line the drain, and haulage and placement of the rock into the drains. This will be installed for drainage from berms and other flat surfaces down to the natural surface if required.

3. Construction of Sediment toe bunds and sedimentation basins

Mt Weld Mining will construct a perimeter bund, also known as a sediment toe bund, around the outer toe of the WRL and TSFs, to not only retain any sediment runoff from the surface of the landform and prevent surface water pooling against the toe of these landforms, but to also prevent vehicular access onto the slopes. The sediment toe bund will direct storm water flow to sedimentation basins prior to controlling release of flow to the surrounding environment in extreme storm events. This structure will be designed to manage drainage off structures with consideration of Probable Maximum Precipitation (PMP).

Table 9-7: Application of the Closure Objectives and Completion Criteria to the Landform Domain

Legend	
✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	TSF 1	TSF 2	TSF 3	WRL	Lake Clay Stockpile	Mineralised Waste Stockpiles	ROM Pad	Blended Ore Stockpile	Topsoil and Subsoil Stockpiles
1.1 All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.2 To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characteristics, site conditions and the constraints of the post-mining environment.	✓	✓	✓	✓	×	×	×	×	×
	As-constructed reports and rehabilitation records are available for review.	✓	✓	✓	✓	×	×	×	×	✓
1.3 Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Surface drainage to downstream environments is retained or reinstated where possible.	✓	✓	✓	✓	✓	✓	✓	✓	✓
	No obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas.	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Surface water diversion structures to remain post closure are constructed in accordance with approved engineered designs.	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.4 Contained surface water chemistry to reflect agreed post closure water chemistry as much as practicable.	Contained surface water chemistry not to exceed agreed levels	✓	✓	✓	×	×	×	×	×	×
1.5 Groundwater levels to reflect agreed post-closure levels as much as practicable.	Groundwater standing water levels not to exceed agreed levels.	✓	✓	×	×	×	×	×	×	×
1.6 The Mt Weld Project is compliant with the requirements of the CS Act 2003 in order to achieve relinquishment.	Areas classified as 'possibly contaminated - investigation required' under the CS Act 2003, which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register.	✓	✓	✓	✓	✓	✓	✓	✓	×
	A Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.									
	Where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.									
2.1 Radiation levels contained within surface soils, groundwater and air-borne particles around rehabilitated areas will be as close to the natural background as practicable.	Post mining radiation levels will be compatible with agreed post mining land uses.	✓	✓	✓	✓	×	✓	✓	✓	×
	TSFs and WRL Radiation levels contained within surface soils and airborne around rehabilitated areas will not exceed background levels.	✓	✓	✓	✓	×	✓	×	×	×
	Annual radiation dose to members of the public does not exceed 1 mS/yr	✓	✓	✓	✓	×	✓	✓	✓	×

Objective	Completion Criteria	TSF 1	TSF 2	TSF 3	WRL	Lake Clay Stockpile	Mineralised Waste Stockpiles	ROM Pad	Blended Ore Stockpile	Topsoil and Subsoil Stockpiles
3.1 Appropriately manage mine waste throughout the life of mine.	Mined waste materials with potential for adverse environmental impact have been identified and managed appropriately so as to have no negative impact on the receiving environment.	✓ (orange)	✓ (orange)	✓ (orange)	✓ (orange)	✓ (red)	✓ (red)	×	×	×
3.2 Design landforms within the constraints of the waste material properties, to ensure they are physically (geo-technically) stable, (geo-chemically) non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.	Landform design incorporates water and drainage management measures to mitigate erosion of final surfaces and slopes.	✓ (orange)	✓ (orange)	✓ (orange)	✓ (orange)	✓ (red)	✓ (red)	×	×	×
	Final surfaces develop resistance to erosive forces and are non-polluting.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	×	×	×
3.3 Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	✓ (red)	✓ (red)	✓ (red)	✓ (orange)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)
3.4 Compliance with appropriate TSF Guidelines and tenement conditions.	Compliance with relevant ANCOLD guidelines for TSF safety and stability.	✓ (orange)	✓ (orange)	✓ (orange)	×	×	×	×	×	×
	Compliance with TSF inspection, auditing and reporting requirements, as stipulated in the tenement conditions.	✓ (orange)	✓ (orange)	✓ (orange)	×	×	×	×	×	×
3.5 Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	Vegetation is comprised of local provenance species.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)
	Vegetation cover values are similar to that of the target analogue.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	×	✓ (red)	✓ (red)	✓ (red)
	Revegetation demonstrates viability through propagule development and seedling recruitment.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	×	✓ (red)	✓ (red)	✓ (red)
3.6 Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	Weed (introduced) species do not dominate any rehabilitated area.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)
	Appropriate management techniques (specific to the weed species) are implemented.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)
	Weed abundance is not above that of relevant analogues.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	×	✓ (red)	✓ (red)	✓ (red)
3.7 The final landscape will have the ability to withstand post mining land use pressures.	Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)
	Revegetation demonstrates sustainability through propagule development and seedling recruitment.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	×	✓ (red)	✓ (red)	✓ (red)
3.8 Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	×	×	×	×	✓ (red)	×	✓ (red)	✓ (red)	✓ (red)
4.1 Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	✓ (red)	✓ (red)	✓ (red)	✓ (red)	✓ (red)	×	✓ (red)	✓ (red)	✓ (red)

Legend

✓ (green)	Full Compliance – Evidence of Measurement
✓ (orange)	Partial Compliance – No Evidence of Measurement
✓ (red)	Not demonstrated at this stage of operation
×	Not Applicable

9.4.3 Tailings Storage Facility 1

9.4.3.1 Knowledge Base

TSF 1 is a paddock-type impoundment, which covers an area of 18.5 ha, approximately 2 km west of the open pit and 300 m south of the process plant site (M38/58). Tailings deposition first commenced into TSF 1 in May 2011 and is still active to date.

TSF 1 was built to five (5) metres above ground level (magl) and designed to provide capacity for 0.27 million tonnes (Mt) of tailings, with the following characteristics:

- initial tailings density of 0.6 t/m^3 rising to 0.7 t/m^3 over the life of the facility (Knight Piesold 2011b);
- tailings %solids = 11.6% (by weight) (Knight Piesold 2003); and,
- maximum dry density = 1.15 t/m^3 (from laboratory testing).

Waste rock generated from the operation, was utilised in the construction of the TSF and EP, with material characterised into five zones (Zone A, B, C, G and F) by Knight Piesold (2011a). The original embankment design for TSF 1 is presented in **Figure 9-1**. Approximately 337,532 BCM of mine waste material was utilised for Stage 1 construction of the TSF and the EP comprising:

- 210,612 m^3 of Zone A material for the TSF embankment and TSF and EP basin liner;
- 126,250 m^3 of Zone B and C material for the TSF and EP embankments; and
- 670 m^3 of Zone F (sand filter) material (Knight Piesold 2011a).

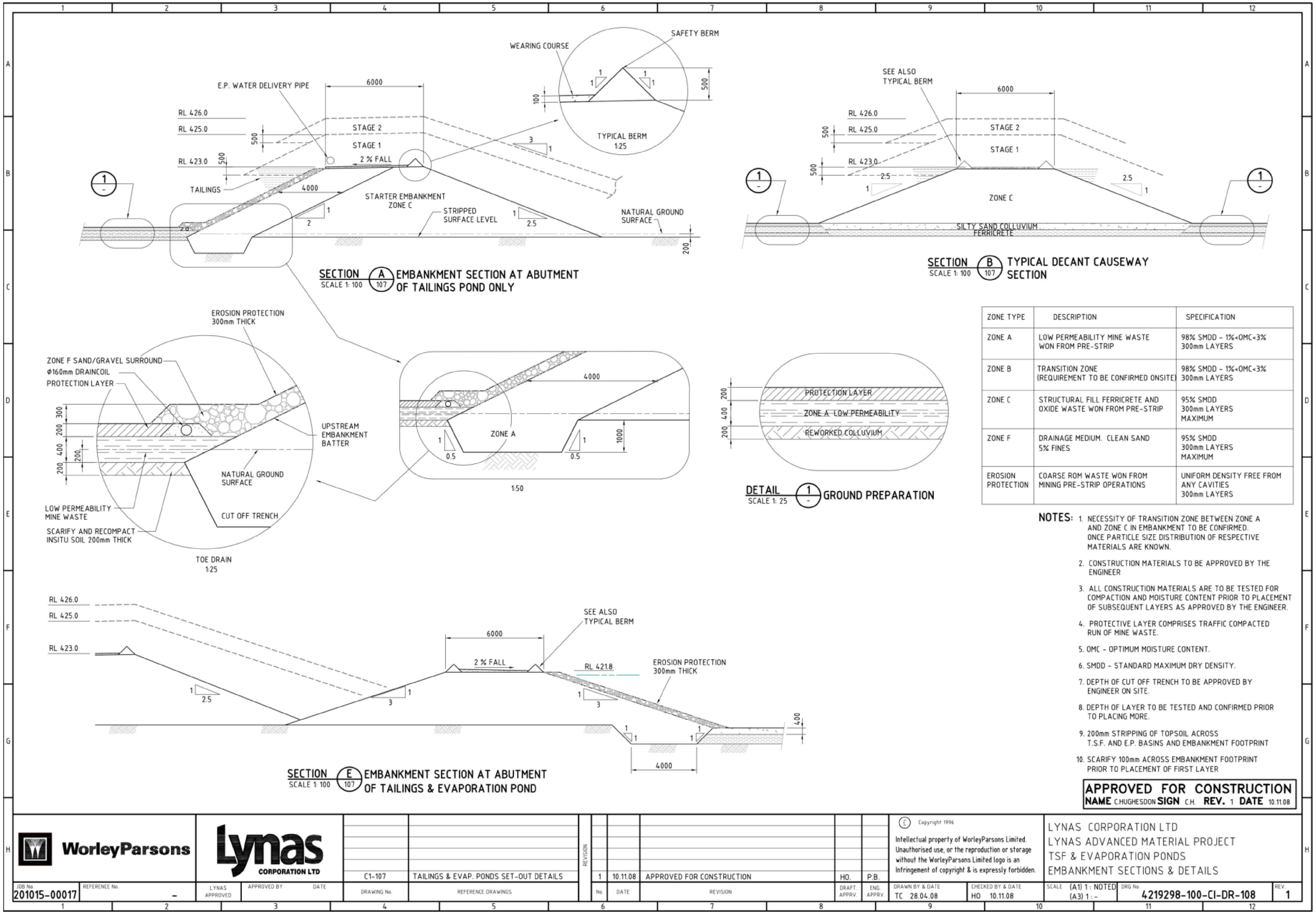
The current TSF 1 embankment geometry includes a crest width of six metres, an upstream slope (H:V) of 3:1 and a downstream slope (H:V) of 2:1. Based on the DMP *Code of Practice* (2013), TSF 1 has a hazard rating of 'Medium' with a classification of 'Category 2' (Coffey 2020).

A clay liner was installed prior to installing the underdrainage and commissioning TSF 1. The clay liner was constructed in two layers by way of scarifying, moisture conditioning and re-compacting the in situ low permeability Zone A soil (on average 250 mm thick), as well as an additional compacted clay import Zone A (on average 150 mm thick), to form a 400 mm thick reduced permeability soil liner. A 200 mm protection layer of structural fill (Zone C) was also placed above the basin liner which reduces the potential for cracking of the liner below and to reduce scour from surface flows due to the sloping nature of the basin floor.

An underdrainage system was installed on the surface of the basin clay liner in around the central decant. The system consists of perforated flexible draincoil pipe surrounded by filter sand (Zone F), covered by erosion protection rock (Zone G), draining to a lined collection sump at the low point in the southwest corner (415.9 m) (Knight Piesold 2011a). No water has reported to the underdrainage system for a period of time (A. Cargill, pers. comm, Lynas 2020), water was historically pumped by a solar-powered pump at TSF 1 back to the process plant for reuse, in the same bunded corridor as tailings delivery lines.

The centrally located decant tower in TSF 1 was constructed from vertically stacked slotted concrete pipes surrounded by 'clean' rockfill, and the decant access causeway was constructed from mine waste providing access to the decant structure for light vehicles and maintenance equipment. During the 2019 audit the access road was clear and well bunded on both sides with a well-maintained wearing course of fine gravel. The decant system at TSF 1 and TSF 2 is comprised of a submersible pump within a centrally located precast decant tower. A separate pump with a floating inlet was set up to pump water directly from the pond surface into the towers for transfer to the RWP, due to difficulties in drawing clean water (Coffey 2020).

The initial TSF design incorporated a future embankment lift to 10 magl or 428.9 mRL, this lift is currently on hold (indefinitely), and will not be undertaken in the near future. Instead, construction of a second TSF (TSF 2) was approved in 2015 and was commissioned in 2016 (**Section 9.4.4.1**). Subsequently the requirement for TSF 3 was identified, TSF 3 is now operational (**Section 0**).



ZONE TYPE	DESCRIPTION	SPECIFICATION
ZONE A	LOW PERMEABILITY MINE WASTE WON FROM PRE-STRIP	98% SMDD - 1%<OMC<3% 300mm LAYERS
ZONE B	TRANSITION ZONE (REQUIREMENT TO BE CONFIRMED ONSITE)	98% SMDD - 1%<OMC<3% 300mm LAYERS
ZONE C	STRUCTURAL FILL FERRICRETE AND OXIDE WASTE WON FROM PRE-STRIP	95% SMDD 300mm LAYERS MAXIMUM
ZONE F	DRAINAGE MEDIUM. CLEAN SAND 5% FINES	95% SMDD 300mm LAYERS MAXIMUM
EROSION PROTECTION	COARSE ROM WASTE WON FROM MINING PRE-STRIP OPERATIONS	UNIFORM DENSITY FREE FROM ANY CAVITIES 300mm LAYERS

NOTES:
1. NECESSITY OF TRANSITION ZONE BETWEEN ZONE A AND ZONE C IN EMBANKMENT TO BE CONFIRMED. ONCE PARTICLE SIZE DISTRIBUTION OF RESPECTIVE MATERIALS ARE KNOWN.
2. CONSTRUCTION MATERIALS TO BE APPROVED BY THE ENGINEER
3. ALL CONSTRUCTION MATERIALS ARE TO BE TESTED FOR COMPACTION AND MOISTURE CONTENT PRIOR TO PLACEMENT OF SUBSEQUENT LAYERS AS APPROVED BY THE ENGINEER.
4. PROTECTIVE LAYER COMPRISES TRAFFIC COMPACTED RUN OF MINE WASTE.
5. OMC - OPTIMUM MOISTURE CONTENT.
6. SMDD - STANDARD MAXIMUM DRY DENSITY.
7. DEPTH OF CUT OFF TRENCH TO BE APPROVED BY ENGINEER ON SITE.
8. DEPTH OF LAYER TO BE TESTED AND CONFIRMED PRIOR TO PLACING MORE.
9. 200mm STRIPPING OF TOPSOIL ACROSS T.S.F. AND E.P. BASINS AND EMBANKMENT FOOTPRINT
10. SCARIFY 100mm ACROSS EMBANKMENT FOOTPRINT PRIOR TO PLACEMENT OF FIRST LAYER

APPROVED FOR CONSTRUCTION
NAME C.HUGHESDON SIGN C.H. REV. 1 DATE 10.11.08

WorleyParsons | Lynas CORPORATION LTD
C1-107 TAILINGS & EVAP. PONDS SET-OUT DETAILS
1 10.11.08 APPROVED FOR CONSTRUCTION HO. P.B.

LYNAS CORPORATION LTD
LYNAS ADVANCED MATERIAL PROJECT
TSF & EVAPORATION PONDS
EMBANKMENT SECTIONS & DETAILS

JOB No. 201015-00017 | DRAWN BY & DATE TC 28.04.08 | CHECKED BY & DATE HO 10.11.08 | SCALE (A1) 1 : NOTED (A3) 1 : - | DRG No. 4219298-100-CI-DR-108 | REV. 1

Figure 9-1: Tailings Storage Facility 1 Embankment Design

The TSF water balance was reviewed, modelled, and updated subsequent to the 2013 TSF audit, to reflect the decreased storage capacity of the TSF, due to the solids and liquor components of the tailings stream (Hatch 2014b). the findings of this review influenced the decision to modify the initial design of TSF 1 into three cells of un-equal area. The lining and division of the TSF into three cells (**Figure 9-2**) was undertaken in a series of stages. Stage 1 incorporated the installation of a High-Density Polyethylene (HDPE) liner in the north-western area of the TSF (Cell A). Cell A was separated from the remainder of the TSF by a dividing wall which was shaped to avoid the underdrainage system.

Stage 2 involved the construction of two additional cells (Cell B and C); both cells are lined with HDPE. During this construction stage the underdrainage pipework system was removed and reinstalled above the HDPE liner. To enable pumping of the buried collection sump below the tailings profile, a drainpipe extends to but does not penetrate the perimeter embankment. This drainpipe emerges from the tailings beach adjacent to the embankment HDPE liner. The underdrainage system, which is now confined to Cell C, in the area around the decant tower, has been fitted with a solar powered pump (Hatch 2014b). Initial pumping rates from the underdrainage system were high; however, the recovery rates have since dropped to relatively low levels associated with the low permeability characteristics of the tailings (Hatch 2017).

In 2014, during the Stage 2 works, the spillway between the Cell A and the Cell C (southern cell) was deepened and re-lined. The crest of the dividing wall between these two cells is virtually at the same elevation as the external wall. The capacity of this spillway was assessed against a 1:100, 72-hour rainfall event and a freeboard of 0.3 m and found to be adequate, largely due to the volume of storage available above the relatively flat beach (Hatch 2014b).

Certificates of Practical Completion and Quality Control (QC) records for TSF 1 construction, including Stage 1 (construction and lining of Cell A with HDPE) have been completed. However, the Construction Report for Stage 2 (construction and lining of Cell B and C, plus other works) did not include a Certificate of Practical Completion or QC records (Hatch 2014b).

Low deposition densities were exacerbated, during the initial operation of TSF 1, due to issues with the recovery and utilisation of the supernatant water; this in turn was directly linked to the sensitivity of the flotation process and the quality of water that could be utilised. An Actiflo TSF water clarification system was installed in August 2014, which enabled the recovery and utilisation of supernatant water from TSF 1.

The ETD system was also implemented in 2014 to improve beaching and settlement of the tailings (see **Section 5.1.5.4**). The ETD system is a process where tailings are treated with a high molecular weight anionic polyacrylamide polymer and a cationic coagulant to rapidly settle the tailings and release relatively clean water for re-use in the concentration plant. The settling process is similar to that which is used in conventional thickeners (KASA 2016). Due to the success of the ETD system the Actiflo system was decommissioned.

Despite the success of the ETD system, the 2016 TSF audit noted that the low-density slurry and the issues associated with using decant water in the process plant have resulted in deposition being more analogous to subaqueous rather than sub-aerial tailings deposition. The low solids content of the discharged tailings has contributed to the following interlinked issues (Hatch 2017):

- excess water consumption and accumulated water storage within TSF 1 (Hatch 2014b);
- positive Water Balance (WorleyParsons 2013);
- average slurry density of 9% (less than the design assumption of 11.6%) (WorleyParsons 2013), which settle to approximately 36% solids (Hatch 2017);
- reduced consolidation density than that anticipated by the designers (Hatch 2014b); and
- premature consumption of storage capacity (Hatch 2014b).

Trials using a combination of a screw-propelled vehicle (MudMaster) with in-situ slurry recirculation to achieve in-situ consolidation and drying were implemented in 2017/2018. Mud-farming practises are now part of the ongoing operation of the TSFs in order to improve consolidation and remove water.

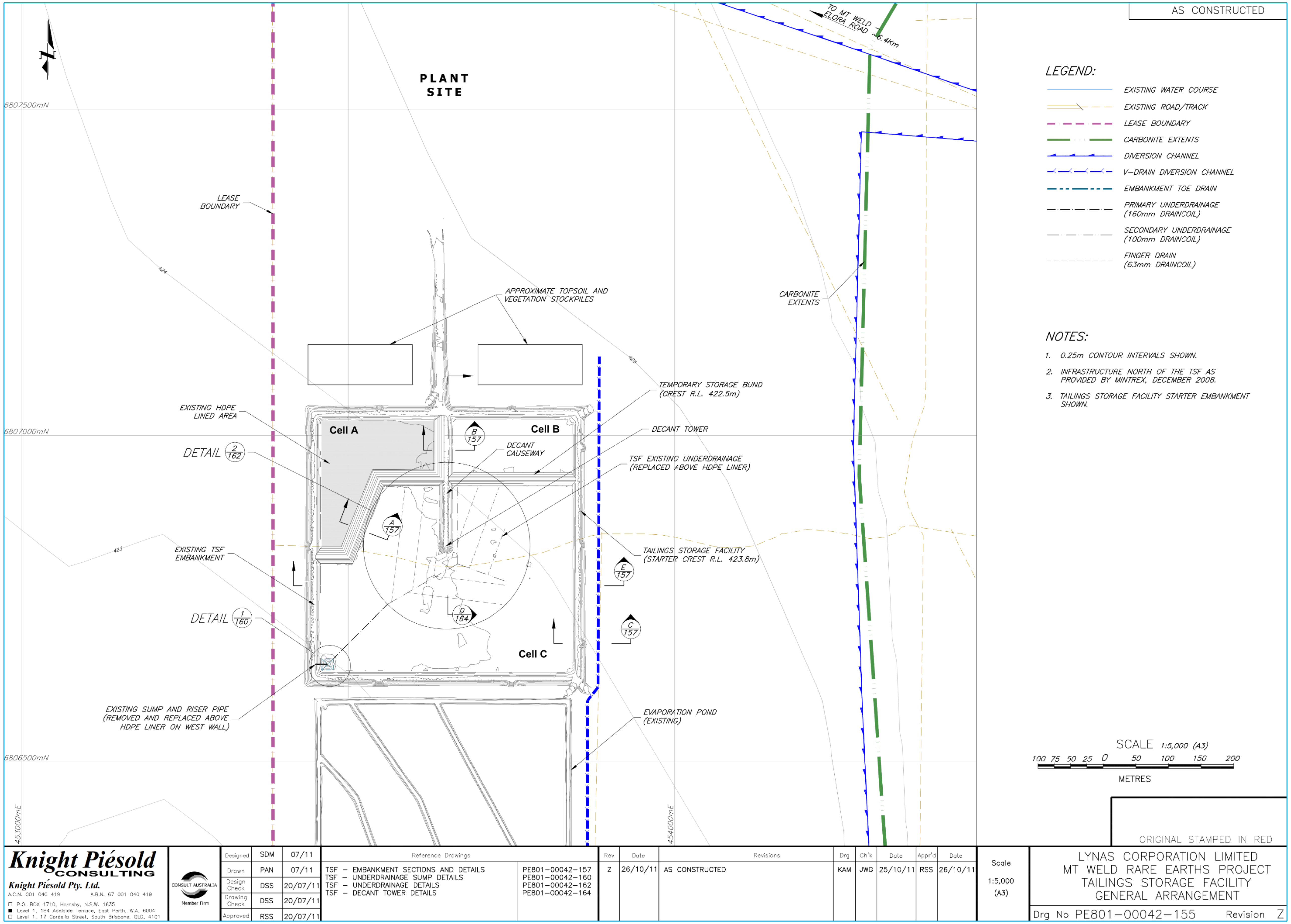


Figure 9-2: Locality plan for Tailings Storage Facility 1 (Lynas 2014b)

As illustrated in **Plate 9-1**, beach formation and drying as evidenced by cracking depth indicates consolidation is improving (Hatch 2017).

Plate 9-1: Exposed Beach and Spigot in TSF 1 (Hatch 2017)

Tailings slurry is usually deposited into one only TSF cell at a time via an average of six to eight discharge points to provide an even distribution of tailings over the cell. The spigots were generally spaced 20 m apart along the perimeter tailings pipeline. During the 2019 audit, it was noted that all the spigots were extended to the tailings level, and that all the spigots were numbered to assist with recording tailings deposition points in the shift logbook (Coffey 2020).

Spigots have consisted of a flexible rubber hose of approximately 65 mm in diameter affixed to the offtake stub, with the downstream end of the hose located inside a 90 mm diameter uPVC slotted pipe, capped at its end. The tailings exit the uPVC pipe at the toe of the embankment through the slots along the length of the pipe (Lynas 2014b).

The dry density of the settled beach tailings during the 2019 audit period for TSF 1 was calculated by Lynas to be approximately 0.91 t/m^3 based on tonnage received and volume of airspace consumed. This is an improvement of 0.29 t/m^3 from the previous audit period density of 0.62 t/m^3, due to the mud farming. The total tailings volume since deposition to TSF 1 commenced is approximately 338,400 m^3 and the total tonnage to TSF 1 approximately 309,532 t.

The remaining tailings storage capacity for TSF 1 is 145,800 m^3, which is equivalent to 132,678 t based on an average (calculated) in situ density of 0.91 t/m^3. This will provide tailings storage for approximately ten months at an average production rate of 13,270 tons per month (average for 2019) (Coffey 2020).

9.4.4 Tailings Storage Facility 2

9.4.4.1 Knowledge Base

A second TSF (TSF 2) has been constructed to the east of existing TSF 1 (**Figure 9-3**). The maximum height of the TSF 2 embankments is five (5) m. The facility covers an area of 18.74 ha, (from the outer toes of the perimeter embankments); an additional 7 ha was required for tailings dewatering equipment, access roads, topsoil stockpiles and a HDPE Lined RWP.

The current TSF 2 embankment geometry includes a crest width of six metres, an upstream slope (H:V) of 3:1 and a downstream slope (H:V) of 2:1. Based on the DMP *Code of Practice* (2013), TSF 2 has a hazard rating of 'Medium' with a classification of 'Category 2' (Coffey 2020).

The deposition method for tailings at TSF 2 was originally proposed to be 'dry' stacked tailings through the use of a tailings dewatering system located within the plant area. The proposed methodology for tailings disposal was proposed to be via haul trucks to TSF 2. However, the operating strategy was amended and approved by DMIRS in 2016 to utilise slurry deposition.

The footprint of TSF 2 is underlaid by a Geosynthetic Clay Liner (GCL), which consists of a waterproof mat, approximately 7 mm thick, comprised of bentonite clay trapped within two layers of geotextile. The design intent of this liner was to achieve a minimum permeability of greater than 1 x 10^{-9} m/s (Lynas 2014b), to impede the vertical movement of any seepage from the facility (Hatch 2013).

Approximately 130,000 compacted cubic metres (CCM) was required for embankment construction and 68,000 CCM was required for the cover over the GCL (Hatch 2014a). The TSF 2 embankments (**Figure 9-4**) were constructed largely from material obtained from the existing WRL and from surplus material from the RWP construction. Construction materials were screened to ensure that radioactivity levels are known and can be managed appropriately (KASA 2014). The materials and zoning from bottom to top comprised:

- Zone A – subgrade, 0.15 m thick foundation for the GCL installation, comprising relatively low permeability material compacted to 94% standard maximum dry density;
- GCL – installed to manufacturer's requirements; and
- Zone B – cover layer comprising selected material from the mine waste stockpiles, with a minimum thickness of 0.3 m. Thickness will be increased to 0.6 m to provide additional protection to areas subject to hauling operations and/or spreading equipment.

TSF 2 has been designed on the basis of zero-discharge to the environment. Mt Weld identified safety concerns related to installation of a spillway due to the need to traffic the perimeter crest on a daily basis and therefore directed the designers not to include a spillway. In the design storm event, the rainfall runoff flow rate will be much larger than the capacity of the decant system, putting TSF 2 at risk of overtopping, and embankment failure. The key mitigation measure in the absence of a spillway is therefore that Mt Weld provides adequate water storage within TSF 2 below the freeboard level (0.5 m) of the crest (Hatch 2014a, Lynas 2014b).

The decant tower consist of 1.8 m diameter slotted precast concrete pipe sections, surrounded by clean rockfill with a nominal particle size 40 mm and a cover layer of washed sand (**Figure 9-4**). Access to the decant tower is from the TSF 2 embankments via an access causeway approximately 10 m in length constructed from select fill material.

The decant drains via gravity to the RWP via a HDPE outfall pipe approximately 42 m long connected to a lined decant drain downstream of the TSF 2 southern embankment. The outfall pipe is connected to the decant via a riser pipe, 315 mm in diameter with five sets of 100 mm holes at 250 mm centres. The outfall pipe is fitted with an isolation valve to allow operators to close off the flow from outside of TSF 2. The design includes weir collars to limit piping of fines, with additional collars to be installed as the tailings level rises. The collars fit over the riser pipe and slide down to the base to close off the holes in the riser pipe below the tailings level. Weir collars shall be installed over the riser pipe, up to the level of the tailings surrounding the decant tower, to minimise the potential for tailings to flow through the holes in the riser pipe. The decant is operated manually, in such a way as to minimise the amount of water standing within TSF 2 while at the same time limiting the volume of tailings being transported into the decant drain and the RWP. An underdrainage collection system was not installed in TSF 2 (Lynas 2014b).

The dry density of the settled beach tailings during the 2019 audit period for TSF 2 was calculated by Lynas to be approximately 0.96 t/m^3 based on tonnage received and volume of airspace consumed. This is an improvement of 0.13 t/m3 from the previous audit period density of 0.83 t/m^3, due to the mud farming. The total tailings volume since deposition to TSF 2 commenced is approximately 413,838 m^3 and the total tonnage to TSF 2 approximately 397,142 t.

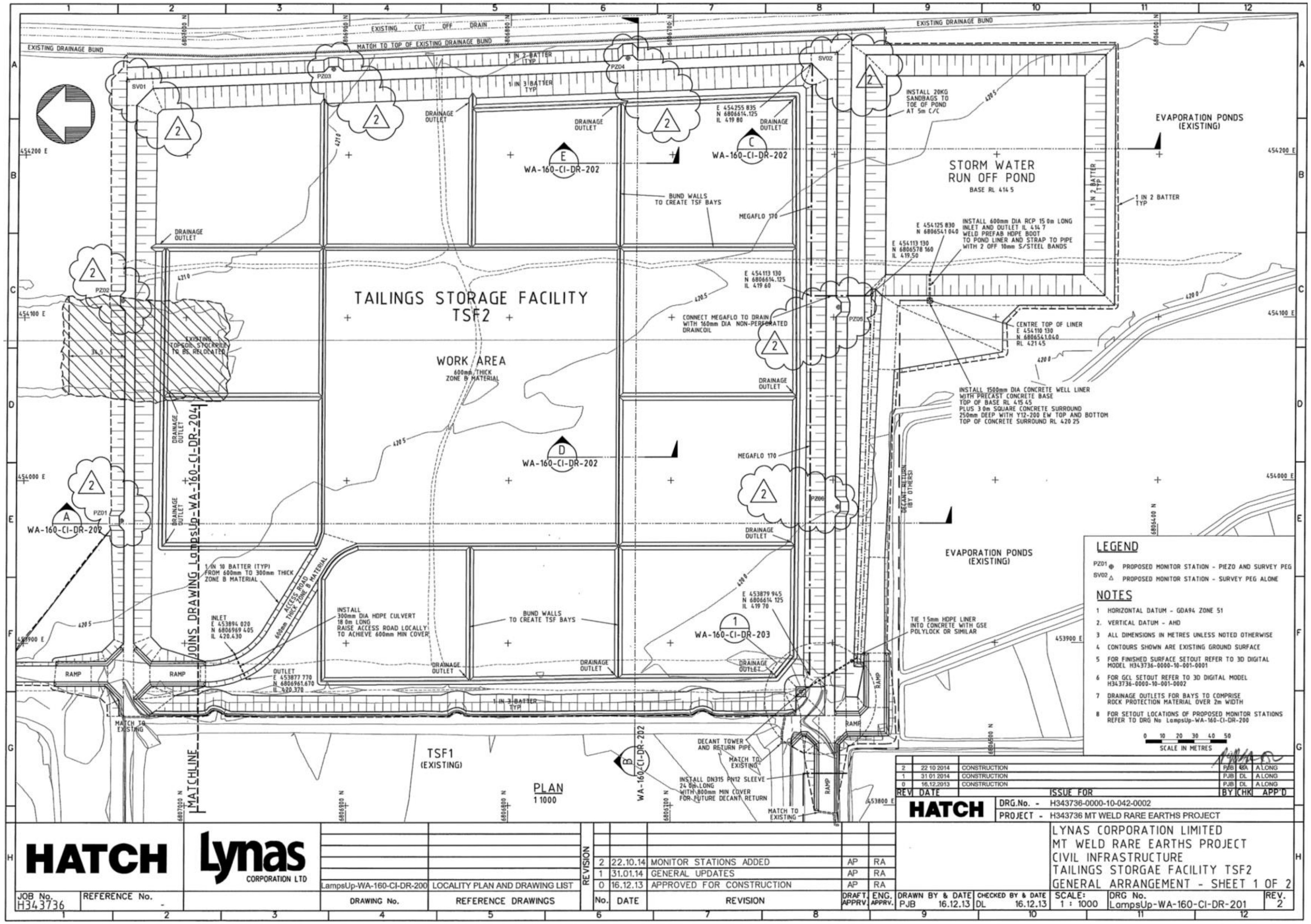
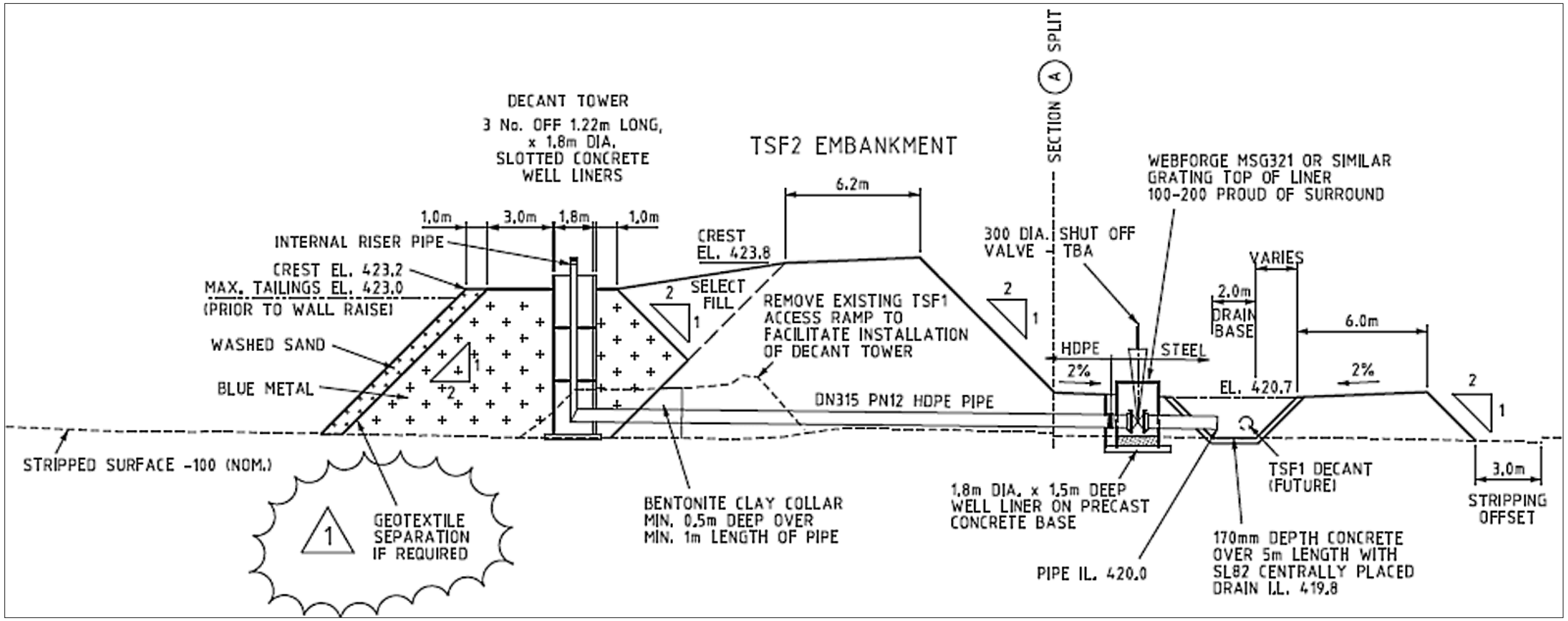


Figure 9-3: Tailings Storage Facility 2 layout



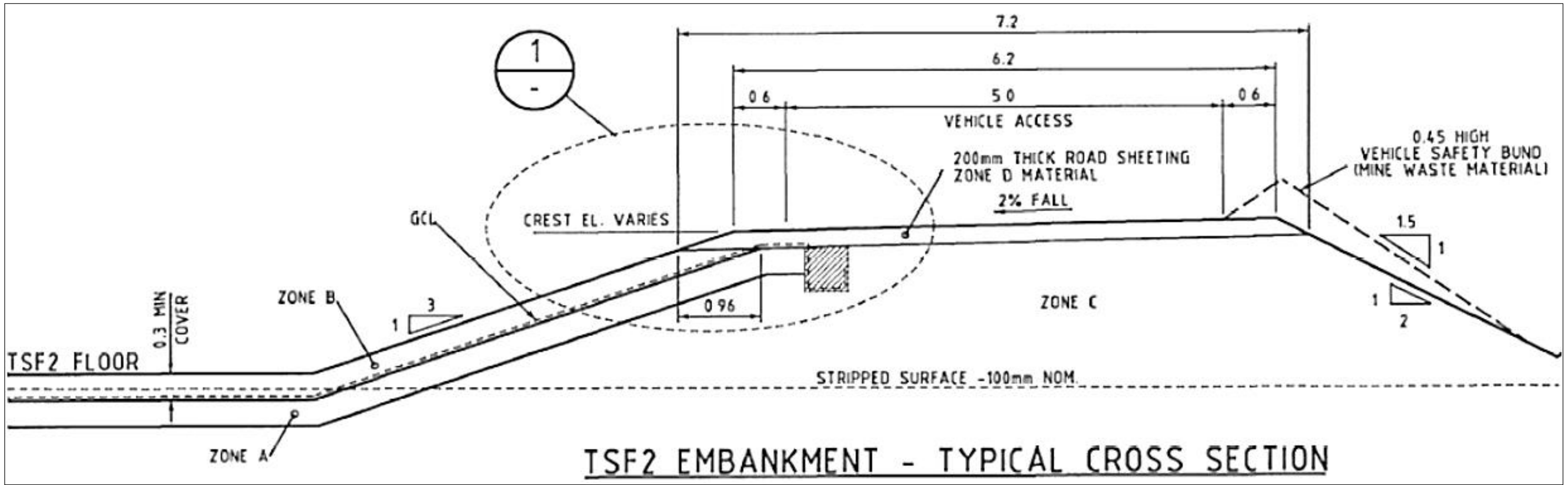


Figure 9-4: (TOP) Tailings Facility 2 Decant design, (BOTTOM) Embankment design (Hatch 2014a)

The remaining tailings storage capacity for TSF 2 is 198,835 m^3, which is equivalent to 190,882 t based on an average (calculated) in situ density of 0.96 t/m^3. This will provide tailings storage for approximately 14 months at an average production rate of 13,270 tons per month (average for 2019) (Coffey 2020).

Wet tailings were observed during the 2019 audit on the majority of the cell, with water in the southwest quadrat (Coffey 2020). The tailings survey in February 2021 was observed to be dry (Coffey, 2020).

Results of vane shear testing in 2014, on the tailings indicated that conventional equipment such as low bearing pressure dozers / excavators will be able to operate on tailings that have been dried to 70% solids (moisture content of 43%) over a depth of 1 m (Hatch 2014a).

9.4.5 Tailings Storage Facility 3

9.4.5.1 Knowledge Base

The construction of TSF 3 involved construction of a three-sided starter embankment, to an approximate height of 5 m high (425 mRL AHD – Stage 1), to form a rectangular impoundment against existing tailings storage cells (TSF 1 and TSF 2).

The cell impoundment area is approximately 15.3 ha within a 26.11 footprint. Site topography is of low relief with a maximum fall of approximately 0.2% from east to west. The general arrangement of TSF 3 is displayed in **Plate 9-3**. Detailed designs for the TSF embankments are presented in Plate 9-4. The top of the TSF perimeter embankment is graded so any spillage from pipelines falls towards the TSF.

TSF 3 has a compacted in situ clayey sand liner which extends up the upstream embankment face (Coffey 2020). The current (Stage 1) TSF 3 embankment geometry includes a crest width of 6.2 m, an upstream slope (H:V) of 2:1 and a downstream slope (H:V) of 2:1 (Coffey 2020). The design tailings storage capacity of TSF 3 cell at Stage 1 completion is 543,800 m^3.

A second construction stage (Stage 2), using downstream methods, to raise the cell perimeter by 5 m to a maximum height of 10 m has been approved; the vegetation in the area assigned to this raise has been cleared. The total tailings storage capacity, once this raise is completed, will be approximately 1,407,000 m^3 (ATC Williams 2017). The proposed (Stage 2) TSF 3 embankment geometry includes a crest width of 26.2 m, an upstream slope (H:V) of 2:1 and a downstream slope (H:V) of 2:1 (Coffey 2020). Lynas are currently developing a detailed design for TSF 4 and anticipate that the operation will look to seek approval for the construction and operation of TSF 4 ahead of constructing the approved lift on TSF 3. Decisions on future tailings storage and management at Mt Weld were still undergoing an options analysis at the time of writing this MCP (A. Cargill, pers. comm, Lynas 2020).

The TSF 3 decant system does not have a decant tower, supernatant water is collected via a diesel-powered pump with a pontoon-mounted suction inlet drawing water from a centrally located pond. The supernatant water from TSF 3 is pumped from the TSF 3 east and west cells to the existing Return Water Pond (south of TSF 2).

TSF 3 had a cut-off trench (**Plate 9-4**) and toe drain installed to collect any supernatant water generated during the initial deposition of tailings, prior to consolidation of the tailings bed and establishment of a 'tailings liner'.

Hydraulic conductivity of the TSF 3 foundation units, mine waste and freshly deposited tailings are presented in **Table 9-8.** Due to these natural low permeability characteristics TSF 3 was not lined with either HDPE (as per TSF 1) or a GCL (as per TSF 2). Seepage analyses indicate that a hydraulic connection between TSF 3 and groundwater is not anticipated, and that the alluvium will remain largely unsaturated during operation of the facility (ATC Williams 2017).

Table 9-8: Seepage Model Hydraulic Conductivities (ATC Williams 2017)

Materials	Hydraulic conductivity
Zone 4 - compacted mine waste (ferricrete)	1×10^{-7}
Zone 1 – compacted high fines content mine waste	1×10^{-8}
Freshly Deposited tailings	1×10^{-8}
Foundation – silty sand	1×10^{-7}
Foundation - hardpan	1×10^{-8}

Foundation – clay/saprolite	1×10^{-9}

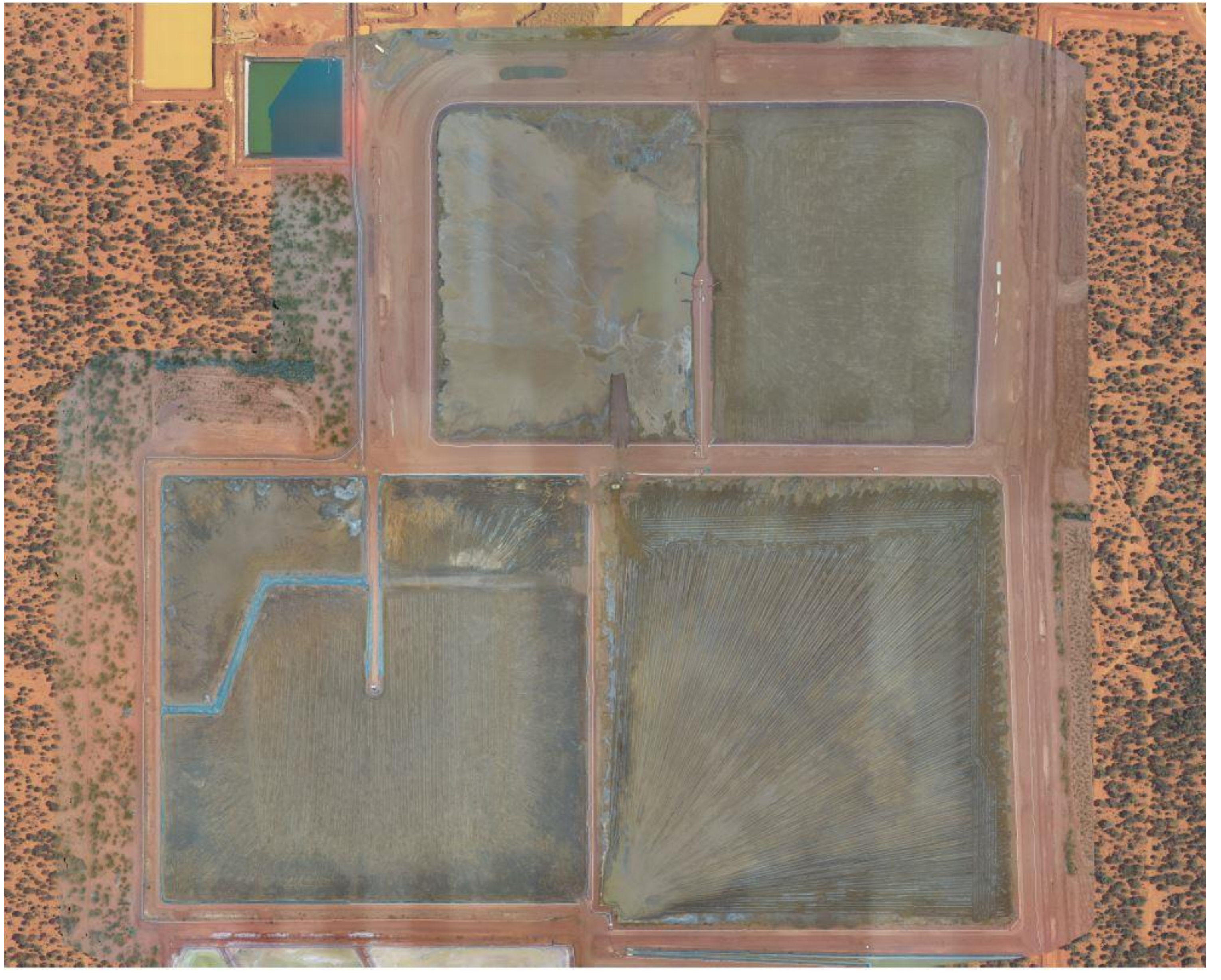


Plate 9-2: TSF 1, 2 and 3 February 2021 (photo supplied by Lynas 2021)

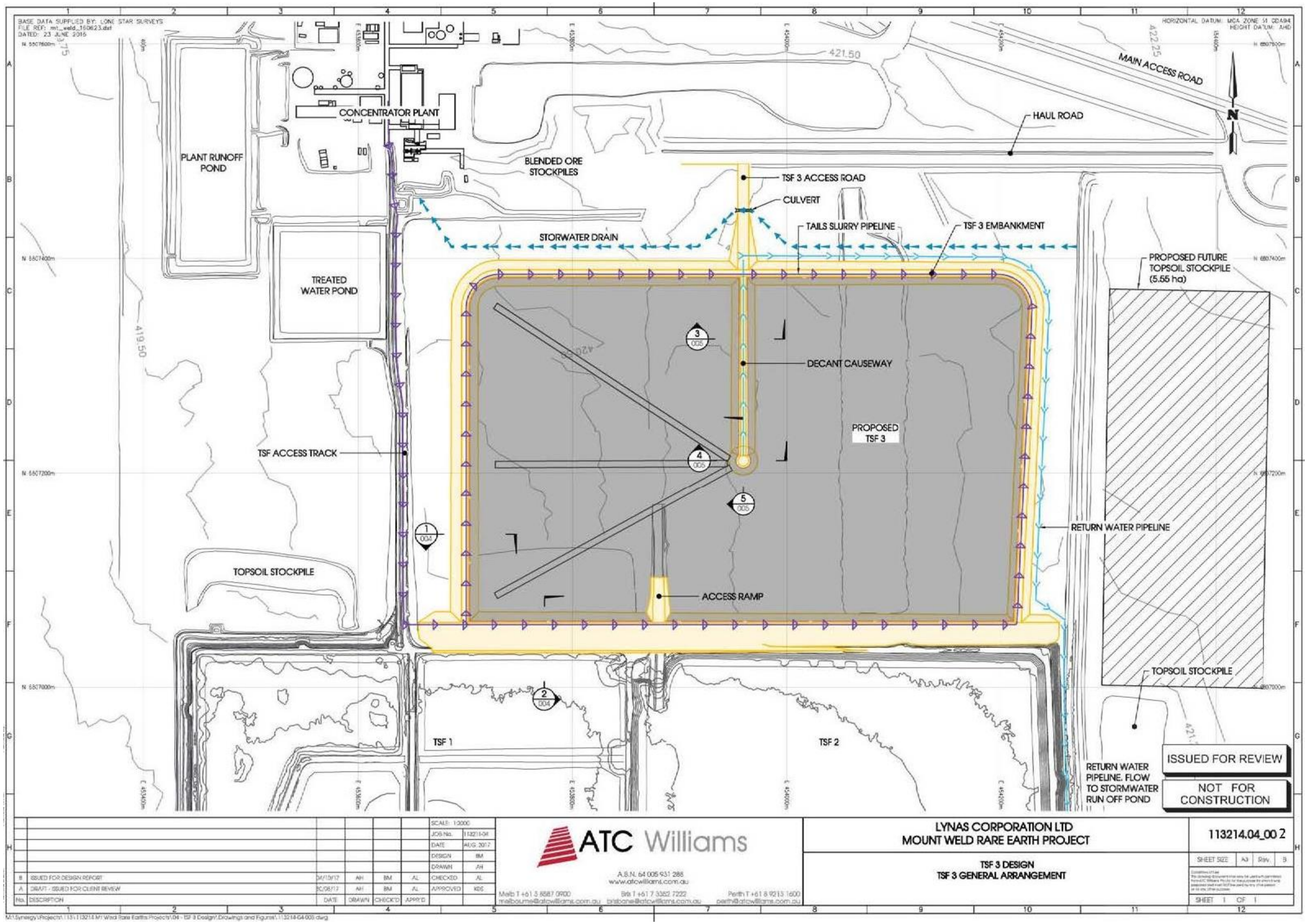
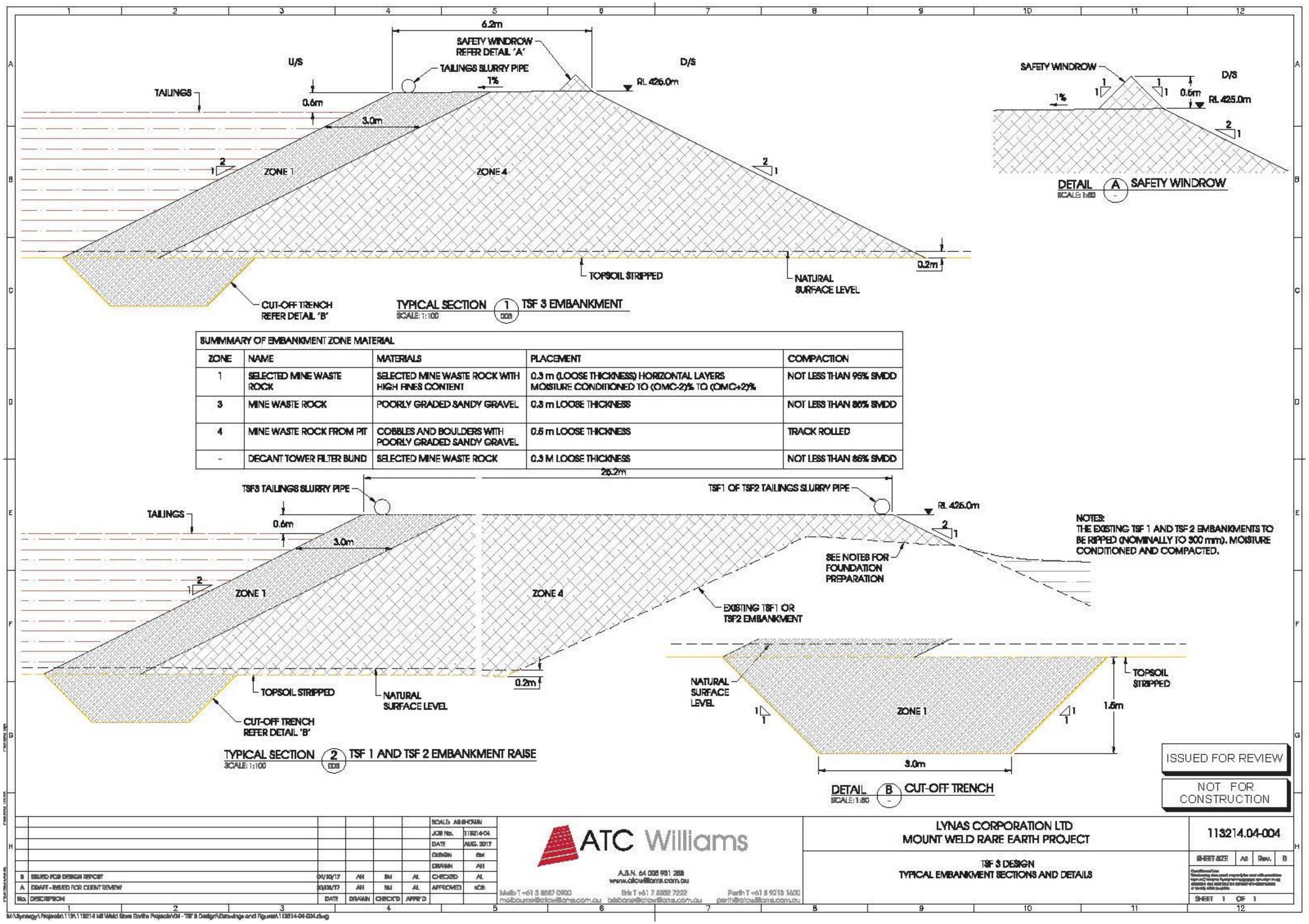


Plate 9-3: Tailings Storage Facility 3 General Arrangement



SUMMARY OF EMBANKMENT ZONE MATERIAL

ZONE	NAME	MATERIALS	PLACEMENT	COMPACTION
1	SELECTED MINE WASTE ROCK	SELECTED MINE WASTE ROCK WITH HIGH FINES CONTENT	0.3 m (LOOSE THICKNESS) HORIZONTAL LAYERS MOISTURE CONDITIONED TO (OMC-2)% TO (OMC+2)%	NOT LESS THAN 95% SMDD
3	MINE WASTE ROCK	POORLY GRADED SANDY GRAVEL	0.3 m LOOSE THICKNESS	NOT LESS THAN 95% SMDD
4	MINE WASTE ROCK FROM PIT	COBBLES AND BOULDERS WITH POORLY GRADED SANDY GRAVEL	0.5 m LOOSE THICKNESS	TRACK ROLLED
-	DECANT TOWER FILTER BUND	SELECTED MINE WASTE ROCK	0.3 M LOOSE THICKNESS	NOT LESS THAN 95% SMDD

Plate 9-4: Tailings Storage Facility 3 Embankment Design

The dry density of the settled beach tailings during the audit period at TSF 3 was calculated by Lynas to be approximately 1.32 t/m^3 based on tonnage received and volume of airspace consumed. This is an improvement of 0.29 t/m^3 from the previous audit period density of 1.03 t/m^3, due to the mudfarming. The total tailings volume since deposition to TSF 3 commenced is approximately 93,610 m^3 and the total tonnage to TSF 3 approximately 124,027 t.

The remaining tailings storage capacity for TSF 3 is 488,032 m^3 (245,118 m^3 - West Cell and 242,914 m^3 – East Cell), which is equivalent to 644,202 t based on an average (calculated) in situ density of 1.32 t/m3. This will provide tailings storage for approximately 48 months (4 years) at an average production rate of 13,270 tons per month (average for 2019).

The combined tailings storage from TSF 1, 2 and 3 is estimated at 72 months (6 years) (Coffey 2020). Lynas are currently undertaking an options analyses regarding tailings storage and management that includes development of TSF 4 (A. Cargill, pers. comm, Lynas 2020).

9.4.5.2 Closure Strategy for Tailings Storage Facility 1, 2 and 3 - Knowledge Gaps and Associated Risks

As outlined in **Section 5.1.5.4** the tailings are considered geochemically benign, have low levels of NORM radionuclides and tailings decant water is comparable with that in the superficial aquifer. Additional information on tailings characterisation is also presented in this Section.

As previously noted, it is anticipated that most gamma radiation can be attenuated with 300 to 500 mm of soil cover. Radon-222 gas (from radium-226) may take a thicker cover depending on the activity concentration of radium-226 and thorium-230 (which decays to radium-226). Further specific testing on the effectiveness of this capping procedure to accurately determine the required depth of capping material to eliminate Radon gas and gamma radiation above background levels and support vegetation is proposed (see **Section 5.1.11.4**).

Although previously approved geotechnical reports suggest the inclusion of a capillary break layer comprising 500 mm of coarse waste rock material, it is also proposed to ascertain if a capillary break is required across the tailings surface (see **Section 5.1.11.4**).

Due to TSF 1 and 2 historically being characterised by poor consolidation characteristics a water shedding structure has previously been presented to and approved as a closure option by DMIRS. However, due to the success of the mudfarming practises (**Section 5.1.5.4**), the potential to manage TSF 1, 2 and 3 as a single closure landform is now feasible and will continue to be investigated. Detailed designs will be finalised following the closure of knowledge gaps as outlined in **Section 9.4.12**.

The deposited tailings, since processing operations began, have ranged from 6 to 11% REO, consequently an evaluation for re-processing to recover additional REO is being considered, following re-treatment the tailings would be re-deposited back into the TSF. Mt Weld has engaged Curtin University to identify re-treatment processes for the deposited tailings (C. Torrisi, pers. comm, Lynas 2021).

At closure, all three TSFs will be capped and re-vegetated, the envisaged capping method is best described as a store-and release profile, comprising oxide mine waste cover material and topsoil. The oxide and topsoil layers will extend across the embankment crests and downstream slopes, and the entire final TSF landform will be seeded with shallow rooted plant species. The final closure design will consider:

- the Plant Available Water (PAW) holding capacity of the potential store and release cover design which may be implemented has been investigated and it is likely that the soil profile will exhibit characteristics to allow vegetation to withstand drought conditions.
- as the site exhibits a negative water balance (annual evaporation exceeding rainfall), it is anticipated this structure would remain dry for the majority of the time. Due to the long mine life (~24 years), Mt Weld anticipate there will be sufficient time to implement consolidation testing and long term in situ trials on the TSF. The tailings will be allowed to consolidate, and monitoring data will inform the viability of this option.
- the final closure spillway will be designed and constructed in accordance with the latest ANCOLD Guidance and Tailings Standards. The main risk presented by this option is the potential for long term erosion at spillway points where water is directed off the landform. For this option to be successful, erosion resistant armouring material will need to be sourced and detailed hydrology, hydraulic and civil engineering completed in parallel to required geotechnical investigations.

A generalised schematic of the proposed cover system is supplied as **Figure 9-5.** The indicative depths illustrated in the schematic are for demonstration purposes only, furthermore a compacted seal may not be required in this context due to the low permeability of the tailings material upon consolidation. However, the figure provides a conceptual system designed to limit infiltration into the landform upon closure.

The ability for the cover profile to support a vegetative layer was assessed with consideration to the findings of the proposed capping material characterisation results.

The Outback Ecology Waste Characterisation report (2014) assessed the PAW of each of the projects waste streams. The PAW was assessed as moderate for all waste and topsoil samples. The alluvium waste recorded a total material value of 9.0% PAW (Moderate), similar to the values of undisturbed topsoil which displayed a mean average of 13.85% PAW (Moderate).

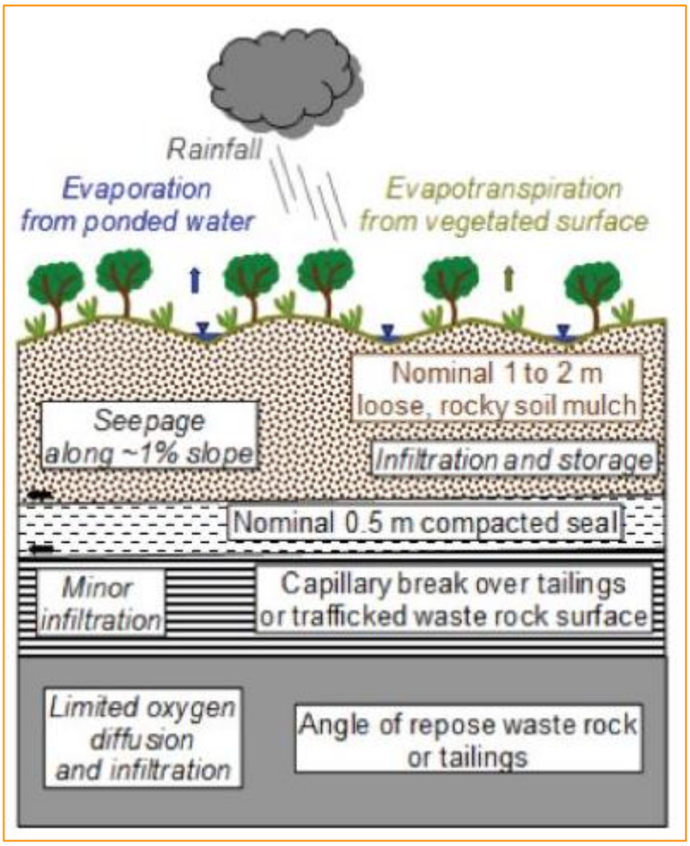


Figure 9-5: Generalised Schematic of a Conceptual Store and Release Cover System to be employed on TSF 1-3 at Closure (Commonwealth of Australia, 2016)

9.4.6 Waste Rock Landform

9.4.6.1 Knowledge Base

The Mt Weld WRL has progressively been expanded with each mining campaign. The existing approved footprint is 61.56 ha, (only 58.88 ha was disturbed), an additional 35.37 ha (actual vegetation clearing 23.45 ha) proposed to accommodate the waste from the Stage 4 mining campaign (96.93 ha total)(**Figure 9-6**).

The Stage 1-2 WRL is located approximately to the east of the open pit, this majority of this aspect of the WRL has not yet been constructed to the final design height, hence there is remaining capacity for storage of waste material. The approved area of the southern aspect of the Stage 2 WRL has not yet been cleared, due to an underlying low-grade resource; Lynas propose to utilise this area to stockpile topsoil generated from clearing the Stage 4 WRL footprint.

The Stage 3 WRL is located to the northeast of the open pit, the first lift of this aspect of the WRL is comprised entirely of Alluvium material.

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Figure 9-6: Mt Weld Waste Rock Landform Plan

The main waste rock mineralogy types include bauxite, haematite, goethite, limonite, calcite and clay. Soils with chemical and physical characteristics that are not conducive to supporting plant and microbial growth are placed below the proposed active soil profile.

In August 2013, Mt Weld engaged Outback Ecology to complete an assessment of topsoil and mine waste. The WRL consists of non-carbonatite overburden, the assessment identified three different mine material types present within the existing WRL, alluvium, calcrete, and lake clays. These three waste material types have distinctly different physical and chemical characteristics, as previously described in **Section 5.1.5.1**.

Current feasibility assessments indicate the presence of economic reserves within the southern footprint of the existing WRL. For this reason, it is not planned to conduct any further rehabilitation trials, on the southern-most batters. Further advances in long term mine planning will identify opportunities for progressively rehabilitation of additional sections of the WRL where possible.

A toe bund has been constructed around the eastern side of the WRL, from topsoil, to capture any sediment migrating off the landform.

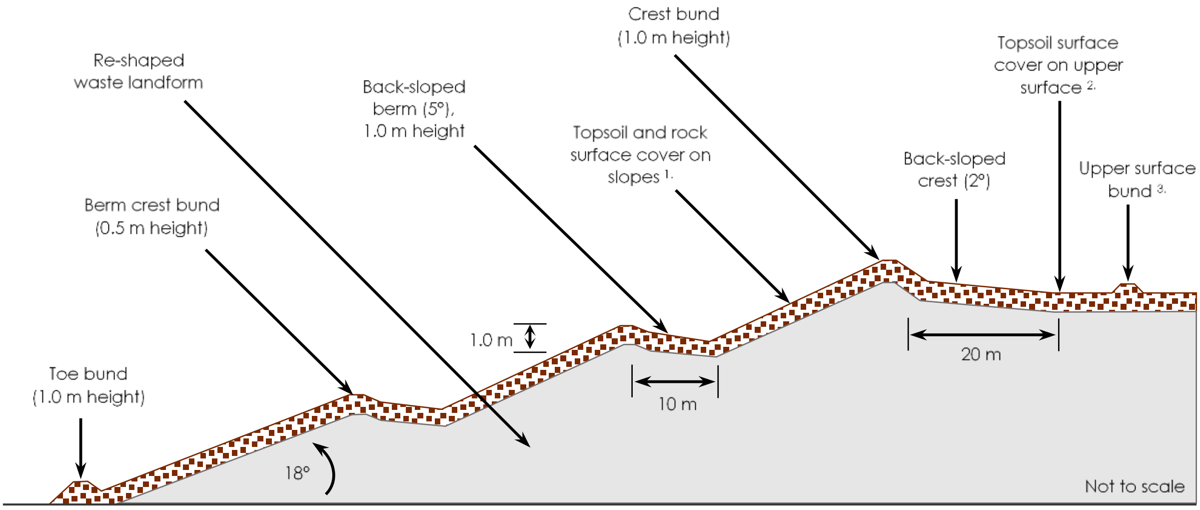
9.4.6.2 Closure Strategy for the Mt Weld WRL Knowledge Gaps and Associated Risks

In 2017, Stantec (2017d) developed a conceptual rehabilitation and closure design for the WRL. Key parameters for the conceptual design include the following:

- a maximum WRL height of 438 mRL;
- individual outer batter slopes to be shaped to a linear slope at an angle of 18°;
- 10 m vertical lifts;
- 10 m wide berms after each 10 m lift, with a 5° back-slope towards the WRL wall to a height of 1.0 m to ensure adequate storage capacity to prevent 'overtopping' of the berm;
- berm crest bunds (at least 0.5 m in height) around the edge of each berm to ensure adequate storage capacity to prevent 'overtopping' of the berm;
- construction of berm crest bunds to be level around the perimeter of each berm and to be built with a construction tolerance of 0.2 m of the design height;
- Lake clay waste and mineralised waste will be confined to internal zones of the WRL, encapsulated within at least 2 m of sand and gravel alluvium waste materials;
- no requirement to exclude water from the mine waste materials (due to non-acid-forming character);
- toe bund (height of 1.0 m) around entire landform to minimise sediment movement to surrounding landscape;
- crest bund (height of 1.0 m) around crest of upper surface to prevent over-topping of surface water from upper surface of WRL;
- back sloping crest of upper surface (approximately 2° gradient, for approximately 20 m), to prevent ponding of surface water adjacent to crest;
- bunding on upper surface (drainage control cells) to split the surface catchment and minimise concentration of surface water (four cells per hectare has been costed);
- topsoil surface cover on the flat upper surface of the WRL; and
- competent, benign waste rock (if available) to be incorporated into the WRL slopes surface.

Lynas consider the 10 m width of the berm as conceptual and propose to determine what the PMP requirements are to accommodate incident rainfall to prevent overtopping of the berm crest bund. In the absence of PMP calculations a 10 m berm will be adopted until the investigative task is completed (A. Cargill, pers. comm, Lynas 2020).

A cross section of the conceptual WRL design for the re-shaped, rehabilitated landform is included in **Figure 9-7**. It is important to note that the cross section is conceptual in nature, it is not drawn to scale and is not intended as final detailed design for construction purposes.



1. 0.2 m topsoil with integrated benign competent rock (total 0.4 to 0.5 m cover depth, perpendicular to slope) on outer slopes.
2. 0.4 to 0.5 m topsoil on flat upper surface (in bunded drainage control cells).
3. Bunds across upper surface to break total surface catchment into smaller areas (approximately 0.25 ha in size).

Figure 9-7: Cross section diagram of conceptual re-shaped design for the Mt Weld WRL (not to scale) (Stantec 2017d)

A key closure objective for the Mt Weld WRL is to minimise erosion of the WRL slopes and thereby limit the movement of sediment into the surrounding landscape. The relatively low coarse fragment content of the topsoil resource at the Mt Weld Project is unlikely to provide a high degree of surface armouring and erosion resistance (Outback Ecology, 2014, and Outback Ecology, 2011). As such, the following recommendations are made in order to mitigate erosion:

- a reduction in alluvium depth from the previous 1 to 1.5 m used for the existing rehabilitation on the western slope of the WRL, to a more suitable depth on slopes;
- addition of competent, benign waste rock materials to the topsoil surface cover of the outer slopes of the re-shaped WRL. The competent waste rock, if sufficient quantities are available, should be integrated into the topsoil surface materials to improve stability of the topsoil; and
- addition of wood or tree mulch, where available, to the surface of the rehabilitated WRL slopes.

Based on these recommendations, conceptual surface cover rehabilitation prescriptions for the Mt Weld WRL include the following;

- Slope cover profile:
  - 0.1 to 0.2 m topsoil, incorporated with approximately 0.3 to 0.5 m competent, benign waste rock (total cover profile depth of approximately 0.4 to 0.6 m), over the underlying sandy alluvium waste materials;
  - deep ripping along contours to mix and integrate topsoil and competent, benign waste rock; and
  - addition of wood mulch to surface.
- Upper surface cover profile (within surface drainage control cells):
  - 0.1 to 0.2 m topsoil over underlying alluvium waste materials; and
  - deep ripping.

The Stantec (2017d) report outlined several knowledge gaps required to be addressed to further refine the WRL design.

- maintain the rehabilitation resource inventory, with available volumes of all resource materials;
- evaluate the surface area and surface cover material volume requirements of the WRL, using a digital elevation or terrain model (DEM or DTM);
- reconcile surface cover volume requirements against available resources in a material inventory;
- revise the WRL design with consideration to PMP to ensure large rainfall events are contained on the landform; and

- evaluate necessary ratio of growth medium to armour rock to achieve desired slope stability.

9.4.7 Blended Ore Stockpiles

9.4.7.1 Knowledge Base

The BOS contains ore that has been crushed and blended prior to processing in the Concentrator Plant. The BOS is located to the west of the ROM bin which feeds the Ball Mill. The BOS has a disturbance footprint of approximately 1.62 ha and is reported under the ROM Mine Activity Type. The stockpiles are approximately 4 m high and will be processed prior to closure.

The volume of the ore stockpiled in the BOS can vary depending on if the Concentrator Plant is running and the feed demands. Traditionally Mt Weld have engaged a hauling contractor to transport the ore between the ROM and the BOS on a campaign basis, however, in recent times the plant has been running at full capacity, so haulage has been continuous.

Over the next couple of years, improvements to how Mt Weld handles and stockpiles ore will be investigated to reduce the number of times ore is handled.

9.4.7.2 Closure Strategy for the Blended Ore Stockpile Knowledge Gaps and Associated Risks

It is expected that all materials stockpiled on the BOS will be processed prior to closure. Radiation monitoring will identify any NORM required to be removed and selectively encapsulated within the WRL. The area will be reshaped to promote natural sheet flow, spread with topsoil, ripped to break compaction and seeded as required.

9.4.8 Lake Clay Stockpile

Stockpiling of the lake clays in a separate stockpile commenced in 2018, prior to construction of TSF 3; in June 2020, this stockpile contained 37,000 m^3, and a footprint of 2.9 ha (**Figure 9-8**). Lynas propose to utilise this temporary stockpile during the construction of TSF 4 (18+ months away) (A. Cargill, pers. comm, Lynas 2020).

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Figure 9-8: Lake Clay Stockpile

9.4.9 Mineralised Waste Stockpile

9.4.9.1 Knowledge Base

Mineralised waste (low grade ore) has been stockpiled immediately to the south of the WRL for potential future processing. The footprint of the Mineralised Waste Stockpile (MWS) was cleared prior to deposition and has decreased in size since the submission of the 2017 MCP, as 2.68 ha of the stockpile has been covered over with alluvium material, the remaining footprint is equivalent to 2.1 ha.

In 2020, Mt Weld estimated that the total volume of mineralised waste was 75,000 BCM; to date none of this material has been processed.

The mineralised waste, sampled during the 2014 assessment by Outback Ecology, were classed as partially dispersive and sodic clays, with slow hydraulic conductivity and moderate coarse fragment content (50%). This waste is therefore considered to have a high potential for erodibility and a high susceptibility to hardsetting (Outback Ecology 2014).

The chemical properties reported for the mineralised waste materials included moderately alkaline pH, non to slightly saline EC, sodic exchangeable sodium percentage, extremely low organic matter and variable concentrations of plant-available nutrients. However, elevated concentrations of arsenic, as well as high concentrations of zinc were reported for the mineralised waste materials. Furthermore, the mineralised waste contains low level radiation in the order of 1.5 – 2.0 Bq/g and is therefore classified as NORM.

Mt Weld anticipate that they will encounter some mineralised waste during the current expansion of the open pit, however, the volume has not been determined. Any new mineralised waste will be stored within the current mineralised waste stockpile, or on the exposed WRL footprint once the WRL material has been removed.

9.4.9.2 Closure Strategy for the Mineralised Waste Stockpile Knowledge Gaps and Associated Risks

If the mineralised waste stockpile is not processed by the end of the mine life, it will be either:

- returned to the open pit; or
- encapsulated with the WRL.

Further studies are required to evaluate the closure strategy of returning the waste to the open pit. It is unknown if the natural rebound of ground water to form a pit lake will be sufficient to blanket the radiation emitted by the material. If this method is not appropriate a potential further strategy involves the encapsulation of the mineralised waste within the pit by capping with a layer of benign alluvium material prior to the rebound of the pit lake.

If the final closure strategy is to encapsulate within the WRL, the material will be treated in a similar fashion to the other NORM waste streams and will be blanketed with a layer of benign alluvium material.

9.4.10 Run of Mine Pad

9.4.10.1 Knowledge Base

The primary Run-of-Mine (ROM) Pad is located immediately adjacent to the open pit and the WRL; this ROM Pad has not been built up and consists of stockpiled ore pending transport to the Concentrator Plant for processing.

Ore stockpiling occurs on the natural ground level and is typically handled by front end loaders or excavators and loaded into haul trucks. The existing ROM Pad stockpiles are up to 6 m high covering 25.41 ha. Surface water run-off from the ROM Pad reports to the Southwest Transfer Pond located to the southwest of the ROM Pad and to a turkey's nest to the northeast of the ROM Pad.

Hydraulic crushing units on excavators, located at the ROM Pad crush the ore to approximately 20 mm before it is then transported approximately 1.5 km to the Concentration Plant and paddock dumped on the Blended Ore Stockpile (BOS) pad, adjacent to the mill.

Development of the Stage 4 open pit envelope will significantly reduce the available envelope for stockpiling ore in the existing area. Consequently, Lynas have identified additional areas with the potential to be utilised for ore handling and stockpiling, including previously disturbed areas on the north eastern side of TSF 3, and the area between TSF 3 and the existing ROM Pad (see **Figure 2-3** and **Figure 2-4**).

Mt Weld also has an increased understanding of its ore characteristics both in grade and non-desirable parameters and therefore propose to establish individual stockpiles based on knowledge to meet the mills need for producing metal tonnes. Consequently, Mt Weld propose to reduce the number of times the ore is handled to increase efficiencies in the crushing and screening process, which in turn will reduce diesel consumption by the mobile plant and reduce fugitive dust emissions.

The proposed Stage 4 ROM Pad expansion footprint equates to 14.03 ha, Mt Weld intend to initially utilise this area for stockpiling Alluvium and Lake Clay waste material for future TSF construction. The proposed maximum volume of Lake Clay material to be stored in this location is 414,000 m^3.

9.4.10.2 Alluvium Stockpile

An area of 4.05 ha has already been cleared to enable stockpiling of Alluvium (generated from the Stage 3 mining campaign) in a temporary stockpile in the previously approved ROM Pad extension (see **Figure 2-3**). Stockpiling of this construction / rehabilitation resource commenced in 2018; in June 2020, this stockpile contained 266,000 m^3. Lynas propose to utilise the material currently stockpiled in this area for the construction of TSF 4 starter embankments (A. Cargill, pers. comm, Lynas 2020). Disturbance for the alluvium stockpile is captured under the ROM Mine Activity Type

Approximately 2,140,000 m^3 of alluvium material will be mined during the proposed Stage 4 mining campaign. Lynas propose to stockpile a maximum 2,405,500 m^3 of alluvium in this area. The maximum height of the proposed stockpiles would be 30 m (455 mRL) with 5 m berms. Lynas propose to install a toe bund around the stockpiles to prevent sediment runoff from entering undisturbed areas.

9.4.10.3 Closure Strategy for the Run of Mine Pad, Alluvium Waste and Lake Clay Stockpile Knowledge Gaps and Associated Risks

It is expected that all materials stockpiled on the ROM Pad will either be processed prior to closure or encapsulated in the approved footprint of the WRL. Radiation monitoring will identify any NORM required to be removed and selectively encapsulated within the WRL. The area will be reshaped to promote natural sheet flow, spread with topsoil, ripped to break compaction and seeded as required.

9.4.11 Topsoil / Subsoil Stockpiles

The topsoil and subsoil resource is stripped to a depth ranging between 200 to 300 mm, in all disturbance areas within the Project area, following the clearing of vegetation. The vegetative material has been stockpiled separately but due to similar properties the topsoil and subsoil have been combined. The stockpiles are in various locations around the site, for later use in rehabilitation. To maintain viability, the Topsoil / Subsoil Stockpiles do not exceed 2 m in height.

The assessment of the topsoil/ subsoil and mine waste materials (Outback Ecology 2014) concluded that the existing stockpiled topsoils/ subsoils are considered to be a valuable rehabilitation resource, even though some changes in the characteristics of the material were evident with depth through the stockpiles.

A total of 505,021 m^3 of topsoil / subsoil has been stockpiled on site as of June 2020, as detailed in **Table 9-9**.

Table 9-9: Mt Weld Topsoil/ Subsoil Stockpile Register (15th June 2020)

Stockpile Number	Location	Description	GPS Coordinates (GDA 94)		Volume (m^3)
			Easting (mE)	Northing (mN)	
1	Mining Area	Large paddock dumped stockpile north of the open pit	455,750	6,807,600	231,890
2	Mining Area	Paddock dumped stockpile eastern perimeter of WRL	456,450	6,807,300	7,880
3	Mining Area	Stockpiled area north of the open pit	455,800	6,807,400	233
4	Mining Area	Small stockpiles south of mining workshop	455,500	6,806,650	85

Stockpile Number	Location	Description	GPS Coordinates (GDA 94)		Volume (m^3)
			Easting (mE)	Northing (mN)	
5	TSF	This stockpile has been relocated to stockpile 9	454,100	6,807,200	0
6	TSF	This stockpile has been relocated to stockpile 9	453,800	6,807,100	0
7	TSF	Flat topped stockpile, not deep ripped, northwest of TSF 1	453,500	6,807,100	5,250
8	TSF	Flat topped stockpile, deep ripped, south of Evaporation Ponds	453,700	6,805,900	30,033
9	TSF	Paddock dumped east of TSF2 - relocation of stockpiles 5 & 6. Includes TSF 3 topsoil stripping	454,350	6,806,800	127,194
10	TSF	Paddock dumped south of TSF 2	454,100	6,805,900	2,952
11	Eastern Diversion Drain	Topsoil material part of dozed bund, parallel to diversion drain on western side.	457,200	6,807,200	10,258
12	Main Access and Haul Road	Number of small stockpiles along main access road and haul road, between plant and mining area.	454,500	6,807,500	575
13	Mining Area	Stage 2 stripped topsoil stockpile	455,372	6,807,664	32,955
14	Mining Area	Relocation of part of Pile 1	456,533	6,806,858	20,340
15	Mining Area	Stripped topsoil from WRL south extension	456,269	6,806,750	1,509
16	Mining Area	Stripped topsoil from WRL south extension	456,620	6,806,880	14,312
17	Mining Area	Pushed up topsoil from c3 WRL extension	456,249	6,807,734	3,145
18	Mining Area	Pushed up topsoil from c3 WRL extension	456,587	6,807,561	2,005
19	Mining Area	Topsoil paddock dumps from stripping of c3 WRL	456,480	6,807,897	14,405
Total Volume					**505,021**

Proposed topsoil /subsoil volumes to be generated from development of Stage 4 mining are presented in **Table 9-10**.

Table 9-10: Proposed topsoil / subsoil volumes to be generated from Stage 4 Mining Campaign

Stockpile Number	Location	Description	GPS Coordinates (GDA 94)		Volume (m^3)
			Easting (mE)	Northing (mN)	
	Mining Area	WRL footprint area	455,885	6,807,828	47,750

Stockpile Number	Location	Description	GPS Coordinates (GDA 94)		Volume (m^3)
			Easting (mE)	Northing (mN)	
	Mining Area	Alluvium stockpile footprint area	454,866	6,807,351	18,350
	Mining Area	Clay stockpile footprint area	545,524	6,807,355	10,100
	Mining Area	area south of current ROM	455,362	6,806,887	16,300
	Mining and Plant Area	Haul road from mining to plant area	454,888	6,807,787	13,300
	Plant Area	plant area expansion footprint	454,182	6,807,643	15,400
	Plant Area	mining infrastructure area footprint	453,965	6,807,816	22,750

Lynas propose to stockpile the topsoil generated from the Stage 4 mining campaign in the previously approved footprint of the Stage 2 WRL, the southern end of this approved area has not been cleared due to the Low-grade resource that is sited in this location. The development of the Stage 4 mining campaign will also result in the requirement to move Stockpile Number 7, northwest of TSF 1 to the southern end of the Stage 2 WRL. The total volume of topsoil to be stored in this location is 149,200 m^3. Lynas do not anticipate developing this resource within the next ten years (A. Cargill, pers. comm, Lynas 2020).

9.4.12 Closure Strategy for the Landform Domain Knowledge Gaps and Associated Risks

A summary of the knowledge gaps and closure implementation tasks identified for the three TSFs, WRL, ROM Pad and Stockpiles in the Mt Weld Project Area is presented below (**Table 9-11**). All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

Table 9-11: Landform Domain - Knowledge Gaps and Implementation Tasks

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
TSF 1, 2 and 3	63.37 (TSF1: 18.52ha TSF2: 18.74ha TSF3: 26.11ha)	Volume of tailings liquor that can be recovered from the underdrainage and when the underdrainage can be decommissioned	TSF remaining uncapped for extended periods exposing NORM and delaying closure of the landform.	• once the recoverable supernatant waters have been removed from the tailings surface, investigate if seepage water can be recovered from the underdrainage; • monitor any volumes recovered from the underdrainage; and • determine how long after ceasing deposition that the underdrainage will be decommissioned	At closure	Environment Department	• remove tailings delivery and distribution pipework and remove the top sections of the decant tower; • remove and seal the decant tower; • Reshape and prepare batters to average 15°; • Reshape and prepare top surface (doze perimeter bench and decant access roads) for cover works; • cover with appropriate cover material sufficient to blanket radiation (as determined by trials); • develop final store and release cover profile; • install coarse waste rock protection layer (as required); • apply topsoil to the upper surface, embankment crests and downstream slopes; • install appropriate drainage control to prevent water ponding against the toe of the TSF embankments; • re-establish natural surface water flows, where feasible; • where appropriate, rip and install erosion control measures; • apply local provenance seed; and • decommission underdrainage when deemed appropriate.	At closure	Mine Closure team
		Time required for consolidation	TSF remaining uncapped for extended periods exposing NORM and delaying closure of the landform.	• Cone Penetration Test to determine tailings consolidation.	Following cessation of deposition into TSF 1, 2 and 3	Mine Closure Team			
		Final Closure Design including the findings of the tailings profile assessment and subsequent depth of material required to cap the TSF to blanket radiation, requirement for a capillary break, and required cover profile to support vegetation	Inappropriate landform design leading to: • slope erosion; • exposure of radioactive materials; • sedimentation of adjacent areas; • failure to achieve relinquishment; • upward migration of salts inhibiting vegetation establishment; • unplanned closure costs; and • rehabilitation failure / significant rework	• Undertake rehabilitation trials during the life of the project to determine the most efficient methodology to provide an effective radiation capping layer, prevent upward migration of salts and rehabilitate the surface of the facility.	2021-onwards	Environment Department			
				• Cone Penetration Test to determine tailings consolidation. • Develop a final closure design including cover profile, surface preparations and geotechnical design of engineered spillways (if required).	Following cessation of deposition into TSF 1, 2 and 3	Mine Closure Team			
		Volume and type of material that will be available for closure of the TSF, including drainage channels.	Adequate volumes of rehabilitation materials not available at closure	• Further materials testing of waste streams to verify adequacy for specific closure tasks (e.g., Slope armouring, NORM capping material, drainage channels)	2021 – 2026	Environment Department			
		Requirement for storm drainage around the TSFs to prevent water	The integrity of the TSF embankments is compromised	• Integrate storm drainage around TSF into site-wide drainage plan	2020-2023	Environment Department			

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
		locally ponding against the TSF walls.							
WRL	96.93	Final landform design including surface water management of the WRL upon closure	Inappropriate landform design leading to: • slope erosion; • potential for back-sloping berms to fill with sediment (topsoil) and fail; • exposure of dispersive, sodic and potentially mineralised waste (radioactive material); • sedimentation of adjacent areas; • failure to achieve relinquishment; • unplanned closure costs; and • rehabilitation failure / significant rework	• develop a final Landform design to minimise erosion (based on soil characteristics, and lessons learnt from the current rehabilitation trials) with consideration to Probable Maximum Precipitation. • evaluate necessary ratio of growth medium to armour rock to achieve desired slope stability.	2021-onwards	Environment Department	• the slopes will be battered to a maximum angle of 18°; • reshape the top surface of the WRL; • install a crest bund and drainage control cells on the top surface of the WRL; • re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; • apply topsoil/ subsoil, where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and • apply local provenance seed.	At closure	Mine Closure Team
		Total waste material types and volumes	Adequate volumes of rehabilitation materials not available at closure	• maintain a rehabilitation materials inventory.	Updated annually	Environment Department			
				• Further materials testing of waste streams to verify adequacy for specific closure tasks (e.g., Slope armouring, NORM capping material). • Evaluate surface area and cover volume requirements.	2020-2023	Environment Department			
				• Cover trials and radiological testing determining adequate depth of cover to attenuate radiation.	2020-2023	Environment/ Safety Departments			
		Areas suitable for progressive rehabilitation	Large remaining liability at time of site closure	• Annual review of disturbance areas to identify potential progressive rehabilitation targets.	Annually	Environment Department			

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
Blended Ore Stockpile	1.62	Extent of radioactive nuclides movement into the soil beneath the BOS	• Inappropriate closure planning. • Inappropriate closure provision. Human or environmental exposure to radioactive material	• Determine the depth to which the soil beneath the BOS needs to be excavated to remove contaminated soil.	At closure	Environment Department/ Safety Department	• remove underlying base layer for processing (approximately 0.5 m of material); • re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and • apply local provenance seed.	At Closure	Mine Closure Team
		Depth to which the soil beneath the BOS needs to be excavated to remove contaminated soil							
Lake Clay Stockpile	2.9	No key closure knowledge gaps were identified for this feature.	N/A				• remove material and encapsulate within the WRL • re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and apply local provenance seed.	At Closure	Mine Closure Team
Mineralised Waste Stockpiles	2.1	Whether the mineralised waste will be processed, backfilled into the open pit, or if encapsulation of the mineralised waste on the surface will be considered as alternative	Inappropriate closure provision. Inappropriate closure planning. Adequate volumes of capping material not being available at closure.	Development of a decommissioning plan for mineralised waste.	3 years prior to closure	Environment Department/ Mining Department	• If the mineralised waste will be processed; • And if not if it will be pushed back into the open pit and covered with 1 m of oxide material, or buried within the WRL; • remove underlying base layer for encapsulation (approximately 0.5 m of material); • re-establish natural surface water flows and drainage lines; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; • apply local provenance seed; and • rock armour where required.	At Closure	Mine Closure Team
		If backfilled, the depth at which this will occur, and cost associated with haulage				Mining Department			
		Total volume of mineralised waste at closure		Regular survey of quantities of mineralised waste and location throughout mine life.	Annually	Mining / Survey Department			

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
		Unknown depth of pit lake post closure - whether the mineralised waste will be covered by the pit lake	Exposure of NORM material.	Post closure pit lake modelling study	2020 -2026	Environment Department			
ROM Pad	39.44	Extent of radioactive nuclide movement into the soil beneath the ROM Pad Depth to which the soil beneath the ROM Pad needs to be excavated to remove contaminated soil At what point in time the temporary stockpiles will be removed from the ROM Pad Expansion area	• Inappropriate closure planning • Inappropriate closure provision • Human or environmental exposure to radioactive material	Determine the depth to which the soil beneath the ROM needs to be excavated to remove contaminated soil.	At closure	Environment Department/ Safety Department	• utilise remaining ore within the plant including underlying base layer (approximately 0.5 m of material); • undertake radiation monitoring and scrape any radioactive material from the surface; • remove material and encapsulate within the WRL • re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and • apply local provenance seed.	At Closure	Mine Closure Team
Topsoil / Subsoil Stockpiles	28.68	No key closure knowledge gaps were identified for this feature.	N/A				• remove topsoil and spread at the defined depth in the required location; • re-establish natural drainage contours; • deep rip the stockpile footprint; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and • apply local provenance seed.	At Closure	Mine Closure Team

9.5 Industrial Infrastructure Domain

9.5.1 Overview

The Industrial Infrastructure Domain, as described within this MCP for the Mt Weld Project is comprised of 25 separate features the majority of which are located in the Plant Area, these features are listed in **Table 9-12** and depicted in **Figure 2-4**.

Table 9-12: Industrial Infrastructure Features

Type	Feature Name
Industrial Infrastructure	Administration Offices (including First Aid Room) and Car Parks
	Bioremediation Facility
	Concentrate Drying and Bagging Area
	Concentrate Handling and Storage Area
	Concentrator Plant (expansion)
	Contractor's Maintenance Workshop
	Emergency Response Training (ERT)Yard
	Exploration Shed
	Explosives Magazine
	Fuel Storage Facilities
	Laboratory and Sample Store
	Landfill
	Laydown Areas
	Mining Contractor's Office and Maintenance Shed
	Powerlines
	Power Plant
	Process Control Room
	Reagent Storage Facilities
	Recycled Water Treatment Plant (RWTP)
	Reverse Osmosis (RO) Plant
	Sea Container Laydown Yard
	Septic Tank and Leach Drain System
	Steam Generation Plant
	Tailings, Supernatant and Raffinate Pipelines
	Workshop and Maintenance Shed

9.5.2 Industrial Infrastructure Objectives and Completion Criteria

The overarching objectives for all industrial infrastructure features is to create safe, non-polluting areas, capable of sustaining an agreed post mining land use. The application of the Project's closure objectives and completion criteria to the Industrial Infrastructure features is presented in **Table 9-13**.

With consideration to these objectives, all plant and infrastructure shall be removed, except where formal agreement for its retention has been reached after consultation with the appropriate stakeholders. With any infrastructure that is identified to remain post-closure, a detailed management plan will be developed once ongoing management costs and liability issues have been resolved. Equipment and facilities that have not been selected to remain post closure will either be dismantled for re-use or re-sale, demolished, and recycled where possible, with the approach selected being based on economic conditions at the time of closure.

Infrastructure areas with the potential for hydrocarbon contamination (e.g. workshops, refuelling facilities) will be assessed for hydrocarbon contamination as per the Department of Environment Regulation 2014 Assessment and Management of Contaminated Sites Guidelines and any contaminated material identified removed for treatment off-site.

Table 9-13: Application of the Closure Objectives and Completion Criteria to the Industrial Infrastructure Domain

Legend

✓ (green)	Full Compliance – Evidence of Measurement
✓ (yellow)	Partial Compliance – No Evidence of Measurement
✓ (red)	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Office Buildings	Bioremediation Facility	ERT Yard	Fuel Storage	Landfill	Laydown Areas	Magazine	Power generation	Powerlines	Concentrator plant	Reagent Storage	Water Treatment	Workshops
1.1 All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.2 To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characterisation, site conditions and the constraints of the post-mining environment.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	As-constructed reports and rehabilitation records are available for review.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
1.3 Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Surface drainage to downstream environments is retained or reinstated where possible.	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓
	No obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas.	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	✓
	Surface water diversion structures to remain post closure are constructed in accordance with approved engineered designs.	✓	✓	✓	✓	×	✓	✓	✓	✓	✓	✓	✓	
1.6 The Mt Weld Project is compliant with the requirements of the CS Act 2003 in order to achieve relinquishment.	Areas classified as 'possibly contaminated - investigation required' under the CS Act 2003, which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	A Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2.1 Radiation levels contained within surface soils, groundwater and air-borne particles around rehabilitated areas will be as close to the natural background as practicable.	Post mining radiation levels will be compatible with agreed post mining land uses.	×	×	×	×	×	✓	×	×	×	✓	×	×	✓
	Annual radiation dose to members of the public does not exceed 1 mS/yr	×	×	×	×	×	✓	×	×	×	✓	×	×	✓
3.3 Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3.3 Landforms in areas planned for revegetation, support a vegetation community that is similar to the target analogue	Vegetation viability through propagule development and seedling recruitment is evident on landforms planned for revegetation.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Vegetation is comprised of local provenance species.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Legend	
✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Office Buildings	Bioremediation Facility	ERT Yard	Fuel Storage	Landfill	Laydown Areas	Magazine	Power generation	Powerlines	Concentrator plant	Reagent Storage	Water Treatment	Workshops
3.5 Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	Vegetation cover values are similar to that of the target analogue.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Revegetation demonstrates viability through propagule development and seedling recruitment.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3.6 Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	Weed (introduced) species do not dominate any rehabilitated area.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Appropriate management techniques (specific to the weed species) are implemented.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Weed abundance is not above that of relevant analogues.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3.7 The final landscape will have the ability to withstand post mining land use pressures.	Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Revegetation demonstrates sustainability through propagule development and seedling recruitment.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3.8 Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4.1 Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

9.5.3 Administration Offices (including First Aid Room) and Car parks

9.5.3.1 Knowledge Base

The Administration Offices (including First Aid Room) and Car Parks are located immediately north of the Workshop and Maintenance Shed. The area consists of an administration building, training room, first aid room, telecommunications infrastructure, ablution facilities and car parks.

9.5.4 Bioremediation Facility

9.5.4.1 Knowledge Base

The Bioremediation Facility is located to the south of the EP. The facility is designed to treat 140 m^3 per annum (+10%) of contaminated waste. The Bioremediation Facility consists of two cells each 20 x 10 m (200 m^2). Each pad is surrounded by 1 m high bund with a 3 m wide crest.

The Bioremediation Facility is elevated, sitting above the height of the EP. Water that accumulates within the cells is collected by drainage pipes and then gravity fed through a filtration system to remove hydrocarbons. The filtered water then gravity feeds onto the surface of the EP.

9.5.5 Concentrate Drying and Bagging Area

9.5.5.1 Knowledge Base

The Concentrate Drying and Bagging Area is located directly to the west of the Concentrate Handling and Storage Area. The area is within a concrete bund and is open to the elements. The concentrate is stored here prior to being dried in a rotary fired kiln. Once the desired moisture content has been achieved in the kiln, the concentrate is bagged in 2.7 t safe working load bulka bags, (loaded to 2.668 t). The bags are then moved to the Concentrate Handling and Storage Area.

Mt Weld received approval from DWER to install an Indirect Fired Rotary Dryer in October 2020 under W639/2020/1 (DWER 2020). The proposed dryer will be capable of processing 30 t/hr of concentrate and will consist of an internal drum that is heated externally by four diesel fired package burners. To allow for the proposed increased production, Lynas has extended the existing concrete hardstand area, this area has been graded into a collection sump to collect stormwater (A. Cargill, pers. comm, Lynas 2020).

9.5.6 Concentrator Plant

9.5.6.1 Knowledge Base

The Concentrator Plant is located to the south of the Administration Buildings, its current approved premise production or design capacity is 443,000 t (of ore) per annum (tpa).

The Concentrator Plant is built up on an elevated pad divided into sections by a number of drainage channels joined by access roads. The Concentrator Plant side pads and roads are graded to direct run-off towards the drainage channels which transfer run-off to the Plant Run-off Pond (refer to **Section 9.7.7**).

The main Project access road acts as a physical barrier to prevent/limit sheet flow north of the road from flowing through the Concentrator Plant. Sheet flow that is intercepted by the main Project access road is directed in a west north-westerly direction along the road beyond the main tenement boundaries eventually re-joining the natural sheet drainage systems.

The Concentrator Plant was initially upgraded in 2013 to support the Stage 2 mining campaign; the design outputs of the Stage 2 upgrade included:

- ore processing throughput increased from 121,000 tpa to 242,400 tpa;
- concentrate production increased from 32,800 tpa to 64,800 tpa, with an upper bound target of 75,000 tpa; and
- tailings disposal rates increased from 11.1 tph to 22.2 tph, which increased tails production from 88,000 tpa (dry) to 177,600 tpa (dry) (KASA 2012).

Lynas have made numerous improvements to the Concentrator Plant, since the major plant expansion in 2013, to gradually increase the throughput of the plant. Current plant infrastructure allows for ore to be processed at 40 t/h, approvals are in place to enable the plant to be upgraded to 70 t/h and then 100 t/h. Lynas will upgrade the plant in the coming years to meet market demand (A. Cargill, pers. comm, Lynas 2020).

Lynas are in the process of developing designs for additional plant infrastructure, which will include, but not be limited to the flotation circuit, dewatering, filtration, and final concentrate; an additional 8.36 ha has been assigned to accommodate this expansion, resulting in a total area of 22.13 ha assigned to the plant site.

The key components of the Concentrator Plant include the following:

- crushing circuit;
- milling circuit;
- flotation circuit; and
- communition circuit.

An overarching description of these circuits is presented below:

9.5.6.1.1 Crushing Circuit

Ore blended to a head grade of 17% REO is retrieved from the BOS stockpiles and tipped into the crusher feed bin. The crushing circuit generates a product, approximately 20 mm, for the mill.

9.5.6.1.2 Milling Circuit

The milling circuit reduces the crushed ore to 80% passing 38 microns in a single milling stage by a ball mill in closed circuit with 4 x 250 mm cyclones. A new grinding mill was proposed under the approved 2017 MP for installation in the vicinity of the existing mill; installation of this has not yet occurred, however, Lynas intend to complete this in the coming years (A. Cargill, pers. comm, Lynas 2020). Various reagents are conditioned prior to flotation, which chemically react or absorb onto the surface of the minerals to allow efficient separation and concentration of the valuable minerals.

9.5.6.1.3 Comminution Circuit

The comminution circuit screens and classifies the milled ore to size.

9.5.6.1.4 Flotation Circuit

The flotation circuit consists of four stages of roughing/scavenging and five stages of cleaning. The conditioning reagents are added at each stage. The product of the flotation circuit contains approximately 36% REO.

9.5.6.1.5 Concentrate Dewatering

The concentrate dewatering circuit consists of a thickener feed tank, a high-rate concentrate thickener, a filter feed tank and a 160 m^2 horizontal filter pressure filter with ancillary equipment. A second thickener circuit is proposed was proposed in the approved 2017 MP; installation of this has not yet occurred, however, Lynas intend to complete this in the coming years (A. Cargill, pers. comm, Lynas 2020).

The product is filtered to reduce the water content to below 17% and then bagged and containerised in preparation for transport.

9.5.7 Concentrate Handling and Storage Area

9.5.7.1 Knowledge Base

The Concentrate Handling and Storage Area located immediately east of the Concentrator Plant is the area where the concentrate is handled and stored until the concentrate is transported off-site. Transport of the concentrate off-site occurs daily, comprising approximately 110 containers per week (maximum 120 per week), each loaded with ten bulka bags.

Lynas are exploring options to bulk load concentrate into containers in the coming years to improve efficiencies in transport and waste avoidance (A. Cargill, pers. comm, Lynas 2020).

9.5.8 Contractor's Maintenance Workshop

9.5.8.1 Knowledge Base

The Contractor's Maintenance Workshop is located to the south of the Power Generation Plant and comprises a workshop area for maintenance and a laydown yard.

9.5.9 Emergency Response Training Yard

9.5.9.1 Knowledge Base

The Emergency Response Training (ERT) Yard comprises a sea container with a confined space storage tank, some old vehicles and wooden pallets. The location of the ERT Yard is likely to be relocated in the future pending mining activities.

9.5.10 Exploration Shed

9.5.10.1 Knowledge Base

The Exploration Shed is a historical shed located in the old mine area approximately 650 m to the north of the open pit. The Exploration Shed is currently utilised to store geology core trays. Within the vicinity of the Exploration Shed, historical ore samples have been stored out in the open. This area is a supervised area on site due to low levels of radioactivity.

The exploration shed will be relocated west of the administration buildings, due to the proposed expansion of the WRL, which will result in an upgrade to how the core is retained (A. Cargill, pers. comm, Lynas 2020).

9.5.11 Explosives Magazine

9.5.11.1 Knowledge Base

The Explosive Magazine comprises a cleared area compound surrounded by a fence with a locked gate and two magazines; it is located to the north of the Stage 3 WRL. The two magazines hold blasting explosives and detonators in accordance with Explosives Storage Licence ETS002770.

9.5.12 Fuel Storage Facilities

9.5.12.1 Knowledge Base

Diesel fuel is stored at four locations on site, one in the mining area which consists of two Transtank© self-bunded units with a capacity of 55 and 68 kilolitres (kL). The second bulk fuel storage area comprises four self-bunded Transtank© units, each with a capacity of 100 kL.

Fuel storage capacity may increase on site, as part of the proposed plant and Recycled Water Treatment Plant expansion, to a total of eight 100 kL self-bunded tanks, located at the administration area. Within the plant area there is currently a 10-kL storage day tank at the power station and a 10 kL storage day tank at the boiler.

9.5.13 Laboratory and Sample Store

9.5.13.1 Knowledge Base

The Laboratory and Sample Store is located next to the Workshop and Maintenance Shed and is used for sample analysis. The laboratory is currently operational and will be required until the final stages of mine operation.

9.5.14 Landfill

9.5.14.1 Knowledge Base

The current Landfill feature is located within the southern aspect of the WRL. The licensed landfill contains buried inert construction and general waste and has a capacity of less than 300 tpa. The landfill was designed and is operated in accordance with the *Environmental Protection (Rural Landfill) Regulations, 2002*. Three historic landfills are located within the WRL, all of which have now been buried.

Spent hydrocarbons, reagent containers and hazardous waste are collected and removed by a licensed contractor for recycling, treatment and/or disposal in an approved waste disposal facility.

9.5.15 Laydown Areas

9.5.15.1 Knowledge Base

A number of hardstand cleared areas, referred to as Laydown Areas, are located within the vicinity of the Concentration Plant. The Laydown Areas are utilised for the temporary storage equipment such as tyres, bunded pallets and plant infrastructure during construction and operational phases of the mine life.

Previous approval has been granted for the Laydown Area that will be developed to the north of the Plant Run-off Pond.

9.5.16 Mining Contractor's Office and Maintenance Sheds

9.5.16.1 Knowledge Base

The Mining Contractor's Office and Maintenance Sheds consists of an office building and a maintenance workshop with minor hydrocarbon storage with a washdown bay, sump, and oil/water separator. Lynas propose to improve the existing washdown bay by expanding the area of the concrete pad around the workshop on which the trucks are washed down. No additional disturbance / clearing is required for the proposed expansion. Lynas are proposing to 'drop' the concrete into place, so that it can be re-located when the infrastructure is required to be moved during the Stage 4 mining campaign (potentially two to three years' time) (A. Cargill, pers. comm, Lynas 2020).

9.5.17 Powerlines

9.5.17.1 Knowledge Base

Mt Weld have a legally binding confidential Water Agreement with Granny Smith Gold Mine. Under this agreement GSGM are legally responsible for decommissioning the Powerlines.

Some sections of the Powerline will be required to be decommissioned to enable development of the WRL north of the open pit and expansions to the ROM Pad where stockpiling of the Lake Clays, Alluvium and ore handling will occur. Lynas are not currently proposing to reinstate the powerlines that will be decommissioned, however will utilise the existing access roads should reinstatement be required (A. Cargill, pers. comm, Lynas 2020).

9.5.18 Power Plant

9.5.18.1 Knowledge Base

Power is generated by 11 diesel generators located near the Concentrator Plant with process equipment totalling eight (8) Megawatts (MW) of installed capacity, (upgraded during Stage 2 from the initial 4 MW). The actual power requirement for the Concentrator Plant is approximately 6 MW, however, power requirements for the proposed Concentrator Plant expansion will be approximately 8.5 MW, which allows for additional generation capacity and backup.

As the Power Plant demand increases beyond the capacity of the low voltage distribution network, the power station capacity will transition to an 11 kV high voltage diesel power station. Waste heat from the generating sets may be used to recover used energy to heat the ore slurry for the flotation process. Lynas anticipate that the upgrade to the Power Plant will occur in the next couple of years (A. Cargill, pers. comm, Lynas 2020).

Mt Weld leases the generators from Kalgoorlie Power Supply who are responsible for the removal of the generators, fuel tanks and associated infrastructure.

9.5.19 Process Control Room

9.5.19.1 Knowledge Base

The process control room is located between the Ball Mill and the flotation circuit and consists of a small building to monitor the plant, a crib area and toilets. The operators are able to view the ball mill on one side and the floatation plant on the other side.

9.5.20 Reagent Storage Facilities

9.5.20.1 Knowledge Base

The following reagents are utilised during conditioning and concentrate dewatering:

- sodium silicate (Na_2,SiO_3) (note sodium silicate is not a dangerous good);
- 'flomin' or 'sylfat' collector (contains a fatty acid to aid the separation of rare earths during flotation);
- sulphuric acid (H_2SO_4);
- sodium hydroxide (NaOH); and
- flocculent (5250).

The main process plant Reagent Storage Facility is a concrete bunded area, incorporated into the plant design. The reagents are stored in self-bunded sea containers, within a laydown area. All dangerous goods are stored and handled in accordance with the manufacturers' specifications, dangerous goods licencing, and relevant legislative requirements.

The water treatment Reagent Storage Facility (self-bunded sea containers) will be replaced by bulk reagent storage to facilitate the proposed expansion associated with the Recycled Water Treatment Plant (RWTP) (A. Cargill, pers. comm, Lynas 2020).

9.5.21 Recycled Water Treatment Plant (RWTP)

9.5.21.1 Knowledge Base

The existing RWTP is located to the west of the RO Plant and includes the Ultrafiltration (UF) Plant (**Figure 9-9**). The RWTP was formerly called the UF Plant in the 2017 MCP.

The UF Plant receives water from the RWP, once the water has been filtered, it is then pumped to the RO Plant to recover water (permeate) to re-use within the Concentrator Plant.

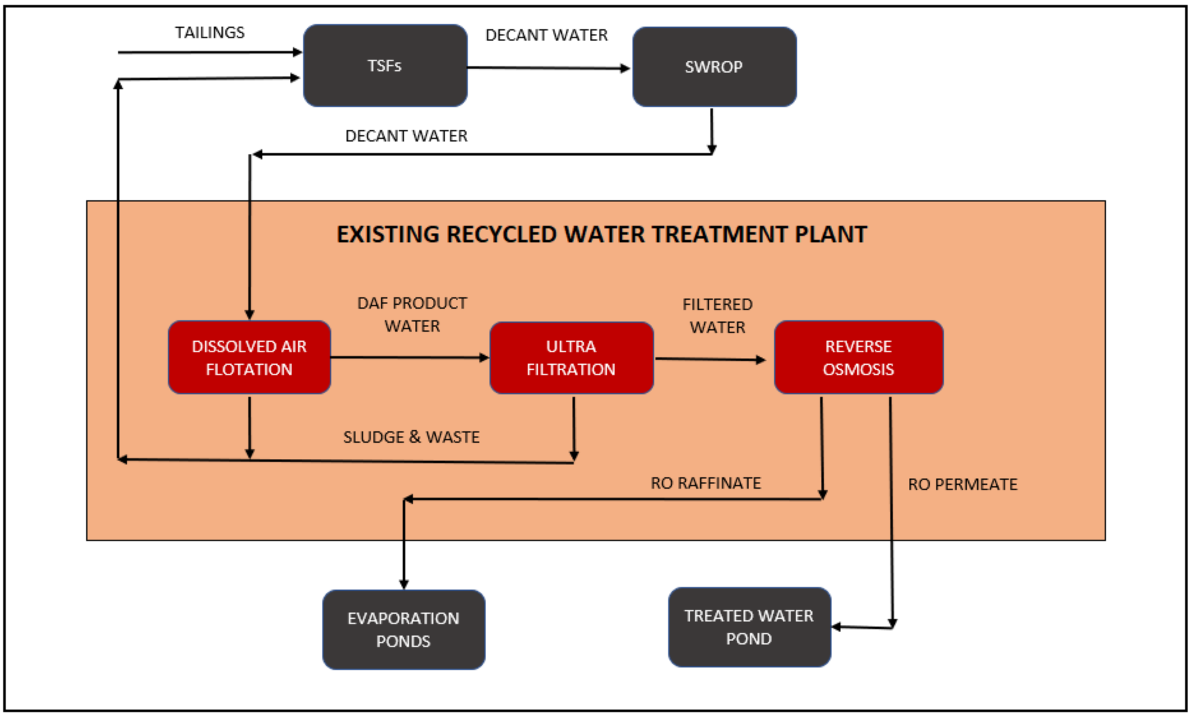


Figure 9-9: Existing Recycled Water Treatment Plant

Mt Weld are proposing to construct and commission a new RWTP to treat TSF decant water at the Mt Weld Rare Earth Project. The existing RWTP plant has overall recycling rates significantly lower than planned due to a range of factors that constrain the process. Its availability is only 53%, while the recovery of water is only 67%, producing in CY19 only 0.20 GL/ annum. Environmentally the issues that hamper the process are algal blooms, anaerobic bacteria, resin acids, silica, manganese, dissolved organic carbon, and biofouling. The UF Plant, which is comprised of three 24-foot sea container units (UF 1, 2 and 3), will be decommissioned, and demobilised from site, once the proposed new RWTP is operational.

The rationale for a new RWTP is the culmination of two years of investigations into TSF wastewater recycling using various types of plant under Works Approval W5533/2014/1, and more recently W6120/2018/1. While reductions in water usage across site have been possible, and the recycling of TSF decant water for reuse has been functional, it has also been technically challenging.

To ensure that the new RWTP plant will address the current plant's deficiencies extensive test work has been conducted at a range of different TSF decant feed water qualities, both by Mt Weld and contractors. The proposed new RWTP has the potential to halve aquifer abstraction rates to 0.6 GL /annum and reduce wastewater discharge to evaporation ponds by nearly two thirds to less than 0.3 GL / annum with minimal changes to water quality discharged (A. Cargill, pers. comm, Lynas 2020). Construction footprints for the RWTP and clearing for construction laydown were approved under MP REGID: 71255.

The key steps in the new RWTP process include chemical softening, clarification, multimedia filtration, weak acid cation exchange followed by high pH and high-pressure reverse osmosis (**Figure 9-10**) (as defined in greater detail below):

- Dissolved Air Flotation (DAF) – the existing DAF unit will continue to be utilised as a pre-treatment stage to remove suspended solids from the TSF decant water. The DAF unit will be utilised when incoming suspended solids are very high;

- Softening - caustic will be used to precipitate out metals including Ca, Mg, Si02, Mn and Fe;
- Multiflo - lamellar clarification to remove precipitates and suspended solids, which will then be pumped to the TSFs;
- Multi Media Filtration - to remove remaining suspended solids; and
- Weak Acid Cation Exchange – to remove all remaining hardness prior to the reverse osmosis stage.

Following weak acid cation exchange the water will be directed to the existing Reverse Osmosis (RO) Plant. A new Surge Pond is also proposed (refer to **Section 9.7.12**) to handle surge flows generated during RWTP backwashes. Water recovered from the Surge Pond will be sent to the TSFs.

Lynas anticipate that the upgrade to the RWTP will produce reverse osmosis quality water suitable for reuse in the Mt Weld Concentrator Plant.

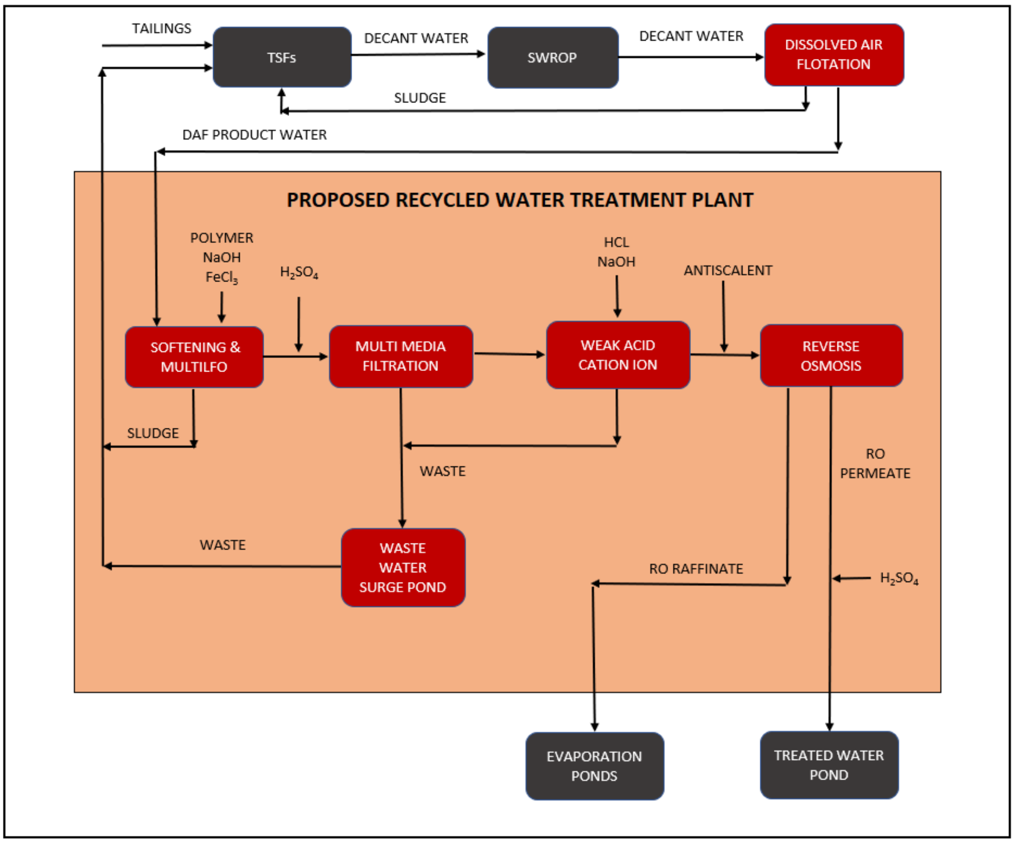


Figure 9-10: Proposed Recycled Water Treatment Plant

9.5.22 Reverse Osmosis Plant

9.5.22.1 Knowledge Base

Raw water for processing is drawn from the Mt Weld Project Borefield and open pit dewatering bores. Groundwater is taken from a 450 mm pipeline and stored in the Raw Water Storage Tank prior to treatment by reverse osmosis to remove undesirable salts.

The Mt Weld RO Plant is a high pH / high pressure unit which keeps the silica and organics in solution and enables very high recoveries in the range of 90-92%.

The treated water is required for slurrying ore, steam dilution, pump gland seal water, reagent preparation and any wash down services up to and within the flotation circuit. The RO Plant modules were upgraded in 2018. The upgrade did not prove successful, and new larger pumps are considered to be the preferred method of meeting RO water demands (A. Cargill, pers. comm, Lynas 2020).

The raffinate (brine) generated as a by-product of the RO process is used in the ETD process with excess directed to the EP. The clean water is stored in the Treated Water Pond.

9.5.23 Sea Container Laydown Yard

9.5.23.1 Knowledge Base

The Sea Container Laydown Yard, located to the North of the Concentrator Plant, is the area where the concentrate is loaded into sea containers prior to being loaded onto trucks to be transported from site. Empty sea containers are also stored here ready for use.

9.5.24 Septic Tank and Leach Drain System

9.5.24.1 Knowledge Base

Sewage generated on site is treated by a septic tank and leach drain system. Sewage is currently treated by a package treatment system, with the wastewater directed to underground leach drains. Lynas propose to expand the sewage system in 2021, to accommodate up to 130 personnel during peak construction activities. The existing four leach drains behind administration and mining offices will be decommissioned and replaced by up to 17 leach drains within a 1,000 m^2 area west of the Plant Run Off Pond.

9.5.25 Steam Generation Plant

9.5.25.1 Knowledge Base

The steam generator plant is located next to the power plant with a capacity of 8 tph, required for processing and running at approximately 7.4 tph.

9.5.26 Tailings, Supernatant and Raffinate Pipelines

Tailings are pumped from the flotation circuit to the TSF cells via two parallel HDPE pipelines. The tailings deposition ring main consists of two HDPE pipelines at TSF 1, TSF 2, and TSF 3 at the main access ramp (Coffey 2020). This pipework is either contained in a bunded corridor, including a tailings spill sump, or is located on areas that drain into the TSF so that any leakage or accidental spillage is contained.

The pipeline to transfer the supernatant from the RWP to the RWTP is located within the same bund as the discharge line. The pipeline to transfer the supernatant from the RWP to the EPs is also located within an earthen bund; this pipeline has been fitted with a flowmeter (to allow the record of discharge amounts) and isolation valves, to allow isolation of the line in the event of a failure or maintenance requirements.

The raffinate pipeline runs from the RO plant to the EP, in the same bund as the TSF deposition lines.

9.5.27 Workshop and Maintenance Shed

9.5.27.1 Knowledge Base

The Workshop and Maintenance Shed are located to the south of the Administration Offices and are used to store received goods, fabrication for plant maintenance and vehicle maintenance. Lynas propose to expand this area to the west to include a larger workshop and warehouse, after completing the upgrade to the RWTP. Approval for this was previously granted under the TSF 3 MP REGID 71255.

9.5.28 Closure Strategy for the Industrial Infrastructure Knowledge Gaps and Associated Risks

A summary of the knowledge gaps and closure implementation tasks identified for the Industrial Infrastructure features affiliated with the Mt Weld Project are presented below (**Table 9-14**). All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

Table 9-14: Industrial Infrastructure - Knowledge Gaps and Implementation Tasks

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
Industrial Infrastructure	30.02	Extent of dust generated from drying and bagging of concentrate	• Inappropriate closure planning; • Inappropriate closure provision; and • Human or environmental exposure to radioactive material	• Radiation monitoring as per requirements of RMP.	Ongoing as per RMP	Safety Department	• develop a detailed decommissioning demolition plan with scheduled removal of related infrastructure including the plant, septic tank infrastructure, pipelines, concrete pads and bunding • remove plant infrastructure including crushing, milling and flotation circuits, as detailed in the demolition and decommissioning plan; • remove all infrastructure including concrete pads, laboratory equipment, bunding, tanks and buildings; • remove all rubbish and place within the landfill; • cap landfill with a minimum of 2 m inert waste rock; • all pipelines and pumps flushed and removed from site; • remove tailings pipeline infrastructure; • ensure septic tanks are safely buried and remove infrastructure (pipelines to septic) from site; • remove of all soils contaminated by saline water or hydrocarbons; • remove all potentially contaminated soils (radiation) and dispose of in one of the TSFs or encapsulate in WRL; • remove all potentially contaminated soils (hydrocarbons) and place in the bioremediation facility; • apply a 1 m cover of suitable material to the area to blanket radiation where applicable; • re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and • apply local provenance seed.	At closure	Mine Closure Team
		Level of radioactive dust in surrounding areas							
		Length of time that concentrate is left in bags in the Concentrate Handling and Storage Area							
		Vertical and lateral extent of hydrocarbon and/or processing chemical contamination to underlying soils.	• Potential risk posed to ecological receptors via uptake of potential contaminants in soil/surface water / groundwater (vegetation used for rehabilitation) limiting rehabilitation success, and potential migration of contaminants to groundwater and surrounding vegetation. • Inappropriate closure planning • Inappropriate closure provision	• Site audit for potentially contaminated sites	At time of incident/ contamination	Environment Department			
				• Continue to maintain / update the contaminated soils inventory and prepare a sampling and analysis plan and remediate areas where required. • Review all previously recorded potential contaminations and treatments to ensure compliance with the *Contaminated Sites Act 2003* • Review groundwater monitoring to include potential sources of contamination from hydrocarbons and from sewage;	At time of incident/ contamination	Environment Department			
				• Develop both a sub-regional groundwater flow model and a surface water hydraulic model. These models would encompass the entire operational footprint of Mt Weld's current and future operations, both on-land and in-lake.	2020-2026	Environment Department			
		Whether any infrastructure is required by a third party	• Inappropriate closure planning • Inappropriate closure provision	• Stakeholder consultation with underlying land holders • Ascertain infrastructure to be retained or removed in accordance with agreed post mining land use • Determine the requirements for transferring responsibility to a third party; • Seek approval, if required, from the Pastoral Lands Board (PLB) for retention of infrastructure; and • Develop an asset transfer agreement prior to closure.	3 years prior to closure	Corporate			

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
		Lack of a comprehensive inventory on the type and quantity of metals on site.	The potential cost savings on scrap credit are not captured.	• Develop an inventory on type and quantity of metals on site to more accurately assess potential cost savings on scrap credit (built into the tendering document).	3 years prior to closure	Environment Department			
		Closure strategy for landfill facility.	Inappropriate closure planning Inappropriate closure provision	• Determine timeframe for rehabilitation and closure of the current landfill facility; and • identify an appropriate landfill facility to enable placement of rubbish during decommissioning.	2020 - 2023 3 year prior to closure	Environment Department			

9.6 Mining Infrastructure Domain

9.6.1 Overview

The Mining Infrastructure Domain for the Mt Weld Project encompasses a single feature, the Open Pit, depicted in **Figure 9-11**.

9.6.2 Mining Infrastructure Objectives and Completion Criteria

The key objectives for closure of the Mining Infrastructure Domain features are:

- inadvertent public access to open pits will be prevented as far as is practicable; and
- surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.

The relevance of the Project's closure objectives and completion criteria to the Mining Infrastructure features is presented in **Table 9-15**.

Table 9-15: Application of the Closure Objectives and Completion Criteria to the Mining Infrastructure Domain

Legend	
✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Mt Weld Open Pit
1.1 All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	✓
1.3 Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Surface drainage to downstream environments is retained or reinstated where possible.	✓
	Surface water diversion structures to remain post closure are constructed in accordance with approved engineered designs.	
1.4 Contained surface water chemistry to reflect agreed post closure water chemistry as much as practicable.	Contained surface water chemistry not to exceed agreed levels	✓
1.5 Groundwater levels to reflect agreed post-closure levels as much as practicable.	Groundwater standing water levels not to exceed agreed levels.	✓
1.6 The Mt Weld Project is compliant with the requirements of the CS Act 2003 in order to achieve relinquishment.	Areas classified as 'possibly contaminated - investigation required' under the CS Act 2003, which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register. A Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.	✓
	where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.	✓
2.1 Radiation levels contained within surface soils, groundwater and air-borne particles around rehabilitated areas will be as close to the natural background as practicable.	Post mining radiation levels will be compatible with agreed post mining land uses.	✓
	Radioactivity will not be transferred to the groundwater aquifer or exposed to the air from Naturally Occurring Radioactive Material (NORM) in the pit footwall	✓
	Annual radiation dose to members of the public does not exceed 1 mS/yr	✓
4.1 Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	✓
5.1 Inadvertent public access to open pits will be prevented as far as is practicable.	Abandonment bunds are constructed around all open pits that exceed 5 m in depth, in accordance with current guidance.	✓

9.6.3 Mt Weld Open Pit

9.6.3.1 Knowledge base

The current approved area of the open pit, including the abandonment bund, comprises 24.82 ha. The extent of the proposed open pit, including the abandonment bund is 52.40 ha. The current open pit extends to a depth of 65 m, the proposed open pit will be developed to a depth of 86 m.

The open pit is required to be dewatered to facilitate mining below the water table.

An indicative location for the Stage 4 abandonment bund has been developed based on the proposed open pit extent (**Figure 9-11**).

9.6.4 Closure Strategy for the Mining Infrastructure – Mt Weld Open Pit Knowledge Gaps and Associated Risks

A summary of the knowledge gaps and closure implementation tasks identified for the Mining Infrastructure feature at Mt Weld are presented below (**Table 9-16**). All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

Mt Weld's strategy for closure and abandonment of the open pit is based on the 1995 Mines Safety and Inspection Regulations of WA and the Department of Industry and Resources Guideline (1997) 'Safety Bund Walls around Open Pits'. The strategy is targeted at minimising the risk of inadvertent (vehicular) public access into any of the abandoned open pits through signage and the construction of a suitable barrier or abandonment bund wall around the perimeter of the abandoned open pit void.

Subsequently for this stage of closure planning, completion of mining at the Mt Weld will leave a final void, to remain in perpetuity. In the future, there may be potential to further mine the Mt Weld Project resource beyond the currently approved open pit area. It is therefore proposed to leave the open pit as a final void, making it safe and allowing it to partially fill with groundwater.

The associated cone of groundwater depression related to dewatering of the open pit will remain as an influence on groundwater for many years after mining ceases. To understand the site hydrogeological systems, post closure and the long-term equilibrium water levels in the mining void, a post closure pit lake modelling assessment is required to better understand the likely function of the pit lake and associated risks.

The requirement for and possible depth of a cover over the floor of the open pit at closure to reduce the levels of radionuclides within the water table and possible radiation exposure has been identified as a knowledge gap.

To date, no discussion has taken place with the pastoralist or Gold Fields Granny Smith regarding whether the open pit should be fenced to exclude stock from the pit lake. Mt Weld will undertake this consultation within five years of closure of the mine.

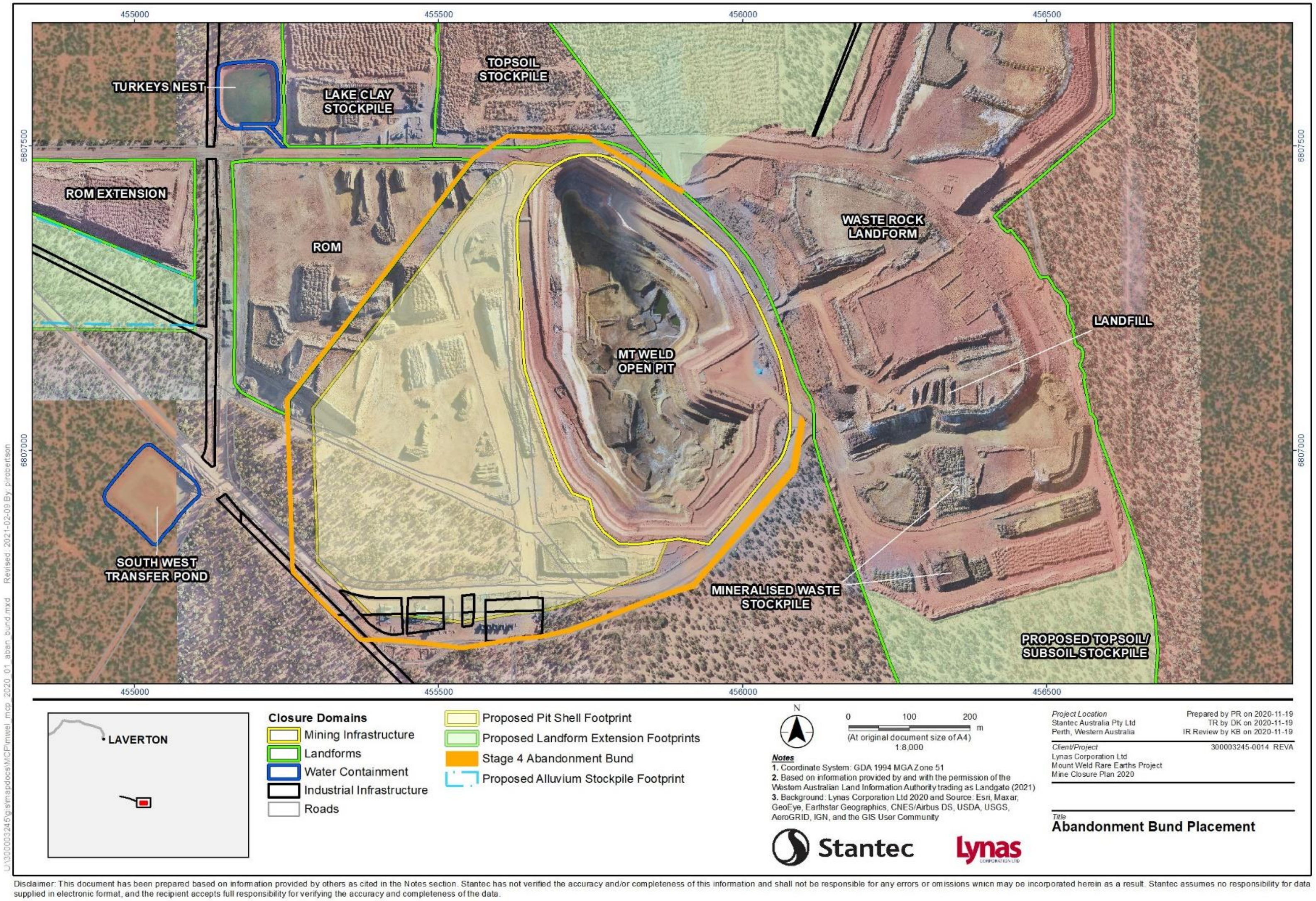


Figure 9-11: Indicative Abandonment Bund Location

Table 9-16: Mining Infrastructure –Mt Weld Open Pit - Knowledge Gaps and Implementation Tasks

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Premature Closure/ Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
Mt Weld Open Pit	52.40	The rate of return of groundwater back into the open pits.	Limited understanding of the cumulative effect of pit dewatering effects and water quality.	• Hydrogeological study modelling post closure pit lake formation	2020-2026	Environment Department	• apply ~ 1 m layer of oxide material to the floor of the open pit to minimise the levels of radiation exposure; • establish fencing, lockable gates, signage and/or alternative bunding where required; • block access to open pit ramp; and • establish abandonment bunding as per DMIRS guidelines	Decommissioning Phase	Mine Closure Team
		Final hydrogeological function of pit lake	Limited understanding of the: • movement of potential contaminants into groundwater; and • concentration of contaminants in the pit lake						
		Predicted post closure pit lake water level	Hazardous materials (potentially located in foot wall or mineralised waste backfill) inadequately covered by pit lake rebound.						
		Predicted post closure pit lake water quality	• potential risk posed to ecological receptors • altered groundwater quality	• Incorporate all monitoring and production bore water quality data into the groundwater flow model, in order to predict the water quality trends, post closure in the open pit.		Environment Department			
		Required depth of capping layer to be applied to the open pit floor	Release of hazardous substances (radiation and, geochemical) into the pit lake	• Sampling, analyses and modelling of geochemical and radioactive properties within the open pit footwall. • Analysis of propensity of hazardous substances to transfer to pit lake and required mitigation techniques (e.g., capping within benign waste).	2020-2026	Environment Department and Mining Team			
		Requirement for post closure management of the pit lake	• inappropriate closure planning • inappropriate closure provision associated with long term management of the pit lake and maintenance of the fence.						
		Requirement for fencing of the open pit post closure to prevent stock access		Stakeholder consultation with underlying pastoral lease holder regarding fencing of the open pit post closure	2020-2026	Environment Department			
		Source of competent abandonment material if required.	inappropriate closure provision associated with haulage of material from Granny Smith, distance will be dependent on available sources of material.	Stakeholder consultation with GSGM regarding availability of material.	2020-2026	Environment Department			

9.7 Water Containment Infrastructure Domain

9.7.1 Overview

The Water Containment Infrastructure Domain for the Mt Weld Project is comprised of the following eleven features listed in **Table 9-17.**

Table 9-17: Water Containment Features

Domain	Feature
Water Containment Infrastructure	Evaporation Pond
	Flood Control Bund
	Northern Cut-off Drain
	Plant Run-off Pond (proposed expansion)
	Raw Water Storage Tank
	Return Water Pond
	Southwest Transfer Pond
	Stormwater Diversion Channel
	Surge Pond
	Treated Water Pond
	Turkey's Nest

9.7.2 Water Containment Infrastructure Objectives and Completion Criteria

The overarching objectives for all water containment features are:

- The Mt Weld Project is compliant with the requirements of the *CS Act 2003* in order to achieve relinquishment;
- Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function;
- Contained surface water chemistry to reflect agreed post closure water chemistry as much as practicable; and
- Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.

The relevance of the Project's closure objectives and completion criteria to the Water Containment Infrastructure features is presented in **Table 9-18**.

Table 9-18: Application of the Closure Objectives and Completion Criteria to the Water Containment Infrastructure Domain

Legend

✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Water Diversion Infrastructure	Water Storage Infrastructure	Tailings Water infrastructure
1.1 All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	✓	✓	✓
1.2 To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characterisation, site conditions and the constraints of the post-mining environment.	✓	✓	✓
	As-constructed reports and rehabilitation records are available for review.	✓	✓	✓
1.4 Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Surface drainage to downstream environments is retained or reinstated where possible.	✓	✓	✓
	No obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas.	✓	✓	✓
	surface water diversion structures to remain post closure are constructed in accordance with approved engineered designs.	✓	✓	✓
1.5 Contained surface water chemistry to reflect agreed post closure water chemistry as much as practicable.	Contained surface water chemistry not to exceed agreed levels	✓	✓	✓
1.6 Groundwater levels to reflect agreed post-closure levels as much as practicable.	Groundwater standing water levels not to exceed agreed levels.	✓	✓	✓
1.6 The Mt Weld Project is compliant with the requirements of the CS Act 2003 in order to achieve relinquishment.	Areas classified as 'possibly contaminated - investigation required' under the CS Act 2003, which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register. A Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.	✓	✓	✓
	where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.	✓	✓	✓
2.1 Radiation levels contained within surface soils, groundwater and air-borne particles around rehabilitated areas will be as close to the natural background as practicable.	Post mining radiation levels will be compatible with agreed post mining land uses.	✓	✓	✓
	Annual radiation dose to members of the public does not exceed 1 mS/yr	✓	✓	✓
3.3 Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	✓	✓	✓
3.5 Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	Vegetation is comprised of local provenance species.	✓	✓	✓
	Vegetation cover values are similar to that of the target analogue.	✓	✓	✓
	Revegetation demonstrates viability through propagule development and seedling recruitment.	✓	✓	✓
3.6 Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	Weed (introduced) species do not dominate any rehabilitated area.	✓	✓	✓
	Appropriate management techniques (specific to the weed species) are implemented.	✓	✓	✓
	Weed abundance is not above that of relevant analogues.	✓	✓	✓
3.7 The final landscape will have the ability to withstand post mining land use pressures.	Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates.	✓	✓	✓

Objective	Completion Criteria	Water Diversion Infrastructure	Water Storage Infrastructure	Tailings Water infrastructure
	Revegetation demonstrates sustainability through propagule development and seedling recruitment.	✓	✓	✓
3.8 Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	✓	✓	✓
4.1 Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	✓	✓	✓
4.2 Infrastructure will be retained or removed in accordance with agreed post mining land use in consultation with relevant key stakeholders and with approval granted where required.	Retained infrastructure will be left in a safe condition and transferred via an appropriate asset transfer agreement to a legally responsible entity.	✓	✓	✓
	Infrastructure and equipment that is not to be retained will be removed to allow rehabilitation to the approved post mining land use of the area.	✓	✓	✓
	Liabilities of any infrastructure to be retained are defined, and approved by relevant key stakeholders, prior to any asset transfer taking place.	✓	✓	✓

Legend

✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

9.7.3 Evaporation Ponds

9.7.3.1 Knowledge Base

The EPs are located adjacent to the southern side of TSF 1 and include a shared embankment with Cell C (TSF 1). The EPs were constructed in two stages: Stage 1 comprises five cells; Stage 2 comprises three cells. The total disturbance footprint of the EPs is 46.54 ha. The EP perimeter embankments have a 6 m wide crest at a height of 1.2 m and embankment batter slopes at 1V:3H, both upstream and downstream.

The Stage 1 EPs (Cells 1 to 5) are clay lined, with an average permeability of 5.33 x 10^{-9} m/s. The Stage 2 EPs (Cells 6 to 8) were constructed with a 400 mm deep soil liner comprising compacted in situ colluvium and lacustrine clay, with a 200 mm deep layer of colluvial sand above soil liner, equating to a permeability of less than1 x 10^{-8} m/s.

The maximum operating water depth in each cell of the evaporation pond is 800 mm. Each pond cell has been designed with a total freeboard of 300 mm to the embankment crest including 200 mm depth below the spillway/ weir invert to transfer storm water between cells from a 1 in 100-year reoccurrence interval, 72-hour storm event. Operating at recommended levels will increase storm water storage capacity in each pond (Lynas 2014 b).

Evaporation performance monitoring includes monitoring of water input from plant – volume, TDS and other parameters on a continuous basis.

The EPs are licenced to receive a combination of RO Reject (Raffinate) water and unclarified tailings supernatant, if required as a contingency and in accordance with Licence L8141/2007/2. Occasions where it may be necessary to dispose of supernatant from the TSF without treatment and re-use may occur as a result of severe rain events or due to maintenance or mechanical failures to the ultrafiltration or RO units.

The EPs were inspected during a site visit by Coffey in 2020 and the following observations were recorded (Coffey 2020):

- The outer slopes were significantly drier than the previous year due to receding water levels. However, these will probably wet up again once the levels within the EP return to higher levels. The permeability of the embankments is not low enough to prevent lateral seepage. This is consistent with historical issues and observations on daily inspection reports.
- The inside crest was being eroded by wave and wind action; however, it is now more exposed than in the previous audit inspection. Repair work was completed in a short section on the western side, but additional repair work was required. It is understood that Lynas plans to repair the upstream faces to mitigate future erosion.

9.7.4 Flood Control Bund

9.7.4.1 Knowledge Base

The Flood Control Bund, located to the east of the site, provides the primary flood protection as it diverts the sheet flow from the upstream catchment (originating in the east), around the Project to the southern area of the lease. A road built on top of the Flood Control Bund is utilised as access for inspections.

The Flood Control Bund is designed to hold a 1 in 10-year rainfall event within the channel, while the 1 in 100-year event would spill out of the channel; a bund located on the downstream side of the channel is designed to contain a 1:100-year event. The Flood Control Bund is wider near the outflow to reduce the depth and velocity of the flow exiting the channel. The outflow incorporates coarse, scour resistant materials to dissipate energy from the flowing water released to the natural watercourse. The southern outflow area has been excavated to establish a 5 m deep sump, that contains three water infiltration bores as part of the Managed Aquifer Recharge (MAR) system outlined in **Section 9.8.7** (Lynas 2020d).

Key attributes of the Flood Control Bund (Golders, 2008) are:

- Length approximately - 2,050 m
- Side slopes - 1V:2H
- Bed width – 10 m
- Minimum channel slope – 0.1 percent
- Channel depth - 1 m below ground level
- Bund height – 1 m above ground level

- Crest width – 4 m

It has been estimated that up to 407,000 kL/ annum of streamflow flows through the Flood Control Bund each year. It was designed to be capable of conveying 95 m^2/sec (or 100-year ARI peak discharge). However, at these levels the freeboard is reported to be less than 200 mm. In the event of a 100-year ARI event the MAR sump will fill up with excess water flowing southwest to re-join the natural sheet flow drainage pattern.

Delineated catchments that report directly to the Flood Control Bund total about 90 km^2 (**Figure 5-9**). The Flood Control Bund is located up-gradient at the discharge of catchments 2, 3 and 4. An additional 408,000 kL/annum flows through Catchment 1 and past the northern areas of the Mt Weld Aquifer (Lynas 2020b).

The Flood Control Bund, which has previously been referred to as the Eastern Diversion Channel (EDC), is a component of the MAR.

9.7.5 Intermediate Process Water Pond

9.7.5.1 Knowledge Base

The construction of an Intermediate Process Water Pond to reduce the suspended solids and soluble salt content of process water to be recycled through the concentrator plant was proposed in the 2017 MCP. It was anticipated that this would reduce the demand for water from the production bores. This feature has not been developed and hence has not been accounted for as a feature in this MCP, Lynas may choose to develop it at a later stage.

Water recycling has now been optimised with progression of the proposed upgrade to the RWTP, as a result, the proposed Intermediate Process Water Pond is not currently required. The proposed Surge Pond (**Section 9.7.12**), has been designed to accommodate back wash from the filtration membrane cleaning process.

9.7.6 Northern Cut-off Drain

9.7.6.1 Knowledge Base

The Northern Cut-off Drain is a small drain, located north of the access road, which runs parallel along the northern edge of an old pastoral station road to divert water away from the mining area. This prevents sheet flow originating north of the cut-off drain from moving south. Water in the drain re-joins natural sheet flow at the western end of this drain, west of the plant site, and flows westward.

9.7.7 Plant Run-off Pond

9.7.7.1 Knowledge Base

The Plant Run off Pond is located immediately west of the concentrator plant and associated infrastructure. It has been designed to capture rainfall and run off from the plant site to prevent flooding of the area. The Plant Run-off Pond consists of four inflow channels (three along the eastern boundary and one along the northern boundary) and a spillway outlet at the south-western corner of the pond. The catchment area reporting to the Run-off Pond is estimated as 18.8 ha (Hatch 2016).

The Plant Run off Pond acts as a sediment sump for surface water drainage from around the Concentrator Plant and other areas potentially containing contaminants (e.g., from the reagent storage area, power plant, fuel storage, vehicle loading bays or workshops), the drainage is directed via the four inflow channels into the pond and allowed to evaporate after minor rainfalls. To date the sediment has not been cleaned out.

The Plant Run-off Pond is unlined; however, it has a compacted earthen basis, and is essentially a bund covering 1.40 ha. The current capacity of the Plant Run-off Pond, up to the spillway invert, is 23,400 ML. Hatch (2016) calculated that the Plant Run-off Pond is unable to contain the runoff associated with a 1 in 100 AEP, 72-hour duration storm of 29.2 ML, which corresponds to a rainfall intensity of 2.4 mm/hour or total depth of 172.8 mm.

The construction of the Plant Run off Pond and the Intermediate Process Water Pond (see **Section 9.7.5**) was previously approved under MP REG ID: 43620. However, the Plant Run-off Pond will be deepened by 1.5 m as part of this proposal to increase the storage capacity to at least 33,000 m^3, enabling it to accommodate all site run off from a 1:100 72-hour AEP event without release to the environment. Lynas propose to encapsulate any sediment and additional material that is excavated, when the Plant Run off Pond is deepened, within the WRL (A. Cargill, pers. comm, Lynas 2020).

The design parameters for the Plant Run off Pond and the Surge Pond are presented in **Table 9-19**. A dividing wall (that runs east-west) will be constructed within the current footprint of the Plant Run off Pond to create the Surge Pond (described in **Section 9.7.12**).

Table 9-19: Design Parameters

Parameter	Plant Run off Pond	Surge Pond
Volume (m3)	33,000	4,000
Area (ha)	2.9	0.4
Depth (m below ground level)	3.4	3.4
Liner	Natural earthen	HDPE

9.7.8 Raw Water Storage Tank

9.7.8.1 Knowledge Base

The raw water required for the process is drawn from the Mt Weld Project Borefield and Dewatering Bores around the open pit. Groundwater is taken from the existing 450 mm pipeline and stored in the Raw Water Storage Tank prior to treated by reverse osmosis then stored in the Treated Water Pond prior to use in the process circuit.

The Raw Water Storage Tank is located immediately adjacent to the Power Plant and Concentration Plant.

9.7.9 Return Water Pond

9.7.9.1 Knowledge Base

A HDPE lined RWP was included in the design and construction of TSF 2 to maximize the abstraction of supernatant liquor and enhance solar drying. The TSF water balance considered TSF 1 and TSF 2 as a combined facility, with a key output being the sizing of the RWP (KASA 2014). The TSF 3 design report included utilisation of the RWP for supernatant water from TSF 3 in addition to TSF 1 and 2.

The RWP is a key element to safety of TSF 2 and is sized to allow for storage of the rainfall collected from a 1:100, 24-hour event over the catchment of TSF 1 and TSF 2 (KASA 2014). The sizing of the RWP was not increased subsequent to construction of TSF 3, instead, a water balance model was adopted by Lynas to maintain licence freeboard and 1:100 storage capacity in addition to licence freeboard (A. Cargill, pers. comm, Lynas 2020).

Water collected in the RWP will be directed to the RWTP for treatment and re-used in the process plant. Total consumption capacity exceeds the peak draw-down requirement from these exceptional scenarios; therefore, the Mt Weld Project water containment infrastructure is considered to be capable of accommodating rainfall in excess of the 1:100, 24-hour event.

The 2019 audit noted that the RWP was approximately one-third full at the time of inspection. The pond appeared to be well maintained and included an HDPE liner inside the impoundment, rescue equipment (doughnut ring with rope), egress mats and a pumping station (Coffey 2020).

9.7.10 Southwest Transfer Pond

9.7.10.1 Knowledge Base

The Southwest Transfer Pond captures water run-off from the ROM Pad. No wastewater is released off-site. The Southwest Transfer Pond has a disturbance footprint of 1.72 ha. Any sediment at the base of the facility upon closure will be stripped and encapsulated within one of the TSFs.

9.7.11 Stormwater Diversion Channel

9.7.11.1 Knowledge Base

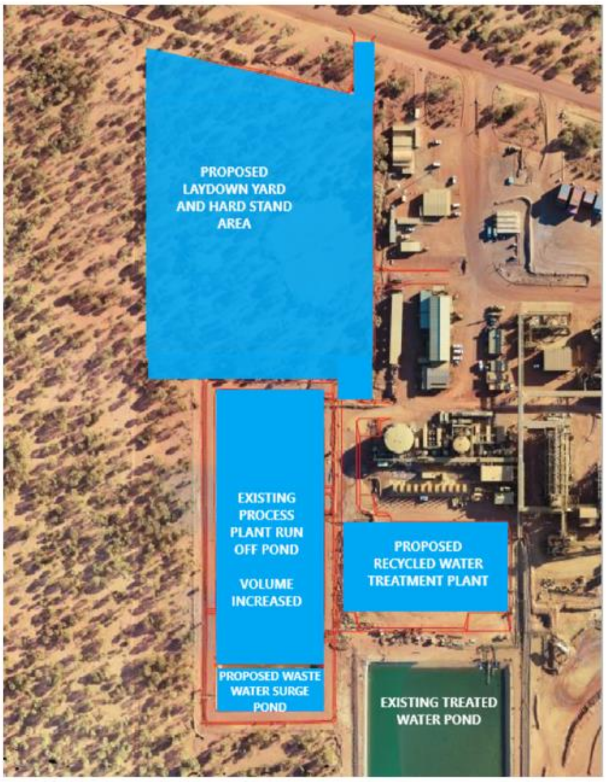
A Stormwater Diversion Channel has been established to the east of the plant area, TSFs and EPs, and provides the primary flood protection for these facilities. This channel also enables clean run-off to re-join the natural drainage system to the southern side of the protected facilities. The water is discharged to re-establish sheet flow characteristics rather than forming a channel.

The Stormwater Diversion Channel consists of a trapezoidal open channel cut into the existing ground surface predominantly perpendicular to the slope of the ground which reduces the potential for erosion at the base of the channel and also allows the channels to release water at a low velocity over a broad area similar to the natural diffuse surface water flows (Lynas 2020d).

9.7.12 Surge Pond

A Surge Pond will be constructed within the existing Plant Run off Pond footprint with a dividing wall that runs east-west to separate the two features (**Figure 9-12**).

The Surge Pond (0.4 ha) is designed to handle surge flows generated during back wash from the filtration membrane cleaning process in the RWTP. The deisgn incporates the ability to recover water from the Surge Pond and send it to the TSFs. The Surge Pond will lined with HDPE, the dividing wall will seprate the waste water from the stormwater runoff,



- *Figure 2: General Site Layout*

Figure 9-12: Location of the proposed Surge Pond

9.7.13 Treated Water Pond

9.7.13.1 Knowledge Base

The treated water pond is a HDPE lined water containment facility located south of the power plant and immediately east of the plant run-off pond.

The treated water pond stores the water for processing once it has been treated by the RO Plant to remove undesirable salts.

9.7.14 Turkey's Nest

9.7.14.1 Knowledge Base

Mt Weld utilise the Turkey's Nest to store water for dust suppression, with water sourced from the open pit dewatering bores. A standpipe is located at the Turkey's Nest for this purpose.

The Turkey's Nest also captures water run-off from the ROM Pad. No wastewater is released off-site. The Turkey's Nest has a disturbance footprint of 1.50 ha. Any sediment at the base of the facility upon closure will be stripped and encapsulated within one of the TSFs.

9.7.15 Closure Strategy for the Water Containment Infrastructure Knowledge Gaps and Associated Risks

A summary of the knowledge gaps and closure implementation tasks identified for the Water Containment Infrastructure features at the Mt Weld Project are presented below (**Table 9-20**). All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

Table 9-20: Water Containment Infrastructure - Knowledge Gaps and Implementation Tasks

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
Water Containment infrastructure	80.38	Quality of the water within the water containment facilities at closure	• Inappropriate closure planning • Inappropriate closure provision.	• Monitoring of sediments in the RWP post closure • Stakeholder consultation	3 years prior to closure	Environment Department Corporate	• determine water quality contained with water containment facilities and dispose of appropriately or allow to evaporate; • remove any liners and dispose of in one of the TSFs or WRL as appropriate; • bury any contaminated material in the base of the facilities; • remove all infrastructure; • all pipelines and pumps flushed and removed from site; • appropriately dispose of or utilise the embankment material; • install a 1 m oxide store and release cover over the facilities; • appropriately armour any structures to remain post-closure (i.e. Flood Control Bund and / or Stormwater Diversion Channel) with competent waste rock material; • re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and • apply local provenance seed.	At Closure	Mine Closure Team
		If current surface water management structures have been designed to remain post closure.	• Inappropriate closure provision. • Inappropriate closure planning	• Site wide surface water management plan with consideration to PMF. • Audit of existing water management structures to determine construction specifications. • Update MCP to include additional armouring of permanent diversion features as required.	2020-2023	Environment Department			
		Will any water containment infrastructure be required by the pastoralist post closure	• Inappropriate closure provision. • Inappropriate closure planning.	• Stakeholder consultation • Formal transfer of infrastructure in consultation with DPLH, Pastoral Land Board.	3 years prior to closure	Corporate			

9.8 Groundwater Infrastructure Domain

9.8.1 Overview

The Groundwater Infrastructure Domain for the Mt Weld Project contains the following five features, as listed in **Table 9-21**.

Table 9-21: Groundwater Infrastructure Features

Domain	Feature
Groundwater Infrastructure	Dewatering Bores
	Monitoring Bores
	Production Bores
	Borefield pipeline
	Managed Aquifer Recharge

9.8.2 Groundwater Infrastructure Objectives and Completion Criteria

The key objectives for closure of the Groundwater infrastructure Domain features are:

- The Mt Weld Project is compliant with the requirements of the *CS Act 2003* in order to achieve relinquishment;
- Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function; and
- Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.

The relevance of the Project's closure objectives and completion criteria to the Groundwater Infrastructure features is presented in **Table 9-22.**

Table 9-22: Application of the Closure Objectives and Completion Criteria to the Groundwater Infrastructure Domain

Legend	
✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Borefield Infrastructure	Monitoring Bores	Managed Aquifer Recharge
1.1 All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	✓	✓	✓
1.2 To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characterisation, site conditions and the constraints of the post-mining environment.	✓	✓	✓
	As-constructed reports and rehabilitation records are available for review.	✓	✓	✓
1.3 Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Surface drainage to downstream environments is retained or reinstated where possible.	✓	✓	✓
	No obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas.	✓	✓	✓
	surface water diversion structures to remain post closure are constructed in accordance with approved engineered designs.	×	×	✓
1.4 Contained surface water chemistry to reflect agreed post closure water chemistry as much as practicable.	Contained surface water chemistry not to exceed agreed levels	×	×	✓
1.5 Groundwater levels to reflect agreed post-closure levels as much as practicable.	Groundwater standing water levels not to exceed agreed levels.	✓	✓	✓
1.6 The Mt Weld Project is compliant with the requirements of the CS Act 2003 in order to achieve relinquishment.	Areas classified as 'possibly contaminated - investigation required' under the CS Act 2003, which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register. A Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.	✓	✓	✓
3.3 Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	✓	✓	✓
3.5 Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	Vegetation is comprised of local provenance species.	✓	✓	✓
	Vegetation cover values are similar to that of the target analogue.	✓	✓	✓
	Revegetation demonstrates viability through propagule development and seedling recruitment.	✓	✓	✓
3.6 Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	Weed (introduced) species do not dominate any rehabilitated area.	✓	✓	✓
	Appropriate management techniques (specific to the weed species) are implemented.	✓	✓	✓
	Weed abundance is not above that of relevant analogues.	✓	✓	✓
3.7 The final landscape will have the ability to withstand post mining land use pressures.	Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates.	✓	✓	✓
	Revegetation demonstrates sustainability through propagule development and seedling recruitment.	✓	✓	✓
3.8 Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	✓	✓	✓
4.1 Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	✓	✓	✓

Objective	Completion Criteria	Borefield Infrastructure	Monitoring Bores	Managed Aquifer Recharge
4.2 Infrastructure will be retained or removed in accordance with agreed post mining land use in consultation with relevant key stakeholders and with approval granted where required.	Retained infrastructure will be left in a safe condition and transferred via an appropriate asset transfer agreement to a legally responsible entity.	✓	✓	✓
	Infrastructure and equipment that is not to be retained will be removed to allow rehabilitation to the approved post mining land use of the area.	✓	✓	✓
	Liabilities of any infrastructure to be retained are defined, and approved by relevant key stakeholders, prior to any asset transfer taking place.	✓	✓	✓

Legend

✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

9.8.3 Dewatering Bores

9.8.3.1 Knowledge Base

A total of twelve dewatering bores have been drilled in and around the periphery of the open cut pit over recent years, this has included (**Figure 9-13**):

- dewatering bores (LWB1 to LWB4); now decommissioned as a result of open pit development and the inability of one of the bores to produce sufficient water flows;
- dewatering bore (LWB11) operated intermittently;
- four new operating dewatering bores (LWB17, LWB22, LWB23 and LWB24); and
- three new bores (LWB25, LWB26 and LWB27, noting LWB27 did not encounter water at the bottom of the bore).

The four new bores were all commissioned by Lynas in mid-2019, LWB17 and LWB23 are currently utilised to maintain dry mining conditions. The water from these bores is pumped to the Raw Water Storage Tank for use in the Concentrator Plant, via the GSGM Borefield Pipeline (AECOM 2019). LWB22 was commissioned but produces saline water, hence it may only be utilised intermittently, LWB24 did not produce water, so is not utilised. LWB25 – 27 were drilled in late-2020 with LWB25 and LWB26 being successful as a water draw point. LWB25 is located at the bottom of the open pit and will supply water to the Mt Weld RO plant.

An amendment to the Groundwater Operating Strategy, to allow abstraction from these bores, was submitted to DWER for approval in December 2020; this included the bore construction reports (A. Cargill, pers. comm, Lynas 2020).

9.8.4 Monitoring Bores

9.8.4.1 Knowledge Base

There is a total of 16 TSF monitoring bores to monitor seepage around TSFs and the EPs, (refer to **Figure 5-12**) comprising:

- eleven monitoring bores have been installed around TSF 1 and the EP and the Bioremediation Facility to monitor the groundwater quality levels.
- a further two monitoring bores were installed adjacent to the eastern embankment of TSF 2; and
- an additional three monitoring bores were installed for TSF 3, a deep and a shallow bore east of TSF 3, and a shallow bore west of TSF 3.

Seven groundwater monitoring bores (P01, P03, P06, P11, B03, P29 and P30) are dedicated to monitoring groundwater related changes associated with open pit dewatering, in addition to four production bores which are also used for monitoring.

9.8.5 Production Bores

9.8.5.1 Knowledge Base

The Mt Weld Borefield originally comprised 13 production bores (B1 to B13) that abstracted water from the weathered carbonatite aquifer for water supply:

- eight of these production bores (B1 to B8) were commissioned in December 1989 and are all located within the western part of the carbonatite;
- five additional production bores (B9 to B13) were installed between 1994 and 1996 to enable the required rates of abstraction, as yields from the original eight bores had declined; and
- three of the bores (B6, B7 and B11) were destroyed and decommissioned by Mt Weld operations in 2007 (URS 2010). However, B11 has since been reanimated for abstraction (A. Cargill, pers. comm, Lynas 2020).

Four GSGM production water supply bores were operating in recent times: one in the western area (B9) and three in the eastern area (B10, B12 and B13) of the carbonatite aquifer. Early in 2019, the yields from production bores B10 and B12 declined or were affected by the ingress of sediment. Following down-hole video inspection, it was apparent these bores have suffered from casing failures and accumulation of mineral deposits reducing bore yields. They were decommissioned in May and June 2019 (AECOM 2020). GSGM currently utilise water supply production bores B9 and B13, within the Mt Weld borefield, under GWL 59529, (AECOM 2019).

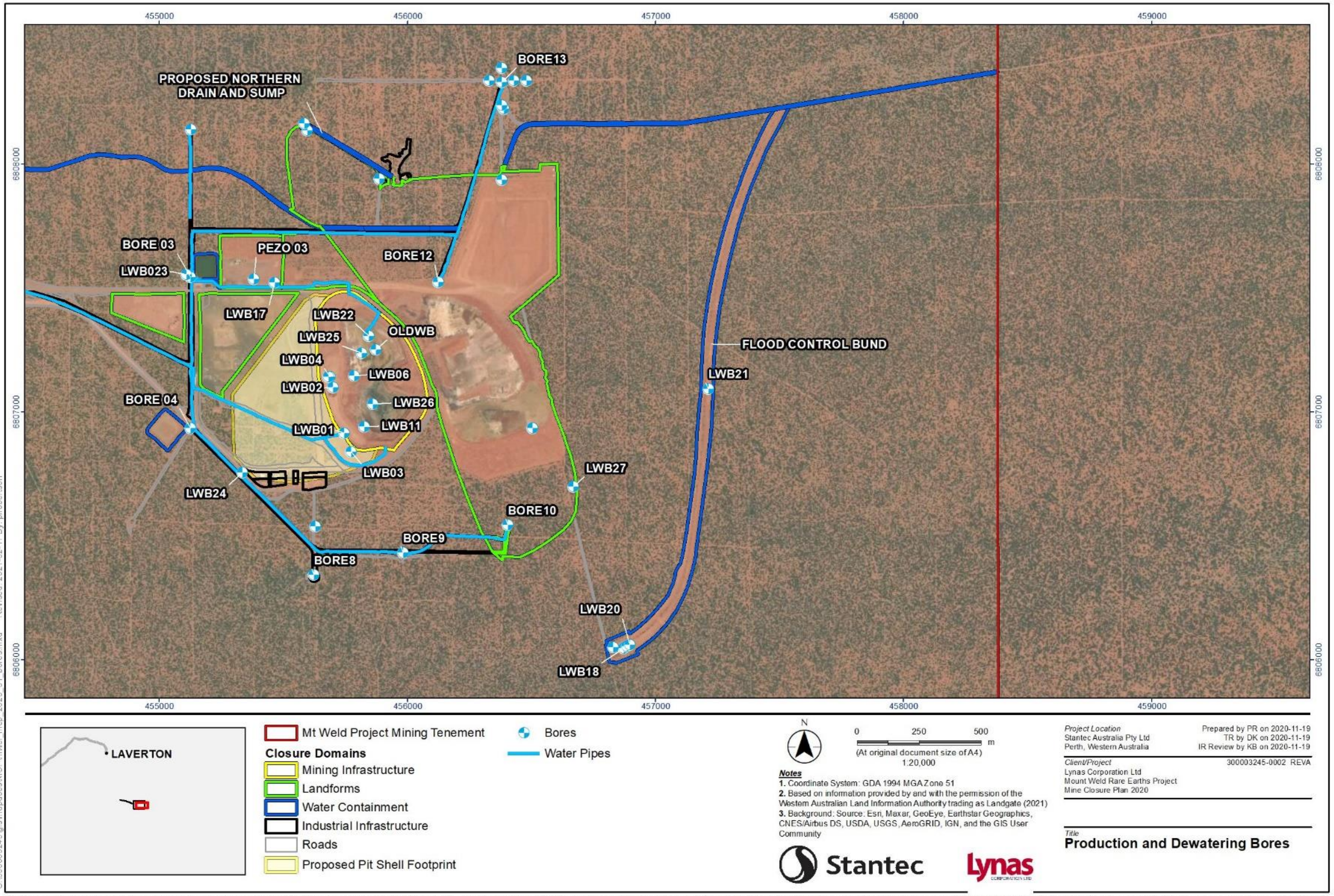


Figure 9-13: Site Production and Dewatering Bores

Two additional mine dewatering bores were completed to replace the decommissioned GSGM bores B10 and B12. The bores were drilled to provide efficient use of the water resource and complement dewatering activities rather than for a separate dedicated make-up water supply requirement (AECOM 2019). GSGM Production bores are powered by site generated reticulated power with Lynas dewatering bores powered by portable generators.

Under the current Water Agreement, GSGM are responsible for decommissioning infrastructure associated with the GSGM Borefield. Mt Weld Mining are responsible for decommissioning any infrastructure and connections made to the GSGM Borefield. GSGM B12 is sited within the footprint of the proposed expansion to the Mt Weld WRL, hence pending negotiations with GSGM, Lynas may accept responsibility for decommissioning of this bore, as it has been identified as potential asset for aquifer recharge (A. Cargill, pers. comm, Lynas 2020).

9.8.6 Borefield Pipeline

9.8.6.1 Knowledge Base

The Borefield Pipeline is 6.5 km long covering an area of 4.85 ha.

The groundwater abstracted from all the bores is pumped through the GSGM Borefield Pipeline. Water is then diverted to the Mt Weld Project Raw Water Storage Tank; the volume is recorded via a flowmeter located at an isolation connection point. The common line continues to the GSGM with a flowmeter located at their process plant to allow for reconciliation.

Mt Weld Mining is only responsible for the section of the pipe between the off take from the GSGM Borefield Pipeline to the Raw Water Storage Tank, which is approximately 200 m in length. Any connections made to the GSGM infrastructure is the responsibility of Mt Weld at closure. An overview of the infrastructure associated with the MCP tenements is presented in **Table 9-23**.

Table 9-23: Groundwater Infrastructure per Tenement

Tenement	
M 38/58	Location of concentrator plant, LWB23 and a number of monitoring bores. GSGM production bore B9, monitoring bores and pipeline infrastructure.
M 38/59	Nil
M 38/326	The dewatering bores, LWB17, 22, 24, 25and 26 are located within the boundaries of this lease. GSGM monitoring bores and pipeline infrastructure.
M 38/327	GSGM production bore B13 and pipeline infrastructure
L 38/98	Main access road and GSGM pipeline infrastructure.

9.8.7 Managed Aquifer Recharge

9.8.7.1 Knowledge Base

A total of ~2.5 GL per annum is extracted from the Mt Weld aquifer by Mt Weld and the neighbouring GSGM. Sustainable yields of 1.2 GL per annum have been estimated from groundwater assessments, consequently both companies have identified operational risks associated with the current long-term water supply from the Mt Weld Aquifer.

The unconfined superficial aquifer, which formed within the surface alluvium is now dewatered, within the cone of depression created by open pit dewatering/abstraction and provides potential water storage capacity (A. Cargill, pers. comm, Lynas 2020). The carbonatite aquifer continues to be dewatered.

In 2017, AECOM identified that there may be opportunities, as part of a long-term water supply strategy, to divert streamflow runoff towards the Mt Weld area to promote increased aquifer longevity through aquifer storage and recovery, known as the MAR. Diverting fresh rainfall runoff in this instance provides an ideal opportunity to add higher quality water to a fresh to brackish aquifer, provided nutrient levels are unchanged.

The Mt Weld aquifer characteristics promote ideal conditions for storing stormwater given the aquifer has a vast storage capacity, as a result of historical groundwater abstraction, and is located adjacent to existing infrastructure. The dyke, which acts as a semi-impermeable barrier to horizontal groundwater flow, has enabled the initial recharge to the groundwater table to be directed into the eastern side of the aquifer, with little or no impact on mine dewatering on the western side.

To minimise the environmental impact of constructing MAR infrastructure and to reduce the financial costs associated with implementation, Mt Weld initially utilised the existing Flood Control Bund (**Figure 9-14**) to intercept regional sheet flow from a 9,000-ha catchment area, the surface water migrates to the west-southwest toward Lake Carey located approximately 17 km to the west.

This MAR Project is considered a proactive initiative to extend the longevity of the aquifer whilst not impacting on ecosystems downstream of stormwater capture infrastructure. Initial development of the MAR included (AECOM 2017b):

- installation of a surface water infiltration sump to a depth of 5 m below the upper hardpan layer. The Flood Control Bund directs water into the sump via a 1:100 grade towards the sump;
- to compliment sump infiltration, three drain holes were installed through to the main carbonatite aquifer zones to increase direct infiltration. It is proposed that the drain holes be cased with 200 mm diameter steel casing (nominal) with 2 mm aperture slots; and
- during storm events when the sump fills, excess water will be allowed re-join the natural sheet flow drainage.

The dedicated infiltration sump facilitates infiltration into the alluvial sediments at the discharge from the Flood Control Bund, in an area to the east of the dolerite dyke. In addition to the above Lynas installed one rock baffle along the Flood Control Bund to help further slow runoff and encourage infiltration this was augmented by an infiltration drain hole. A total of four infiltration holes were drilled to support the eastern MAR (A. Cargill, pers. comm, Lynas 2020).

Mt Weld has identified the potential expansion to the MAR to promote the recharge of the Carbonatite Aquifer through the capture and infiltration of clean stormwater at Mt Weld into the western aspect of the dyke. A potential area has been identified on the northern toe of the Stage 4 WRL to capture sheet flow intercepted in this area. This includes construction of a drain (**Figure 9-14**) graded 1:100 with water flowing west towards an infiltration sump 5 m deep. Two new steel cased infiltration bores will be drilled to a maximum of 200 m through to the main carbonatite aquifer zone to increase direct infiltration.

Mt Weld will continue to liaise with the Water Licensing Division of DWER on this initiative and obtain all necessary approvals under the Rights in Water and Irrigation Act, 1914 to implement the proposal.

9.8.8 Closure Strategy for the Groundwater Infrastructure Knowledge Gaps and Associated Risks

A summary of the knowledge gaps, the associated risks and closure implementation tasks identified for the Groundwater Infrastructure Domain features is presented in **Table 9-24**. All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

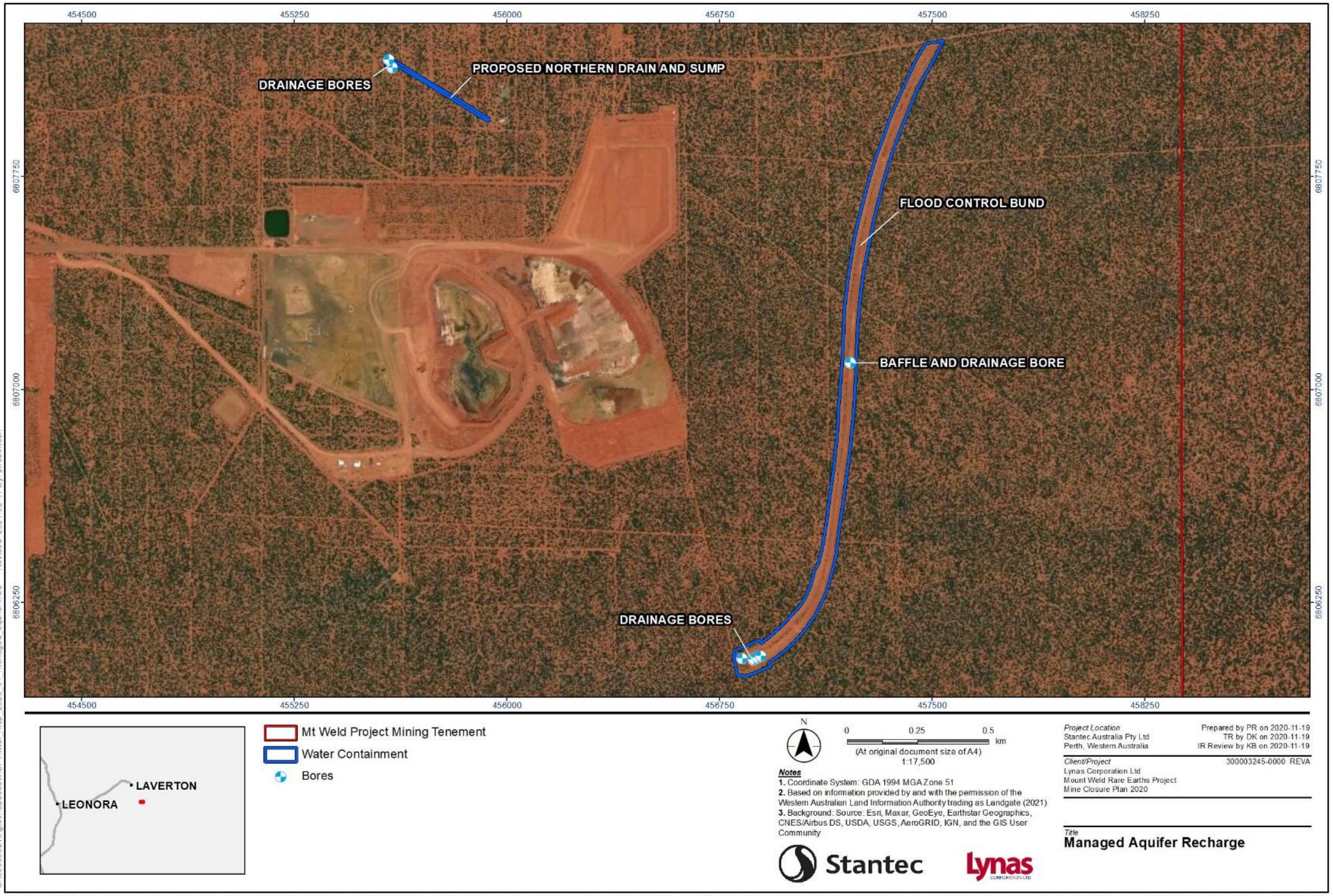


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Figure 9-14: Managed Aquifer Recharge

Table 9-24: Groundwater Infrastructure Domain Knowledge Gaps and Associated Risks

Feature	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
Ground Water Infrastructure	Responsibility for rehabilitation of B12	Inappropriate closure provision.	• Stakeholder consultation with GSGM regarding the closure liability of B12.	2020-2023	Corporate	• remove groundwater infrastructure including bores and pipelines to be detailed in the demolition and decommissioning plan; • securely plug all bores and infiltration drain holes at minimum 400 mm below ground surface, • remove all infrastructure including concrete pads, • re-landscape infiltration pond to blend in with surrounding landscape (if not retained by pastoralist) • remove infiltration baffle, • all pipelines and pumps flushed and removed from site; • remove of all soils contaminated by saline water or hydrocarbons; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; • apply local provenance seed.	At Closure	Mine Closure Team
	Will any groundwater infrastructure be required by the pastoralist post closure, including, but not limited to the MAR.	• Inappropriate closure provision. • Inappropriate closure planning.	• Stakeholder consultation with pastoralist. • Formal transfer of infrastructure in consultation with DPLH, Pastoral Land Board.	3 years prior to closure	Corporate			
	The number of bores that will be retained post closure for ongoing monitoring, and the extent of the affiliated pipeline.	Potential increase in financial liability.	• Undertake consultation with regulators to ascertain specific groundwater infrastructure that will be retained post closure. • Develop a register of what bores will be required post closure for monitoring. • Progressively rehabilitate bores / pipeline footprint not required, or when they become unserviceable.	Progressively where feasible or 3 year prior to closure	Environment Department & Corporate			

9.9 Roads Domain

9.9.1 Overview

The Road Domain within the Mt Weld Project tenements has been divided into Access Roads and Tracks, and Haul Roads.

9.9.2 Roads Domain Objectives and Completion Criteria

The key objectives for closure of the Roads Domain features are:

- Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function;
- The Mt Weld Project is compliant with the requirements of the *CS Act 2003* in order to achieve relinquishment; and
- Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.

The relevance of the Project's closure objectives and completion criteria to the Roads Domain features is presented in **Table 9-25.**

Table 9-25: Application of the Closure Objectives and Completion Criteria to the Roads Domain

Legend	
✓ (green)	Full Compliance – Evidence of Measurement
✓ (yellow)	Partial Compliance – No Evidence of Measurement
✓ (red)	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Access Roads and Tracks	Haul Road
1.1 All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	✓	✓
1.2 To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characterisation, site conditions and the constraints of the post-mining environment.	✓	✓
	As-constructed reports and rehabilitation records are available for review.	✓	✓
1.3 Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Surface drainage to downstream environments is retained or reinstated where possible.	✓	✓
	No obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas.	✓	✓
1.6 The Mt Weld Project is compliant with the requirements of the CS Act 2003 in order to achieve relinquishment.	Areas classified as 'possibly contaminated - investigation required' under the CS Act 2003, which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register. A Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.	✓	✓
	where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.	✓	✓
3.3 Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	✓	✓
3.5 Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	Vegetation is comprised of local provenance species.	✓	✓
	Vegetation cover values are similar to that of the target analogue.	✓	✓
	Revegetation demonstrates viability through propagule development and seedling recruitment.	✓	✓
3.6 Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	Weed (introduced) species do not dominate any rehabilitated area.	✓	✓
	Appropriate management techniques (specific to the weed species) are implemented.	✓	✓
	Weed abundance is not above that of relevant analogues.	✓	✓
3.7 The final landscape will have the ability to withstand post mining land use pressures.	Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates.	✓	✓
	Revegetation demonstrates sustainability through propagule development and seedling recruitment.	✓	✓
3.8 Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	✓	✓
4.1 Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	✓	✓
5.2 Infrastructure will be retained or removed in accordance with agreed post mining land use in consultation with relevant key stakeholders and with approval granted where required.	Retained infrastructure will be left in a safe condition and transferred via an appropriate asset transfer agreement to a legally responsible entity.	✓	✓
	Infrastructure and equipment that is not to be retained will be removed to allow rehabilitation to the approved post mining land use of the area.	✓	✓

Legend	
✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Access Roads and Tracks	Haul Road
	Liabilities of any infrastructure to be retained are defined, and approved by relevant key stakeholders, prior to any asset transfer taking place.	✓	✓

9.9.3 Access Roads and Tracks

9.9.3.1 Knowledge Base

The Main Access Road to the Mt Weld Project Mining Lease from Laverton is 6.4 km long and 30 m wide and located predominately on miscellaneous lease L38/98. The section of the Access Road on the lease to the Project site (M38/058) is 1 km long and 30 m wide.

The Main Access Road acts as a water diversion course for sheet flow originating in the north and provides the primary flood protection for the Plant. Sheet flow water north of the Main Access Road is directed in a westerly direction along the Access Road beyond the concentrator and main tenement boundaries (Lynas 2020d).

The Mt Weld Access Roads and Tracks are depicted in **Figure 9-15**. Access to the magazine is via a short section of track, located in the cleared buffer to the north of the WRL, which connects to the east side of an old station track.

The proposed expansion of the open pit (Stage 4) will result in some minor re-location of Access Roads and Tracks around the southern end of the open pit.

The total area of disturbance for the access roads is 20.59 ha. Stakeholder consultation will be undertaken to determine whether any roads, access tracks or fence lines will be retained.

9.9.4 Haul Road

9.9.4.1 Knowledge Base

The existing Haul Road covers approximately 4.89 ha and is used to transport ore from the Open Pit to the ROM Pad and from the ROM Pad to the BOS for Processing. During construction it is believed that a drain, which runs parallel to the northern aspect of the Haul Road, was constructed to assist with local runoff from the Haul Road itself, this drain was not intended to divert the external catchment runoff. During rainfall events, the Haul Road and land to the north act together to divert runoff west of the site. The drain, however, does not have sufficient capacity to contain the 1 in 100 AEP storm event generated by the external catchment (~65 m^3/s), and during large rainfall events the Haul Road is expected to be overtopped and may result in inundation of the site (Hatch 2016).

In the coming years it is intended to increase the height of the existing Haul Road to mitigate surface water flows and direct water in a general westerly area or install culverts to have water flow underneath the road to drain into the Surface Water Diversion Drain (A. Cargill, pers. comm, Lynas 2020).

Lynas propose to construct a new Haul Road, which will cover approximately 5.85 ha (**Figure 9-15**).

The use of saline wastewater greater than 17,000 mg/L TDS was approved for utilisation as a dust suppressant on haul roads in February 2019 (DWER 2019), provided the following controls continue to be implemented:

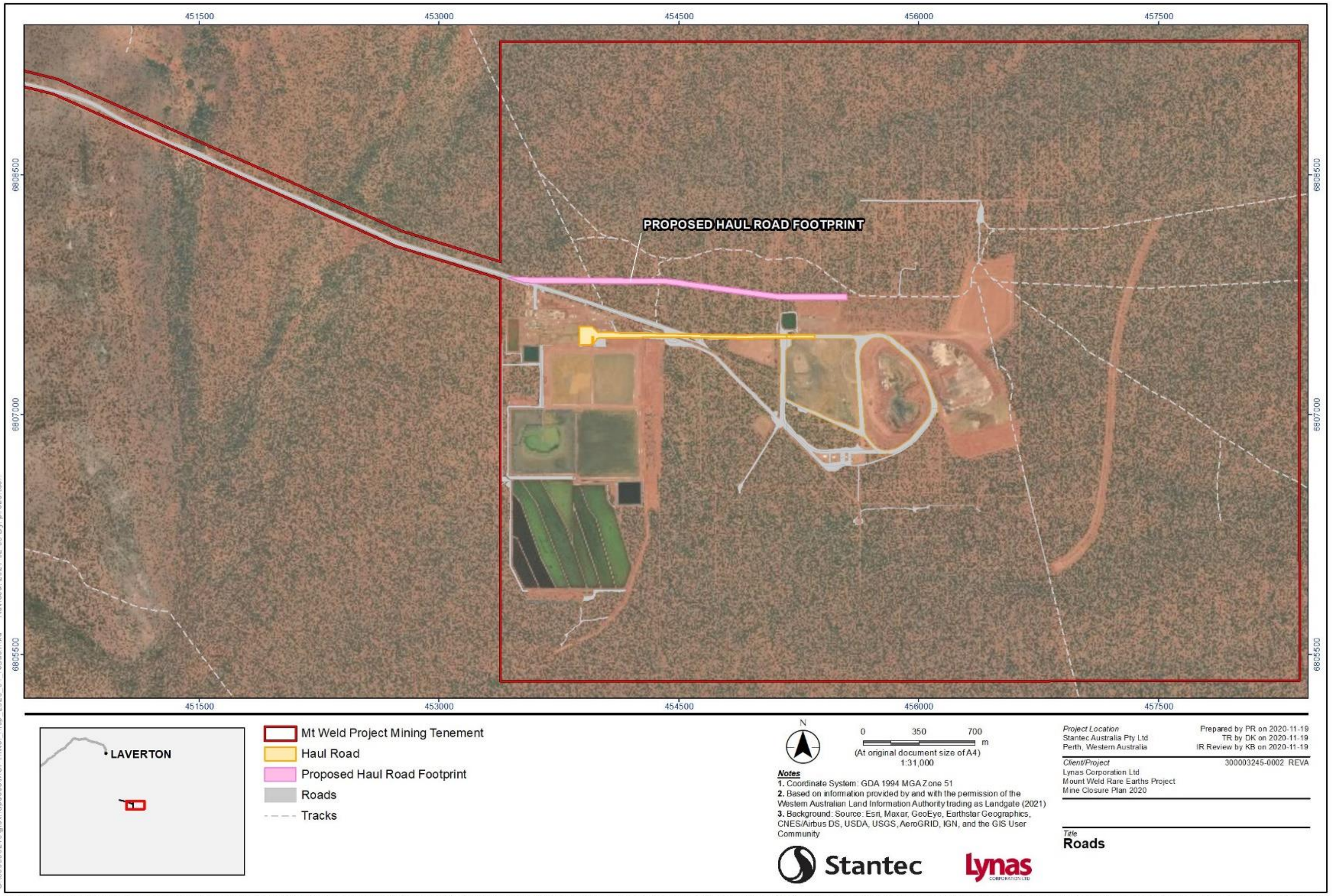
- competency check for water cart operators;
- bunds and drainage lines in place on roadways to protect vegetation;
- visual monitoring; and
- wastewater be applied in a manner to avoid damage to vegetation.

Adverse impacts to the health and survival of vegetation as a result of saline discharge was classified as medium. The risk of trace radionuclides within wastewater was considered by the Radiological Council of Western Australia (RCWA) in 2016, however, given the source water has similar radionuclide concentrations as that assessed in 2016, the risk remains minimal (DWER 2019). The volume of water utilised for dust suppression, in addition to the quality of the water utilised continues to be presented within the Mt Weld AER.

9.9.5 Closure Strategy for the Roads Knowledge Gaps and Associated Risks

A summary of the knowledge gaps and closure implementation tasks identified for the Road features associated with the Mt Weld Project are presented below (**Table 9-26**). All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

Roads will be stripped down where required, windrows graded in and re-contoured to resemble the natural landscape with an aim of reinstating sheet water flow through the Project area.



Disclaimer: This document has been prepared based on information provided by others as cited in the Notes section. Stantec has not verified the accuracy and/or completeness of this information and shall not be responsible for any errors or omissions which may be incorporated herein as a result. Stantec assumes no responsibility for data supplied in electronic format, and the recipient accepts full responsibility for verifying the accuracy and completeness of the data.

Figure 9-15: Roads Domain

Table 9-26: Road - Knowledge Gaps and Implementation Tasks

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
Roads Domain	31.33	Agreements with other stakeholders for access post closure, if so for what period of time, and what the potential impacts are.	• Inappropriate closure provision. • Inappropriate closure planning	• Undertake consultation to ascertain if any roads will be retained post closure. • Undertake formal transfer of infrastructure or obtain legal agreements outlining responsibilities, in consultation with DPLH, Pastoral Land Board.	3 years prior to closure	Corporate	• Sample and assess levels of salt build up in the road profile; • Remove material that may inhibit rehabilitation growth, if required; • Windrows graded in; • Strip down where required and re-contour to re-establish natural drainage lines and sheet flow; • spread topsoil where required; • deep rip all rehabilitated areas along the contour; • spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and • apply local provenance seed.	At Closure	Mine Closure Team
		Will any road infrastructure be required to protect permanent features (e.g. TSFs) post closure.	• Inappropriate closure provision. • Inappropriate closure planning.	• Surface water assessment to determine level of protection required for post-closure landforms	2020-2023	Environment Department			
		Cumulative impact to Haul Roads of the application of dust suppression water (> 17,000 mg/L TDS)	• Cumulation of salts within the road profile. • Adverse impacts to the health and survival of adjacent vegetation and rehabilitation. • Inappropriate closure provision. • Inappropriate closure planning	• Identify volume of material that may be characterised by high salt levels and require removal/ encapsulation at closure. • Identify a location where the material that is potentially high in salts can be encapsulated.	3 years prior to closure	Environment Department			

9.10 Exploration Domain

9.10.1 Overview

The Exploration Disturbance Domain is comprised of the following two features:

- Drill Holes and Drill Pads; and
- Exploration Tracks.

9.10.2 Exploration Disturbance Objectives and Completion Criteria

The key objectives for closure of the exploration disturbance features are:

- Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function;
- The Mt Weld Project is compliant with the requirements of the *CS Act 2003* in order to achieve relinquishment; and
- Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.

The relevance of the Project's closure objectives and completion criteria to the Exploration features is presented in **Table 9-27**.

Table 9-27: Application of the Closure Objectives and Completion Criteria to the Exploration Domain

Legend	
✓	Full Compliance – Evidence of Measurement
✓	Partial Compliance – No Evidence of Measurement
✓	Not demonstrated at this stage of operation
×	Not Applicable

Objective	Completion Criteria	Exploration Activities
1.1 All achievable conditions and commitments relevant to rehabilitation and closure will be met.	All achievable conditions and commitments relevant to rehabilitation and closure are met.	✓
1.2 To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characterisation, site conditions and the constraints of the post-mining environment.	✓
	As-constructed reports and rehabilitation records are available for review.	✓
1.3 Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Surface drainage to downstream environments is retained or reinstated where possible.	✓
	No obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas.	✓
1.6 The Mt Weld Project is compliant with the requirements of the CS Act 2003 in order to achieve relinquishment.	Areas classified as 'possibly contaminated - investigation required' under the CS Act 2003, which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register. A Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.	✓
	where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.	✓
2.1 Radiation levels contained within surface soils, groundwater and air-borne particles around rehabilitated areas will be as close to the natural background as practicable.	Post mining radiation levels will be compatible with agreed post mining land uses.	✓
	Annual radiation dose to members of the public does not exceed 1 mS/yr	✓
3.3 Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	✓
3.5 Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	Vegetation is comprised of local provenance species.	✓
	Vegetation cover values are similar to that of the target analogue.	✓
	Revegetation demonstrates viability through propagule development and seedling recruitment.	✓
3.6 Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	Weed (introduced) species do not dominate any rehabilitated area.	✓
	Appropriate management techniques (specific to the weed species) are implemented.	✓
	Weed abundance is not above that of relevant analogues.	✓
3.7 The final landscape will have the ability to withstand post mining land use pressures.	Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates.	✓
	Revegetation demonstrates sustainability through propagule development and seedling recruitment.	✓
3.8 Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	✓
4.1 Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	✓

9.10.3 Drill Holes and Drill Pads

9.10.3.1 Knowledge Base

The Drill Holes and Drill Pad feature covers all exploration drill holes pads contained within the Mt Weld Project operational area.

In the period from April 2010 to August 2012, a complete survey of all rehabilitated drill holes at the Project was carried out by Calytrix Consulting Pty Ltd. A total of 1,749 exploration drill holes, which date from as early as 1969, were identified on the Mt Weld Project tenements. Of these, 932 are located outside of areas covered by the WRL, ROM Pad, topsoil stockpiles, open pit and Concentrator Plant. All identified exploration drill holes, and associated tracks have been rehabilitated as per the requirements of the DMIRS, as stated in the POW for each drilling program.

As of August 2012, none of the rehabilitated drill holes at the Project required any additional attention, including with regard to radiation. The gamma radiation levels measured from all holes was the same as natural background radiation levels in the area surrounding the Project (Calytrix 2012).

The majority of the drilling was undertaken by aircore rigs which caused minimal ground disturbance. All sample bags, and spoils have been removed from the drill sites.

Recent drilling programmes have been confined to open pit footprint within previously disturbed areas. In the event that these areas are not mined out in the future, Lynas will rehabilitate in line with DMIRS requirements.

9.10.4 Exploration Tracks

9.10.4.1 Knowledge Base

The Exploration Tracks feature covers all exploration tracks within the Mt Weld Project operational area. All stated in **Section 9.10.3,** all the identified exploration drill holes, drill pads and associated tracks identified in the 2010-2012 survey have been rehabilitated as per the requirements of the DMIRS. The exploration tracks were not ripped, except for the activities conducted as part of the trial outlined in **Section 5.1.11.1.**

As per the recommendations of the trial, a site wide assessment was suggested to determine which tracks would benefit from additional rehabilitation works and priority be given to those which pose an erosion risk. The assessment was undertaken by Mt Weld staff between December 2018 and August 2019 and included a review of 21 sites located outside the LoM disturbance footprint.

Areas within the LoM disturbance footprint were deemed not suitable for further works unless the active impacts on the environment are high. A summary of the 2018-2019 assessment is contained within **Table 9-28**. Lynas do not expect to undertake any further rehabilitation in areas where future disturbance is proposed (A. Cargill, pers. comm, Lynas 2020).

Table 9-28: Exploration Track Rehabilitation Requirements (Lynas 2020c)

Location		Recommendation	Proposed Actions
ETP 11 ETP 13 ETP 14 ETP 17	ETP 19 ETP 20 ETP 21	Track to be closed with no rehabilitation.	Tracks may be closed by installing signage, earthen bunding or woody branch vegetation material to indicate to road users' access is restricted.
ETP 5 ETP 7	ETP 10	Track to be closed and rehabilitated.	Further rehabilitation is required. Tracks should be closed to prevent vehicular access. Photo monitoring to be undertaken annually for three years once rehabilitation has been undertaken.
ETP 1 ETP 2 ETP 3 ETP 4 ETP 6 ETP 8	ETP 9 ETP 12 ETP 15 ETP 16 ETP 18	Tracks to remain open with no further rehabilitation.	Tracks to remain open for vehicular access. No further rehabilitation is currently required.

9.10.5 Closure Strategy for the Exploration Disturbance Domain Knowledge Gaps and Associated Risks

The knowledge gaps, the associated risk and closure implementation tasks for the Exploration Disturbance Domain are presented in **Table 9-29**. All of gaps identified have been captured within the Knowledge Gap Register and Schedule of Works presented in **Appendix E**.

Table 9-29: Exploration Domain - Knowledge Gaps and Implementation Tasks

Feature	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Timeframe	Responsible	Decommissioning Tasks	Decommissioning Task Timeframe	Responsible
Exploration Domain	Unknown total area of exploration disturbance requiring additional rehabilitation.	• Lack of vegetation establishment on some exploration tracks • Impacts to surface water flow (disruption of sheet flow and channelling of flow down creating erosion).	• Project wide assessment to identify which tracks would benefit from additional rehabilitation works and priority be given to those which pose an erosion risk. • Investigate alternative measures to slow water flow including cross bunding with competent material and spreading of vegetation.	2020-2023	Environment Department	• re-spread stockpiled topsoil and/or vegetation mulch along the exploration tracks; • lightly rip compacted areas; • seed with local provenance seed where required; • establish a photo monitoring and rehabilitation record for the database; • maintain a process of progressive closure and reduction of liability, with regular reporting to regulators and stakeholders informing and supporting that process	2023-2026	Mine Closure Team

10. Closure Monitoring and Maintenance

Monitoring is essential to track the progress of rehabilitation and closure, to inform when contingencies and corrective actions are needed, and to ensure that the rehabilitation fulfils completion criteria, which defines the success of rehabilitation strategies for closure.

Regular monitoring will involve annual assessment of rehabilitation progress, such as the cover and assemblage of vegetation, degree of erosion, and cover and species for plant pests. Rehabilitation will continue to be monitored until the criteria is met, and then annually for five years after this time to ensure the ecosystem is resilient and self-sustaining and does not require further management intervention.

Information from monitoring should also feed back into management strategies and improve rehabilitation and environmental management. If particular strategies are not progressing rehabilitation towards the completion criteria, then new strategies can be developed to help achieve desired outcomes. For example, species that have not grown successfully may be substituted with other appropriate local provenance species or establishment techniques revised.

The proposed closure monitoring takes into account the wider receiving environments, receptors and exposure pathways. Mt Weld will utilise appropriate procedures in sampling, analysis and reporting of results, and continue to reference the recorded trends against the expected or predicted performance.

In the event that monitoring demonstrates movement outside of the agreed parameters, Mt Weld are committed to the development of remedial and intervention strategies, and continuing post closure monitoring until the agreed completion criteria has been demonstrated to be met.

The monitoring type and frequency proposed to be undertaken post closure is summarised in **Table 10-1**. Greater detail on the proposed monitoring is presented in the paragraphs below the table.

Table 10-1: Post Closure Monitoring and Maintenance

Type of Monitoring	Monitoring Frequency and Duration
Landscape Assessment (EFA): • species richness; • evidence of secondary vegetation growth; • qualitative assessment of vegetation health; • visual monitoring – vegetation condition; and • fauna habitat.	• monitor annually for the first three consecutive years, after which biennial monitoring can commence; • triennial monitoring can commence after the tenth year of monitoring, if required; and • continued monitoring may not be appropriate at sites with substantial issues; these issues may include but are not limited to: lack of vegetation cover, instability of the soil surface, or erosion. Subsequently, further works may be required.
Erosion and surface drainage monitoring	Undertaken biennially over ten-year monitoring period and post periods of intense rainfall.
Visual assessment of the geotechnical stability of the open pits and TSFs.	Undertaken biennially over ten-year monitoring period.
Radiation Monitoring	Undertaken annually for three years. The monitoring frequency will be critically reviewed after three years, as required by the current RMP iteration at time of closure.
TSF compliance audit inspection	Undertaken over the first three years of post-closure monitoring.
Groundwater monitoring (standing water levels and water chemistry)	Undertaken annually over ten-year monitoring period.
Contained surface water quality monitoring	Undertaken biennially over ten-year monitoring period.

Type of Monitoring	Monitoring Frequency and Duration
Contaminated Sites	Monitoring and reporting to be undertaken in accordance with the DSI findings and remediation requirements.
Weed surveys	Undertaken annually for three years. The monitoring frequency will be critically reviewed after three years.
Aerial imagery	Undertaken biennially over ten-year monitoring period.
Auditing against completion criteria	Annually until criteria are met.

In addition, annual post closure site audits will be undertaken until relinquishment to assist in defining rehabilitation maintenance programs for tasks as required. The following post closure maintenance for the Project is proposed:

- monitor and maintain any required water diversions this may include additional armouring at erosion scour points;
- monitor and maintain all open pit abandonment bunding;
- maintain all groundwater monitoring bores required;
- monitor and maintain any existing fencing that is required post-closure; and
- maintain access to areas required for rehabilitation monitoring, until relinquishment is achieved, and these areas can be rehabilitated.

Mt Weld are cognisant that under Part V of the EP Act, which regulates pollution on mine sites, a 'Closure Notice' may be issued to require monitoring, reporting and active management of a decommissioned facility after a licence has ceased to have effect, in addition to what is presented in **Table 10-1**, this would apply particularly to TSFs.

It is anticipated that vegetation photographic monitoring as a minimum will be conducted during April or May each year, to ensure comparability between years and align with the EFA which has been implemented by Mt Weld.

It is proposed that long term monitoring of each landform will be conducted according to a yet to be determined frequency, with at least some rehabilitation monitoring to be conducted at the Project annually. Variance in rehabilitation success will inform the frequency with which monitoring will occur to accurately capture the requirement for implementation of mitigation measures. This is supported by the knowledge that rehabilitation in dry climates takes numerous years to develop into a sustainable ecosystem, and that a large monitoring program would become impractical.

A key component of future monitoring will be quantification of erosion rates on constructed waste landforms. Based upon the characteristics of the soil and mine waste materials present, and evidence of erosion on site, some erosion of constructed and rehabilitated waste landforms is inevitable, particularly in the short term. The establishment of an appropriate erosion assessment program will enable the rates of erosion to be quantified, identify whether erosion rates are reducing over time (e.g., as slopes and landforms 'self-armour'), or are remaining constant, and identify areas of landforms that may require further earthworks and/or erosion mitigation in the future.

There are a number of methods which can be used to assess the rates of erosion on a constructed slope. It is proposed that a combination of the following methods will be utilised at the Mt Weld Project:

- permanent erosion assessment transects;
- erosion pins; and
- Digital Elevation Model (DEM) assessment.

It is proposed that, following waste landform construction and rehabilitation activities, a series of permanent transects are established on the slopes of the constructed landforms to monitor erosion over time. Transects will be established to measure the frequency, depth and width of erosion features (rills and gullies) over time, at each assessment location perpendicular to the slope. This will enable quantification of the development of erosion features (rills and gullies), with the width, depth and associated volume of soil lost from each erosion feature to be assessed over time.

Erosion pins will be used, in conjunction with the establish erosion transects, to evaluate sheet erosion (i.e. movement of soil materials not within a rill or gully) from the constructed surface, and deposition of sediment at the base of the slopes.

Utilisation of digital elevation data can be an effective tool to monitor larger scale erosion and sediment movement / deposition across the Project over time. Evaluation of landform elevation data following landform construction and rehabilitation, can assist in identification of potential 'low points' or catchment areas where surface water is likely to accumulate and potentially erode constructed slopes, enabling proactive remediation measures to be undertaken. Subsequent evaluation of aerial survey information can then be utilised to provide an indication of bulk soil / sediment movement over time at a landform and /or site scale. While this method is not utilised currently at the project there is a rapid uptake of the use of UAV technologies within the mining industry for erosion and rehabilitation monitoring and Mt Weld is exploring the cost effectiveness of employing this methodology in the future.

Radiation monitoring will continue post closure in accordance with the current iteration of the RMP and will likely comprise:

- environmental radiation surveys at the following locations:
  - boundary of the mining pit;
  - site boundary; and
  - post operational area surveys (TSF, WRL etc.)
- Dust monitoring;
- High-Vol TSP sampling;
- Groundwater sampling of TSF bores for (Ra-228 and Ra-226);
- Occupational Radiation Monitoring during closure activities as per the approved RMP at time of closure activities.

10.1 Environmental Monitoring

Measures of vegetation re-establishment will be used as a proxy for ecosystem rehabilitation, for example plant density/cover and species diversity. One valuable tool in monitoring is the selection of permanent photo points so that changes to the landscape can be visually recorded and tracked over time. As outlined in **Section 5.2**, EFA monitoring has been implemented across a selection of analogues, both natural and rehabilitated to inform the development of realistic completion criteria. Additionally, photo monitoring points have been established to provide a broader snapshot of the project and surrounding landscape over time.

If monitoring indicates that rehabilitation is not progressing as planned, then appropriate response and works will be undertaken; this will be reported in the AER and the update to the MCP.

11. Financial Provision for Closure

A financial liability estimate was undertaken for the Project in June 2020 to reflect operational and closure planning changes. The closure cost estimate has not as yet been updated to reflect the Stage 4 open pit cutback proposed additional activities outlined within this MCP. However, the methodology and financial processes which were utilised to develop the June 2020 estimate will be congruent to the proposed expansion, and are provided in a basis of estimate assumptions report supplied as **Appendix F**. This report outlines the foundation of the cost estimate developed for the Mt Weld Project and provides evidence that the mine has considered the costs required to implement the MCP.

The basis of estimate assumptions report outlines what equipment was considered appropriate for the proposed closure works and consequently costed. The equipment includes a range of Caterpillar mining equipment and other relevant and typical equipment used in mine closure and rehabilitation activities by earthmoving and civil contractors. Unit costs and production schedules based on earthmoving first principles have been developed and calibrated against actual rehabilitation and mining activities to ensure currency and consistency with expected contractor rates for the type of closure activities allowed for in the estimates (**Appendix F**).

Key assumptions for the closure cost estimate include (**Appendix F**):

- the closure schedule is as per the current Life of Mine plan with ore processing ceasing in 2042, rehabilitation and demolition works undertaken over an estimated two-year period and post closure monitoring and maintenance undertaken over a ten-year period prior to successful relinquishment;
- third party equipment costs have been developed using a bottom up first principles basis;
- demolition rubble collected during the decommissioning of the infrastructure across the whole site is to be transported for burial within a designated location (e.g., WRL);
- scrap steel is to be removed from the site for scrap value;
- contaminated soils, sediments and silts removed from around the processing plant and other areas, is to be removed for burial within one of the TSFs prior to its rehabilitation;
- general contamination thickness across the processing plant and associated infrastructure is assumed to be 300 mm;
- haulage distances assumed for transport of rehabilitation materials is assumed to average 3,000 m, and where distances are different the costs have been altered accordingly;
- all rehabilitation costs have been estimated on a first principles, bottom up, task and activity basis;
- all closure works are assumed to be undertaken on a single (day) shift, twelve-hour, seven days per week basis, with equipment efficiencies (availability and utilisation of available hours) based on operational experience;
- project management of the closure works and post closure management, maintenance and monitoring is included as a part of the closure provision. Pre-closure works including technical studies required to inform the closure plans are assumed to be undertaken as a part of the operations but have been included within the estimate. A sudden closure care and maintenance cost has also been included within the cost model; and
- fuel prices used within the costs are set at $0.60 per litre delivered to site ex the diesel fuel excise rebate.

Financial provisioning has been included for the following components which will be undertaken throughout operations:

- closure related technical studies;
- social studies; and
- rehabilitation trials.

The closure related technical studies to be undertaken during operations include:

- closure planning review and updates;
- contamination/Ecotox/Hazard investigations;
- hydrogeological/ground water modelling;
- landform design and engineering;
- development of landform decommissioning plans;
- annual audits of TSFs listed on the DWER operating licence;
- surface water hydrology and drainage assessment studies;
- maintenance of material inventory balance studies; and
- development of a data management system.

The social studies to be undertaken during operations include:

- post closure land management plan; and
- stakeholder engagement.

The rehabilitation research, investigations and trials to be undertaken during operations, include but are not limited to:

- TSF cover trials (e.g., adequacy of cover to blanket rehabilitation); and
- capillary rise in the TSF covers.

Provision has also been made for an adequate period of post-closure monitoring and maintenance, including provision for remedial work if monitoring shows completion criteria are not being met.

12. Management of Information and Data

This MCP is intended to be a live document that is subject to changes during mine operations and mine closure. Closure planning is a complex process that commences at initial mine planning and evolves with the project and improved knowledge. In accordance with s83AA of the Mining Act, Mt Weld will implement a management strategy to review and update this plan every three years (or at such time as specified in writing) and submit to the DMIRS for review.

This MCP will be reviewed periodically and updated accordingly for currency with legislation, standards, Guidelines and operational requirements. It is intended that as much rehabilitation as possible will be undertaken progressively during the life of the mine. This will allow rehabilitation methods to be tested and refined to determine the most suitable and, successful method for final rehabilitation.

The update and review of the MCP will include a review of the financial provision, in addition to this, any significant closure outcomes will result in a review of the MCP and financial provisioning. Details on the closure tasks associated with each feature at the Project and an indicative timeframe for completion of each task (based on the LoM plan and schedule of activities) is presented in this report. The MCP is a subset of the mining planning, and is integrated with the mine planning, scheduling and operation activities for each Project planning phase.

Additional Mine Closure related data to be collected and maintained in Mt Weld's Environmental Management System includes information referred to within and supporting this MCP incorporating:

- stakeholder engagement register;
- register of legal obligations and commitments;
- rehabilitation data including:
    - final as built reports of constructed landforms;
    - dates and methodology employed for final surface preparations; and
    - final seed mix composition, quantity and date sown.
- records of monitoring as outlined in Section 10 above;
- remediation measures employed where required;
- environmental data inclusive of all flora, fauna, materials characterisation and hydrological reports;
- records of internal and external inspections and audits, issues raised and subsequent remediation methodologies;
- inventories of rehabilitation materials including locations and volumes of:
    - topsoil or alternate growth mediums (as required);
    - competent waste for use in armouring closure landforms; and
    - inert waste for capping of TSF and encapsulation of hazardous material within the WRL.
- Annual Environmental Reports as provided to DMIRS and DWER for compliance with the *Mining Act*, and the projects Part V Licence and Ministerial Statement issued under the EP Act;
- records of significant spills and remediation measures; and
- waste disposal records including waste hydrocarbon and tyre disposal.

The above records will be stored electronically within Mt Weld Mining's server, with relevant spatial information included in a Geographic Information System.

13. Reviewed Mine Closure Plans

13.1 Revision Summary

An overarching summary of the changes made between the 2017 and 2021 versions of the Mt Weld MCP is presented in **Table 13-1**.

Table 13-1: Revision summary

2021 MCP Section	Summary of the changes made
Section 1	Re-structured to comply with the 2020 MCP Guidance. Information previously in Section 1 is now captured in Section 2.
Section 2	Re-structured to comply with the 2020 MCP Guidance. The scope of the 2020 MCP was defined by the tenements which have a tenement condition requiring the submission of an MCP. The complete list of the described features was moved from Section 2 to Section 9.
Section 3	The summary of MCP closure commitments was incorporated into Section 3.
Section 4	The list of internal and external Stakeholder was refined, and the Stakeholder Engagement Strategy was updated.
Section 5	Re-structured to comply with the 2020 MCP Guidance. The Post mining land use is now described in Section 6. The baseline environmental data sections were updated with the findings of work completed on site. A review of the Contaminated Sites Register was undertaken. Summary tables have been developed and included in Section 5.1. Knowledge gaps are presented at the end of Section. An Operational Data section was also developed.
Section 6	Re-structured to comply with the 2020 MCP Guidance. The Post mining land use was previously Section 5. Only minor changes were made to the text in this section. The closure objectives and completion criteria which were previously presented in Section 6 are now presented in Section 8.
Section 7	Re-structured to comply with the 2020 MCP Guidance. The Collection and Analysis of Closure Data was previously presented in Section 7. The risk assessment which was previously presented in Section 8 is now presented in Section 7. The Mt Weld 5x 5 risk matrix was utilised in 2020 and 2017 – no change to the risk ranking methodology.
Section 8	Re-structured to comply with the 2020 MCP Guidance. The closure objectives and completion criteria were previously presented in Section 6 of the 2016 MCP.

2021 MCP Section	Summary of the changes made
	A thorough review of the closure objectives and completion criteria was completed. A comparison of the 2017 and 2020 closure objectives and completion criteria is presented in **Table 13-2**.
Section 9	Re-structured to comply with the 2020 MCP Guidance. Section 9 now incorporates a complete list of the site Domains and Features. The closure implementation tables presented in this overarching document have all been reviewed and updated.
Section 10	Minimal changes to this section
Section 11	Assumptions updated to reflect the current assumptions report.
Section 12	Minor revision
Section 13	New Section – MCP re-structured to comply with the 2020 MCP Guidance.
Appendix A	The current Legal Compliance Register related to closure is presented.
Appendix B	The current Stakeholder Consultation Register is presented.
Appendix C	2020 Waste Characterisation Report appended.
Appendix D	The current Mine Closure Risk Assessment is presented. No change as the 2017 MCP Risk Assessment was also presented as Appendix D.
Appendix E	Current Schedule of Works is presented. No change as the 2017 MCP Schedule of Works was presented as Appendix E.
Appendix F	No change as the 2017 MCP included the Closure Cost Assumptions as Appendix F.

Table 13-2: Comparison of Closure Objectives and Completion Criteria between the 2017 and 2021 MCP

Closure Objectives 2021		Closure Objectives 2017	Completion Criteria 2021	Completion Criteria 2017	comment
1. Compliance					
1.1	All achievable conditions and commitments relevant to rehabilitation and closure will be met.	Unchanged	All achievable conditions and commitments relevant to rehabilitation and closure are met.	Unchanged	Objective and criteria remain the same.
1.2	To rehabilitate using current mine rehabilitation techniques suitable to the site conditions and the constraints of the post-mining environment.	Unchanged	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characteristics, site conditions and the constraints of the post-mining environment As-constructed reports and rehabilitation records are available for review.	Final landform designs and rehabilitation techniques employ leading practice methodology and incorporate the material characterisation, site conditions and the constraints of the post-mining environment. As-constructed reports and rehabilitation records are available for review.	Small change in wording: Characterisation is changed to characteristics.
1.3	Surface drainage patterns will be reinstated or managed where practicable to be consistent with the regional drainage function.	Unchanged	• surface drainage to downstream environments is retained or reinstated where possible. • no obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas. • surface water diversion structures to remain post closure are constructed in accordance with approved engineered designs.	• surface drainage to downstream environments is retained or reinstated where possible. • no obstacles to free flow of surface water, except those to reduce flow velocity in erosion-prone areas.	The completion criteria have been expanded to include all surface water diversion structures to remain post closure.
1.4	Contained surface water chemistry to reflect agreed post closure water chemistry as much as practicable.	Contained surface water and ground water chemistry to reflect agreed post closure water chemistry as much as practicable.	Contained surface water chemistry not to exceed agreed levels.	Contained surface water and groundwater chemistry not to exceed Livestock Drinking Water Guidelines or historical background levels, whichever is higher.	This objective and completion criteria have become more site specific. Removed groundwater chemistry from this objective and criteria.
1.5	Groundwater levels to reflect agreed post-closure levels as much as practicable.	Unchanged	Groundwater standing water levels not to exceed agreed levels.	Unchanged	This wording remains unchanged.
1.6	The Mt Weld Project is compliant with the requirements of the *CS Act 2003* in order to achieve relinquishment.	Unchanged	• areas of potentially contaminating activities which may restrict the post mining land use have been identified in a Preliminary Site Investigation (PSI) report, the MCP or the site register. • a Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements. • where areas of the project are classified as 'possibly contaminated - investigation required' or 'contaminated – remediation required' under the CS Act, progress towards reclassification as 'Remediated for Restricted Use' or 'Remediated' has been made, such as to achieve relinquishment.	• areas of potentially contaminating activities which may restrict the post mining land use and activities have been identified in a Preliminary Site Investigation (PSI) report, the MCP and the site register. • a Detailed Site Investigation (DSI) into the identified sites has been undertaken to determine the appropriate remediation requirements.	Small change in wording: "And activities" has been removed from the first criteria. The second criteria remain unchanged. A new completion criterion has been developed to be specific to the outcome of compliance with the CS Act. Closure implementation tasks such as the removal of hazardous wastes have been outlined within the Industrial Infrastructure Domain closure strategy.
2. Radiation					
2.1	Radiation levels contained within surface soils, groundwater and air-borne particles around rehabilitated areas will be as close to the natural background as practicable.	Unchanged	• Post mining radiation levels will be compatible with agreed post mining land uses. • TSFs and WRL- Radiation levels contained within surface soils and airborne around	• Post mining radiation levels will be compatible with agreed post mining land uses. • TSFs and WRL- Radiation levels contained within surface soils and airborne around	Change to the criteria. The transfer of radioactivity to the groundwater may have already happened in geological past. Lynas regularly sample the groundwater which is used as drinking water and is sampled under current

Closure Objectives 2021		Closure Objectives 2017	Completion Criteria 2021	Completion Criteria 2017	comment
			rehabilitated areas will not exceed background levels. • Annual radiation dose to members of the public does not exceed 1 mS/yr.	rehabilitated areas will not exceed background levels. • Radioactivity will not be transferred to the groundwater aquifer or exposed to the air from Naturally Occurring Radioactive Material (NORM) in the open pit footwall. • Annual radiation dose to members of the public does not exceed 1 mS/yr.	guidelines. The other dot points in completion criteria should be sufficient to reduce risk of exposure to any receiving receptors including users of the aquifer water. Lynas anticipate that the risk of exposure to receiving receptors will be agreed upon during post mining land use discussions.
3. Landforms and Rehabilitation					
Planning and Landform Construction					
3.1	Appropriately manage mine waste throughout the life of mine.	Unchanged	Mined waste materials with potential for adverse environmental impact have been identified and managed appropriately.	Mined waste materials with potential for adverse environmental impact have been identified and managed appropriately so as to have no negative impact on the receiving environment.	Minor wording change "so as to have no negative impact on the receiving environment" has been removed from the first criteria.
3.2	Design landforms within the constraints of the waste material properties, to ensure they are physically (geo-technically) stable, (geo-chemically) non-polluting/ non-contaminating, and capable of sustaining an agreed post-mining land use.	Establish geotechnically safe, stable and non-polluting landforms.	• Landform design incorporates water and drainage management measures to mitigate erosion off final surfaces and slopes. • Final surfaces develop resistance to erosive forces and are non-polluting.	• Landform design incorporates water and drainage management measures to mitigate erosion of final surfaces and slopes. • Final surfaces develop resistance to erosive forces and are non-polluting. • No sediment migrating from constructed landform slopes being transported beyond sedimentation control structures.	Removed the third criteria as the site cannot control the properties only their management.
3.3	Compliance with appropriate TSF Guidelines and tenement conditions.	Unchanged	• Compliance with relevant ANCOLD guidelines for TSF safety and stability. • Compliance with TSF inspection, auditing and reporting requirements, as stipulated in the tenement conditions.	Unchanged	Unchanged
3.4	Topsoil or appropriate growth medium is applied to all areas where revegetation is planned.	Unchanged	• Areas identified in the MCP as areas that will be rehabilitated have had topsoil or growth medium applied at the recommended depth.	Unchanged	
Vegetation establishment and monitoring					
3.5	Vegetation attributes in deliberately revegetated areas will have values consistent with the target analogue.	Vegetation attributes in rehabilitated areas will have values indicative of the target analogue, in areas planned for revegetation.	• Vegetation is comprised of local provenance species. • Vegetation cover values are similar to that of the target analogue. • Revegetation demonstrates persistence through propagule development and seedling recruitment.	• Establishment of self-sustaining ecosystem comprised of local provenance species. • Establishment of key structural vegetation species trending toward appropriate analogues • Revegetation demonstrates viability through propagule development and seedling recruitment.	Improved wording of the objective and first two criteria.
3.6	Weed (introduced) species, not including seeded pastoral species, do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	Weed (introduced) species do not dominate rehabilitated areas, whether rehabilitation areas are planned for revegetation or not.	• Weed (introduced) species do not dominate in rehabilitated areas. • Weed abundance is not above that of relevant analogues. Appropriate weed management techniques (specific to the weed species) are implemented.	• Weed (introduced) species do not dominate any rehabilitated area. • Appropriate management techniques (specific to the weed species) are implemented. • Weed abundance is not above that of relevant analogues.	Small changes to improve the wording.

Closure Objectives 2021		Closure Objectives 2017	Completion Criteria 2021	Completion Criteria 2017	comment
3.7	The final landscape will have the ability to withstand post mining land use pressures.	Unchanged	• Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at appropriate and agreed stocking rates. • Revegetation demonstrates sustainability through propagule development and seedling recruitment.	• Revegetated areas comprise a suitable proportion of 'intermediate' and 'un-desirable' plant species to provide resilience to grazing at surrounding and agreed stocking rates. • Revegetation demonstrates sustainability through propagule development and seedling recruitment.	Minor wording changes to the first criteria. Second criteria remain unchanged.
3.8	Where appropriate, palatable vegetation species will be established in revegetation, other than on landforms, in line with the post-mining land use of pastoralism.	Not presented previously	Proportions of palatable ('desirable') plant species used in rehabilitation seed mixes have been considered and balanced against the potential effects of grazing on the stability of rehabilitation areas.	Not presented previously	
4. Key Stakeholders					
4.1	Actively engage key stakeholders on a regular basis including attaining agreement on the post-mining land use.	Unchanged	Stakeholders were consulted according to the agreed Stakeholder Engagement Strategy.	The Project meets the agreed post mining land use that was accepted by key stakeholders.	Improved wording for the criteria
4.2	Infrastructure will be retained or removed in accordance with agreed post mining land use in consultation with relevant key stakeholders and with approval granted where required.	Unchanged	• Retained infrastructure will be left in a safe condition and transferred via an appropriate asset transfer agreement to a legally responsible entity. • Liabilities associated with any infrastructure to be retained are defined, and approved by relevant key stakeholders, prior to any asset transfer taking place. • Infrastructure and equipment that is not to be retained will be removed to allow rehabilitation to the approved post mining land use.	• Retained infrastructure will be left in a safe condition and transferred via an appropriate asset transfer agreement to a legally responsible entity. • Infrastructure and equipment that is not to be retained will be removed to allow rehabilitation to the approved post mining land use of the area. • Liabilities of any infrastructure to be retained are defined, and approved by relevant key stakeholders, prior to any asset transfer taking place.	No changes to the objective, minor word changes to one of the criteria and re-ordering of the second and third criteria.
5. Safety					
5.1	Inadvertent public access to open pits will be prevented as far as is practicable.	Public Safety will be maintained by exclusion from the site.	Abandonment bunds are constructed around all open pits that exceed 5 m in depth, in accordance with current guidance.	Inadvertent public access to open pits will be prevented as far as is practicable by: • Constructing abandonment bunds around all open pits that exceed 5 m in depth, in accordance with current guidance. • Constructing bunds across access roads leading to the site	Improved wording of the objective and criteria.
Redundant Closure Objectives and Completion Criteria					
	NA	Landforms in areas planned for revegetation, support a vegetation community that is similar to the target analogue.	NA	Vegetation viability through propagule development and seedling recruitment is evident on landforms planned for revegetation.	Now Incorporated into other objectives and criteria.

13.2 Responses to DMIRS Comments on the 2017 MCP

Mt Weld Mining have populated a response to DMIRS's comments on the 2017 MCP Registration ID 54212, (**Table 13-3**).

Table 13-3: Mt Weld response to the 2017 DMIRS Comments

Section of the 2017 MCP	DMIRS Comment – 2017	Mt Weld response
Stakeholder Engagement	DMIRS would expect stakeholder consultation that is targeted towards closure to be undertaken prior to the next MCP revision. The stakeholder consultation register should be updated to reflect the consultation undertaken. The stakeholder consultation register should focus on consultation undertaken which has relevance to closure planning.	The stakeholder consultation register, presented in Appendix B, has been refined to focus on consultation undertaken which has relevance to closure planning, and been updated to reflect the consultation undertaken. Mt Weld has provided regular updates to DMIRS and DWER on project status and expansion plans. Stakeholder engagement on long lead closure expectations has not yet occurred, however, the 2021 MCP reflects a practical timeline for appropriate consultation with stakeholders.
Post Mining Land Use	Further consultation is required with key stakeholder (including the proposed post mining land managers) to determine agreement on the post mining land use, closure objectives and completion criteria.	Lynas concur that further stakeholder consultation is required with key stakeholder (including the proposed post mining land managers) to determine agreement on the post mining land use, closure objectives and completion criteria.
Completion Criteria	Completion criteria are not considered final and are required to be refined in consultation with stakeholders as data from analogue sites and rehabilitation trials becomes available. Completion criteria for landforms should state the detailed design specification (including slope, surface water and drainage parameters and erosion rates) for the WRLs and TSFs. This may include reference to specific design reports.	Lynas concur that the completion criteria are not final. Mt Weld is committed to ensuring that the current completion criteria become more comprehensive and detailed in future revisions of the MCP, through the inclusion of quantitative standard values as they are developed. Following feedback from DMIRS, received in the approval letter for the 2017 iteration of the MCP, the 2017 closure objectives and completion criteria have been further refined and developed. A comparison and justification of changes to the closure objectives and completion criteria between the currently approved 2017 MCP and the version presented in this MCP is presented in **Table 13-2**. Final detailed designs are still required to be finalised for the TSFs and WRL; at which point in time the criteria can be modified to incorporate the design specifications.
Collection and Analysis of Closure Data	DMIRS expects the investigative tasks identified in the document to be completed accordance with the timeframes presented. Outcomes from the investigative task should be presented in the next MCP revision. It is acknowledged the landform designs presented in the MCP document are conceptual and further investigations are proposed by Lynas in order to develop effective design criteria. Lynas will need to ensure where design criteria differ's from what was previously approved under a Mining Proposal that appropriate approval is sought prior to implementing the final landform design.	Lynas will continue to incorporate the outcomes from the investigative task and trials in the next MCP revision, and revise and update the research and investigation tasks accordingly.
Identification and Management of Closure Issues	DMIRS expects hydrogeological studies proposed to understand the potential for alteration of pit lake water quality and associated closure risks to be completed in accordance with the timeframes presented in Table 9-10 of the MCP document.	Due to a focus on improving tailings management and gaining a greater understanding of the surface hydrology these tasks have not yet been completed. Lynas are committed to completing the proposed hydrogeological studies within the next three years.
Closure Implementation	In order to track the progress Lynas is making towards addressing the identified knowledge gaps it is recommended a table summarising all the identified knowledge gaps and associated investigative tasks is provided in the next MCP revision. The table should provide detail on the proposed timing (as outlined in the 2017 MCP), revised timing (if required), and progress towards completing tasks or outcomes of completed tasks.	A spreadsheet summarising all the identified knowledge gaps and associated investigative tasks is presented in **Appendix E**. A thorough review of all the gaps and tasks identified in the 2017 MCP was completed during development of this MCP, these tables provide detail on the status and timing of the tasks.
Financial Provisioning for Closure	The closure cost assumptions report should be reviewed as part of the closure planning cycle.	A closure cost assumptions report has been appended to this MCP (**Appendix F**). This report reflects the existing disturbance in June 2020, the assumptions presented within this report can be extrapolated to the changes presented within this MCP.

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Worley Parsons (2008). Mt Weld Tailings Storage Facility and Evaporation Pond. Geotechnical Design Report. December 2008. Submitted to Lynas Corporation Limited.

Worley Parsons (2013). Mt Weld Mining Pty Limited Mt Weld Rare Earths Project - Tailings Storage Facility Annual Performance Audit.

Appendices

Appendix A Mt Weld - Legal Compliance Register

Regulator	Permit	Reference Number	Project	Expiry Date	Comments
Minister for the Environment, Environmental Protection Authority	Ministerial Statement	MS476	Site Wide Approval	No renewal required	The last proposal change was on 22 Jan 2018. The changes replace Schedule 1 and Attachment 5 of the MS 476. The scope of the changes were as follows: • Inclusion of a third Tailings Storage Facility (TSF 3) to be incorporated into the current approved TSF footprint; • Remove key characteristics which: o Have no direct environmental impact; and o Are regulated through legislation enforced by other agencies.
	Environmental Management Programme (EMP)	MTW-EN-PLA-0001. Version 9	Site Wide Approval	No renewal required	Latest version 9 (2015)
		W5533/2013/1	Process Water Ponds and Clarifier	4/05/2019	Works Approval Amendment submitted to DER on 29/1/16
		W5645/2014/1	TSF2 Construction	21/12/2019	Works Approval Amendment submitted to DER on 29/1/16
	Works Approval	W6120/2018/1	TSF3 and Process Plant Expansion	9/04/2021	
	Works Approval	W6369/2020/1	Concentrate Dryer	28/10/2023	
	Prescribed Premises Licence	L8141/2007/2	Site Wide Approval	15/04/2026	Licence Amendment No. 2 approved 14 Feb 2019.The amendment authorises the operation of TSF3, increased production to 443,000 tpa. Use of saline wastewater for dust suppression irrespective of total dissolved solids (TDS) concentration.
	Programme of Works	REG ID 60178	Exploration on M38/326	22/08/2020	
	Programme of Works	REG ID 66437	M38/58, M 38/59 AND M 38/326	29/04/2021	
	Programme of Works	REG ID 69857	M 38/58 AND M 38/326	20/09/2021	
	Programme of Works	REG ID 77753	E 38/2224	1/01/2023	
	Mine Closure Plan	**REG ID 71255**	Site Wide Approval	7/02/2021	
	Project Management Plan	Via DMIRS SRS Website	Site Wide Approval	No renewal required	
	Dangerous Goods Licence	DGS021014	Site Wide Approval	14/11/2021	
	Mining Proposal	Reg ID 5573	First Mining Campaign	No renewal required	
		REG ID 6040	Concentration Plant, TSF1 and Evaporation Ponds	No renewal required	
		REG ID 20376	Minor Mods to TSF and Evap Ponds	No renewal required	
		REG ID 26088	Minor Mods to TSF and Evap Ponds	No renewal required	
		REG ID 30446	Design Changes to TSF	No renewal required	
		REG ID 31872	TSF Upgrade Phase 2	No renewal required	
		REG ID 33811	Stage 2 Expansion Revised	No renewal required	
		REG ID 43620	Process Water Ponds	No renewal required	
		REG ID 47342	TSF2 and Tailings Dewatering Facility	No renewal required	
		REG ID 53140	Mining Campaign 2	No renewal required	
		REG ID 55867	TSF2 Additional Clearing	No renewal required	
		REG ID 58538	TSF2 Long Term Deposition	No renewal required	
		REG ID 71255	TSF3 and Process Plant Expansion	No renewal required	
	Tenement	L38/98	Access Road	19/11/2024	
		M38/327	Power line	26/11/2026	
		M38/326	Pit, Stockpiles and ROM	26/11/2033	
		M38/59	WRL	26/11/2026	
		M38/58	Concentration plant,TSF, Evaporation pond	25/11/2026	
		E38/2935	Exploration	16/10/2019	Converted to G38/36 and G38/37
		E38/2222	Exploration	14/08/2020	
		G38/34	General Purpose	22/10/2038	
		G38/35	General Purpose	3/07/2039	
		G38/36	General Purpose	Pending	
		G38/37	General Purpose	Pending	
Department of Water and Environment Regulation - Water (DWER)	Groundwater Abstraction Licence	GWL171310(3)	Site Wide Approval	3/12/2029	
	26 D Licence to Construct	CAW202923(1)	Bore 3 and Bore 10 or 4	14/06/2021	Form 2 - LWB 024 (installed 1-7/8/2019); LWB 023 (Installed 26 June -7 July 2019)
		CAW204717(1)	Bore 25, 26, 27	31/08/2021	
	Groundwater Operating Strategy	NA	Site Wide Approval	4/12/2022	GOS Approved by DWER on 4 December 2019
Radiological Council of Western Australia	Registration of Mt Weld Mine Site and Transit Holding Yards	RS 65/2010 20002	Premises where radioactive material is used or stored	22/07/2019	Licence Renewal submitted. DMIRS will assess and provide new licence. Legal to operate under current licence whilst new is under assessment.
	Registration of Irradiating Equipment	RX 27/2011 20695	Register Irradiating Equipment	4/03/2020	
Australian Radiation Protection and Nuclear Safety Agency (ARPANSA)	Radiation Management Plan	MTW-MT-PLA-0001. Version 9	Site Wide Approval	No expiry date	Approved by DMIRS on 20 December 2018
Department of Industry, Innovation and Science. Australian Government	Permission to Export Concentrate to Lynas Malaysia	MEP/802/MIN/001A	Export of Concentrate	17/02/2022	Max 260,000 tonnes of Controlled Ore permitted to be transported over life of this permit.

Regulator	Permit	Reference Number	Project	Expiry Date	Comments
Department of Mines, Industry Regulation and Safety (DMIRS)	Explosives Licence	ETS002770	Onsite Storage	15/08/2022	

Ministerial Statement 476

Administered by the Department of Water and Environmental Regulation under the Environmental Protection Act 1986
Assessment Number: 1194

Source	Reference	Version	Focus Area	Condition / Commitment	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
As per Ministerial Conditions of MS476							
MS 476	2-1			The proponent shall implement the consolidated environmental management commitments documented in schedule 2 (of the Ministerial Statement).	Compliant	Substantial compliance has been achieved with the implementation of this proposal	2019 Environmental Compliance Audit
MS 476	2-2			The proponent shall implement subsequent environmental management commitments which the proponent makes as part of the fulfilment of conditions and procedures in the statement.	Compliant	Substantial compliance has been achieved with the implementation of this proposal	2019 Environmental Compliance Audit
MS 476	4-1			Prior to ground-disturbing activities at Mt Weld, the proponent shall prepare an Environmental Management Programme to the requirements of the Environmental Protection Authority on advice of the Department of Environmental Protection, the Department of Minerals and Energy, the Radiological Council and the Water and Rivers Commission, as appropriate. The programme shall consist of the following environmental management plans for the Mt Weld site:	Compliant	EMP is in place and forms part of IMS. Environmental Management program has been approved with ISO14001 accreditation for the EMS (2013) and Re-certified in 24 April 2019.	Approval letter from EPA?
MS 476	4-1			4. decommissioning management plan, including rehabilitation of disturbed sites, overburden dumps and residue ponds [see condition 8];	Compliant	An Environmental Management Programme (EMP) prepared by the proponent for the initial mining component of the Project was first approved in 2007. Eight EMP revisions h ave been developedfor changes to the Project scope. A decommissioning management plan has not been prepared as it is not yet required (refer condition 8-1 and 8-2). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884).	Approval letter from EPA?; (2016-1468885770884).
MS 476	4-2			The proponent shall implement the environmental management plans required by condition 4-1 for the Mt Weld site.	Compliant	An Environmental Management Programme (EMP) prepared by the proponent for the initial mining component of the Project was first approved in 2007. Eight EMP revisions have been developedfor changes to the Project scope. A decommissioning management plan has not been prepared as it is not yet required (refer condition 8-1 and 8-2). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884).	Approval letter from EPA?; (2016-1468885770884).
MS 476	8-1			At least six months prior to decommissioning of the beneficiation operation plant at Mt Weld, the proponent shall prepare a Decommissioning Management Plan to the requirements of the Environmental Protection Authority on advice of the Radiological Council, the Department of Minerals and Energy and the Department of Environmental Protection. This plan shall address:	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
MS 476	8-1			1. removal or, if appropriate disposal on-site of plant and infrastructure;	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
MS 476	8-1			2. rehabilitation of all disturbed areas to agreed final land use(s); and	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan

Ministerial Statement 476

Administered by the Department of Water and Environmental Regulation under the Environmental Protection Act 1986
Assessment Number: 1194

MS 476	8-1			3. identification of contaminated areas, including provision of evidence of notification to relevant statutory authorities.	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
MS 476	8-2			The proponent shall implement the Decommissioning Management Plan required by condition 8-1.	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Ministerial Statement 476 - Schedule 2 - 20 May 1998	4		Management Plans	4. decommissioning management plan, including rehabilitation of disturbed sites, overburden dumps and residue ponds [see condition 8];	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	2016-1468885770884; 2018 MCP
Ministerial Statement 476 - Schedule 2 - 20 May 1998	5		Rehabilitation and Decommissioning	To protect rehabilitated area's flora and fauna, the proponent will participate in an appropriate programme to control feral animals (goats and rabbits), in consultation with Agriculture WA and pastoral owners, prior to the commencement of rehabilitation measures.	Compliant	No sustancial rehabilitation at Mt Weld has occurred to date which would tigger valuable consultation. No goats have been recorded at Mt Weld.	Mt Weld Rare Earths Project Environmental Management Programme Version 9
Ministerial Statement 476 - Schedule 2 - 20 May 1998	6		Rehabilitation and Decommissioning	Rehabilitation at Mt Weld will be progressively undertaken, generally in accordance with DME's guidelines. Rehabilitation activities will be reported annually to DME.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Ministerial Statement 476 - Schedule 2 - 20 May 1998	7		Rehabilitation and Decommissioning	A plan outlining the decommissioning of the Mt Weld facilities will be prepared by the proponent in accordance with the Mine Safety and Inspection Regulations.	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	Mine Closure Plan 2017, Reg ID 71255

Miscellaneous Purpose Tenement - L38/98

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 20/11/2003
Date Expired: 11/11/2024

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
Tenement L38/98	1	1	Land clearing	Unless the written approval of the Environmental Officer, Department of Industry and Resources is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.	Compliant	Compliance with approvals and internal clearing approval	LCR - MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register
Tenement L38/98	12	2	Land clearing	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	Compliant	Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure - effective 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
Tenement L38/98	18	1	Infrastructure	On the completion of the life of mining operations in connection with this licence the holder shall: remove all installations constructed pursuant to this licence; and on such areas cleared of natural growth by the holder or any of its agents, the holder shall plant trees and/or shrubs and/or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the Inspector and properly maintain same until the Inspector advises regrowth is self supporting; unless the Warden or Minister for State Development orders or consents otherwise.	Not Applicable	MCP & refer to MS condition	2018 MCP task.
Tenement L38/98	22	4	General	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled: "Mt Weld Rare Earths Project, Mining Proposal / Works Approval Application for Lynas Corporation Ltd" (MP 5573) dated December 2006, signed by Nicholas Curtis - Executive Chairman and letter entitled "Area of Waste Dumps for First Stage of mining Mt Weld Rare Earths Project" dated 6 February 2007, signed by Robert Duncan - Chief Geologist and retained on Department of Industry and Resources File No. E0037/200701; (Reg ID 33811) "Mt Weld Rare Earth Project - Stage 2 Expansion Revised Mining Proposal _ Part 1 M38/326, L38/98, M38/58, M38/59, M38/327" dated 19 January 2012 signed by Greg Kaeding, Senior Environmental Specialist and retained on Department of Mines and Petroleum File No. EARS-MPMCP-33811 (MCP Reg ID: 54212)"Mt Weld Rare Earths Project Mine Closure Tenements: M38/58, M38/59, M38/326, M38/327 and L38/98" dated 28 June 2016 signed by Anthony Malloch, and retained on Department of Mines and Petroleum file no. EARS-MCP-54212 as Doc ID 4347372; (MP Reg ID 71255) "TSF3 and Production Expansion Mining Proposal Mt Weld Rare Earth Project" dated 13 January 2018 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5506839; (MCP Reg ID 71255) "Mt Weld Rare Earth Project Mine Closure Plan" dated 14 December 2017 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5496496 Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.	Compliant	The 2019 Environmental Compliance audit covers the requirements of the relevant mining proposals, documents and correspondence	2019 Compliance Audit and this LCR
Tenement L38/98	23	1	Land Clearing	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.	Compliant	Clearing and induction procedures highlight the need to minimise clearing	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure - effective 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register
Tenement L38/98	24	1	Infrastructure	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environment Division, DoIR.	Not Applicable	MCP & refer to MS condition	2018 MCP task.
Tenement L38/98	25	1	Waste Disposal	All rubbish and scrap is to be progressively disposed of in a suitable manner.	Compliant	Waste is disposed of via landfill or removal off site	Site Inspection (8 February 2016). Land fill approvals and waste management plan

Miscellaneous Purpose Tenement - L38/98

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 20/11/2003
Date Expired: 11/11/2024

Tenement L38/98	26	1	Rehabilitation	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environment Division, DoIR.	**Compliant**	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored.	MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabiliation Trial Design Report.
Tenement L38/98	28	2	Reporting	The Licensee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: March.	**Compliant**	AER 2018	2017 Mt Weld Annual Environmental Report 20150317 OEPA Document Received Receipt_2015 AER
Tenement L38/98	31	1	Approval	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMIRS. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMIR's website: 2021	**Compliant**	MCP review not required till 2021	

Mining Tenement - M38/58

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 26/11/1984
Date Expired: 25/11/2026

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
M38/58	2	2	Land Clearing	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	Compliant	Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS. No evidence of progressive rehabilitation occurring on site.	IMTW-EN-PRO-0017_0 Clearing and Disturbance Procedure (Draft) MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/58	4	1	Land Clearing	Unless otherwise directed by the District Mining Engineer: • Topsoil being removed and stockpiled for replacement prior to the excavation of costeans, trenches or pits. • All excavations being progressively refilled as sampling proceeds; and the topsoil returned as soon as possible. • All excavation and surface disturbances being refilled and the ground rehabilitated to the satisfaction of the District Mining Engineer.	Compliant	Approval has been obtained before works commenced. Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/58	7	14	General	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled: "Mt Weld Rare Earths Project, Mining Proposal / Works Approval Application for Lynas Corporation Ltd" (MP 5573) dated December 2006, signed by Nicholas Curtis - Executive Chairman and letter entitled "Area of Waste Dumps for First Stage of mining Mt Weld Rare Earths Project" dated 6 February 2007, signed by Robert Duncan - Chief Geologist and retained on Department of Industry and Resources File No. E0037/200701. "Mt Weld Rare Earths Project, Lynas Corporation Ltd Clearing of Vegetation for Proposed Infrastructure" (MP 5997) dated 10 March 2008, signed by John Croall - General Manager and retained on Department of Industry and Resources File No. E0037/200701 "Mt Weld Rare Earths Project, Lynas Corporation Ltd Proposed Concentration Plant" (MP 6040) dated 9 April 2008, signed by John Croall - General Manager and Letter entitled " Response to DoIR Queries - Proposed Concentration Plant at Mt Weld, Lynas Corporation Ltd" dated 2 May 2008 signed by Peter Jansen - Environ Senior Consultant and retained on Department of Industry and Resources File No. E0037/200701 "Proposed Minor Modifications of the Tailings Storage Facility and Evaporation Pond - Mount Weld Rare Earths Project" Reg ID 20376 dated 17 September 2008 signed by Tony Hadley and retained on Department of Industry and Resources File No. E0214/200701; (Reg. ID: 30446) "Mining Proposal for proposed changes to Tailings Storage Facility - Mt Weld Rare Earth Project" dated 8 April 2011 signed by John Croall - General Manager WA, and retained on Department of Mines and Petroleum file No. EARS-MP-30446; (Reg. ID: 31872) "Mt Weld TSF Upgrade Phase 2 Mining Proposal" dated 2 August 2011 signed by John Croall - General Manager WA and retained on Department of Mines and Petroleum file No. EARS-MP-31872; Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earths Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager Safety Health Environment & Community and retained on Department of Mines and Petroleum file No. EARS-MP-31872; (Reg. ID 33811) "Mt Weld Rare Earth Project - Stage 2 Expansion Revised Mining Proposal - Part 1 M38/326, L38/98, M38/58, M38/59, M38/327" dated 19 January 2012 signed by Greg Kaeding, Senior Environmental Specialist and retained on Department of Mines and Petroleum file No. EARS-MP-33811; (Reg ID 43620) "Mt Weld Rare Earths Project Mining Proposal: Proposed Process Water Pond Facility and Modifications to Process Water Management" dated 10 October 2013 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-43620, Doc ID 2561687; (Reg ID 43620) Letter titled "Submission of revised information: Mt Weld Rare Earths Project Mining Proposal (J00772); Proposed Process Water Pond Facility and Modifications to Process Water Management, M38/58" dated 13 December 2013 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-43620, Doc 2670065; (Reg ID 47342) "Mt Weld Rare Earths Project Mining Proposal: New Tailings Storage Facility and Tailings Dewatering System" dated 17 March 2014 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-47342 as Doc ID 2817194; (Reg ID 47342) Letter titled "Provision of further information (Reg ID 47342) Mt Weld Rare Earths Project, Mining Proposal: New Tailings Storage Facility and Tailings Dewatering System: M38/58" dated 5 June 2014 signed by Deborah Cahill Environment Manager and retained on Department of Mines and Petroleum File No. EARS-MP-47342 as Doc ID 2955040; (MP Reg ID 53140) "Mining Proposal for Lynas Corporation: Mt Weld Rare Earths Project Mining Campaign 2" dated 11 November 2014 signed by Deborah Cahill and retained on Department of Mines and Petroleum File No. EARS-MP-53140 as Doc ID 3260283; (MP Reg ID 55867) "Mt Weld Rare Earths Project Mining Proposal Amendment: Tailings Storage Facility 2" dated 8 September 2015, signed by Peter Jansen and retained on Department of Mines and Petroleum File No. EARS-MP-55867 (MP Reg ID: 58538) "Mt Weld Rare Earths Project Mining Proposal: TSF2 Modification" dated 12 of February 2016 signed by Anthony Peters, and retained on Department of Mines and Petroleum File No. EARS-MP-58538; (MCP Reg ID: 54212)"Mt Weld Rare Earths Project Mine Closure Tenements: M38/58, M38/59, M38/326, M38/327 and L38/98" dated 28 June 2016 signed by Anthony Malloch, and retained on Department of Mines and Petroleum file no. EARS-MCP-54212 as Doc ID 4347372; (MP Reg ID 71255) "TSF3 and Production Expansion Mining Proposal Mt Weld Rare Earth Project" dated 13 January 2018 signed by Tony Malloch and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5506839; (MCP Reg ID 71255) "Mt Weld Rare Earth Project Mine Closure Plan" dated 14 December 2017 signed by Tony Malloch and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5496496 Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.	Compliant	Constructed as per Proposal	2018 Environmental Compliance Audit
M38/58	8	3	Land Clearing	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform, to the satisfaction of the Executive Director, Environment Division, DMP.	Compliant	Clearing is approved in accordance with approval documents.	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan; Approvals register
M38/58	9	3	Infrastructure	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Executive Director, Environment Division, DMP	Not Applicable	Not relevant to this operation during 2019.	
M38/58	10	3	Waste Disposal	All rubbish and scrap is to be progressively disposed of in a suitable manner	Compliant	Waste is disposed of via landfill or removal off site	MTW-EN-PLA-0004_0 Landfill Management Plan Site Inspection (8 February 2016)
M38/58	13	3	Reporting	The lessee submitting to the Executive Director, Environment Division, DMP a brief annual report outlining the project operations, mine site environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: March.	Compliant	2018 Annual Environmental Report submitted	2018 Mt Weld Annual Environmental Report

Mining Tenement - M38/58

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 26/11/1984
Date Expired: 25/11/2026

M38/58	19	3	Rehabilitation	At the time of the close-out of the tailings storage facility and prior to rehabilitation, a further review by a geotechnical/engineering specialist will be required to be submitted to the Executive Director, Resource and Environmental Compliance, DMIRS. This report shall review the status of the structure and its contained tailings, examine and address the implications of the physical and chemical characteristics of the materials and present and address the results of all environmental monitoring. The rehabilitation stabilisation works proposed and any on-going remedial requirements shall also be addressed.	Compliant	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
M38/58	24	1	Rehabilitation	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self sustaining, functional ecosystems comprising suitable, local provenance species or an alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
M38/58	25	3	Reporting	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMP's website: 2019	Compliant	Mine Closure plan was updated and submitted to DMP in Dec 2017, and approved in 2018. This MCP includes preliminary completion criteria. These will be refined as agreed land-uses are settled, and research and investigation tasks are completed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan;
M38/58	26	1	Waste Disposal	Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability.	Opportunity for Improvement	MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	2019 Environmental Compliance Audit (Jan 2020)
M38/58	27	1	Rehabilitation	All topsoil and vegetation being removed ahead of all mining operations and being stockpiled appropriately for later respreading or immediately respread as rehabilitation progresses.	Compliant	Topsoil Management Plan has been developed. Clearing procedures developed and implemented.	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/58	28	1	Surface Water	All activities being carried out in such a manner so as to not have a detrimental effect on the natural water flow through the lease and surrounding areas to the satisfaction of the Environmental Officer, DMP.	Compliant	Diversion drains ensure that the operations do not place an impact on the surface water quality. Groundwater and vegetation monitoring assess any down stream impacts.	MTW-EN-PRO-0009_0 Surface Water Sampling Procedure for Plant Ponds MTW-EN-SOP-0003_0 Surface Water Monitoring Inspection Procedure MTW-PR-EV-0019a Karrillion Surface and Groundwater Sampling Procedure - Appendices MTW-EN-CHK-0007_0 Surface Water Monitoring Inspection Checklist Site Inspection (8 February 2016)
M38/58	32	1	Rehabilitation	All disturbances to the surface of the land made as a result of exploration, including costeans, drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Mines and Petroleum (DMP). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DMP.	Compliant		
M38/58	33	1	Waste Disposal	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program.	Compliant		
M38/58	35	1	Closure	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMIRS. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMIR's website: 2021	Compliant		

Mining Tenement - M38/59

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced: 26/11/1984
Date Expired: 25/11/2026

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
M38/59	2	1	Land Clearing	All topsoil being removed ahead of mining operations and stockpiled for replacement in accordance with the directions of the District Mining Engineer.	Compliant	Approval has been obtained before works commenced. Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/59	4	1	Land Clearing	Unless otherwise directed by the District Mining Engineer: • Topsoil being removed and stockpiled for replacement prior to the excavation of costeans, trenches or pits. • All excavations being progressively refilled as sampling proceeds; and the topsoil returned as soon as possible. • All excavation and surface disturbances being refilled and the ground rehabilitated to the satisfaction of the District Mining Engineer.	Compliant	Approval has been obtained before works commenced. Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/59	6	6	General	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled: "Notice of Intent - Expansion of Mt Weld Borefield" dated 7 January 1996 and retained on Department of Minerals and Energy File No. 2242/96. "Mt Weld Rare Earths Project, Mining Proposal / Works Approval Application for Lynas Corporation Ltd" (MP 5573) dated December 2006, signed by Nicholas Curtis - Executive Chairman and letter entitled "Area of Waste Dumps for First Stage of mining Mt Weld Rare Earths Project" dated 6 February 2007, signed by Robert Duncan - Chief Geologist and retained on Department of Industry and Resources File No. E0037/200701; (Reg ID 33811) "Mt Weld Rare Earth Project - Stage 2 Expansion Revised Mining Proposal _ Part 1 M38/326, L38/98, M38/58, M38/59, M38/327" dated 19 January 2012 signed by Greg Kaeding, Senior Environmental Specialist and retained on Department of Mines and Petroleum File No. EARS-MPMCP-33811 (MP Reg ID 53140) "Mining Proposal for Lynas Corporation: Mt Weld Rare Earths Project Mining Campaign 2" dated 11 November 2014 signed by Deborah Cahill and retained on Department of Mines and Petroleum File No. EARS-MP-53140 as Doc ID 3260283 (MCP Reg ID: 54212)"Mt Weld Rare Earths Project Mine Closure Tenements: M38/58, M38/59, M38/326, M38/327 and L38/98" dated 28 June 2016 signed by Anthony Malloch, and retained on Department of Mines and Petroleum file no. EARS-MCP-54212 as Doc ID 4347372; (MP Reg ID 71255) "TSF3 and Production Expansion Mining Proposal Mt Weld Rare Earth Project" dated 13 January 2018 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5506839; (MCP Reg ID 71255) "Mt Weld Rare Earth Project Mine Closure Plan" dated 14 December 2017 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5496496 Where a difference exists between the above document(s) and the following conditions, then the following	Compliant	The 2015 Environmental Compliance audit covers the requirements of the relevant mining proposals, documents and correspondence	2015 Compliance Audit
M38/59	7	1	Land Clearing	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.	Compliant	Environmental induction and clearing and disturbance procedures have been updated to be more specific and a conclusive signoff process to ensure minimal disturbance occurs onsite.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure valid from 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register Environmental Induction May 2015
M38/59	8	1	Land Clearing	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	Compliant	Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/59	9	1	Infrastructure	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	Not Applicable	Not relevant to the operations in 2019	Not applicable in 2019
M38/59	10	1	Waste Disposal	All rubbish and scrap being progressively disposed of in a suitable manner.	Compliant	Waste is disposed of via landfill or removal off site	2019 Environmental Compliance Audit (Jan 2020)
M38/59	11	1	Rehabilitation	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure.

Mining Tenement - M38/59

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced: 26/11/1984
Date Expired: 25/11/2026

M38/59	17	2	Reporting	The lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in March.	Compliant	Sighted 2018 Annual Environmental Report and submission letters to OEPA, DER and DMP.	2018 Mt Weld Annual Environmental Report
M38/59	18	3	Reporting	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMP's website: 2019.	Compliant	Mine Closure plan was updated and submitted to DMP in Dec 2017, and approved in 2018. This MCP includes preliminary completion criteria. These will be refined as agreed land-uses are settled, and research and investigation tasks are completed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan;
M38/59	21	1	Rehabilitation	Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability.	Compliant		
M38/59	22	1	Rehabilitation	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self sustaining, functional ecosystems comprising suitable, local provenance species or alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.	Compliant		
M38/59	23	1	Rehabilitation	All disturbances to the surface of the land made as a result of exploration, including costeans, drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Mines and Petroleum (DMP). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DMP.	Compliant		
M38/59	24	1	Waste Disposal	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program.	Compliant		
M38/59	25	1	Reporting	Unless the written approval of the Environmental Officer, DMP is first obtained, the use of drilling rigs, scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.	Compliant		
M38/59	26	1	Closure	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMIRS. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMIR's website: 2021	Compliant		

Mining Tenement - M38/326

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced: 26/11/1984
Date Expired: 25/11/2026

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
M38/326	3	1	Exploration	All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	Opportunity for Improvement	No evidence of progressive rehabilitation occurring on the waste rock landform. A procedure for the rehabilitation of exploration tracks is currently under development. Exploration relating activities have been sufficiently rehabilitated	MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT
M38/326	4	2	Exploration	All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	Opportunity for Improvement	No evidence of progressive rehabilitation occurring on the waste rock landform. A procedure for the rehabilitation of exploration tracks is currently under development. Exploration relating activities have been sufficiently rehabilitated	MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT
M38/326	5	1	Waste Disposal	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration programme.	Compliant	Waste is disposed of via landfill or removal off site	DMIRS Site Inspection (May 2018)
M38/326	6	2	Land Clearing	Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.	Compliant	LCR lists the apporvals. Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS. No evidence of progressive rehabilitation occurring on site.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure valid 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/326	8	6	General	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled: "Notice of Intent - Expansion of Mt Weld Borefield" dated 7 January 1996 and retained on Department of Minerals and Energy File No. 2242/96. "Mt Weld Rare Earths Project, Mining Proposal / Works Approval Application for Lynas Corporation Ltd" (MP 5573) dated December 2006, signed by Nicholas Curtis - Executive Chairman and letter entitled "Area of Waste Dumps for First Stage of mining Mt Weld Rare Earths Project" dated 6 February 2007, signed by Robert Duncan - Chief Geologist and retained on Department of Industry and Resources File No. E0037/200701; (Reg ID 33811) "Mt Weld Rare Earth Project - Stage 2 Expansion Revised Mining Proposal _ Part 1 M38/326, L38/98, M38/58, M38/59, M38/327" dated 19 January 2012 signed by Greg Kaeding, Senior Environmental Specialist and retained on Department of Mines and Petroleum File No. EARS-MPMCP-33811 (MP Reg ID 53140) "Mining Proposal for Lynas Corporation: Mt Weld Rare Earths Project Mining Campaign 2" dated 11 November 2014 signed by Deborah Cahill and retained on Department of Mines and Petroleum File No. EARS-MP-53140 as Doc ID 3260283 (MCP Reg ID: 54212)"Mt Weld Rare Earths Project Mine Closure Tenements: M38/58, M38/59, M38/326, M38/327 and L38/98" dated 28 June 2016 signed by Anthony Malloch, and retained on Department of Mines and Petroleum file no. EARS-MCP-54212 as Doc ID 4347372; (MP Reg ID 71255) "TSF3 and Production Expansion Mining Proposal Mt Weld Rare Earth Project" dated 13 January 2018 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5506839; (MCP Reg ID 1255) "Mt Weld Rare Earth Project Mine Closure Plan" dated 14 December 2017 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5496496 Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.	Compliant	The 2015 Environmental Compliance audit covers the requirements of the relevant mining proposals, documents and correspondence	2018 Compliance Audit
M38/326	9	1	Land clearing	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.	Compliant	Environmental induction updated in 2015, site clearing procedures and processed have been updated and utilised during the clearing program of TSF2. Database and GIS files updated once disturbance certificate submitted and approved. Environmental induction and training includes points to keep cleared areas to a minimum. Site based clearing process exists to ensure proposed clearing is review and checked by site EA prior to approval to ensure compliance against approved disturbance. No evidence of progressive rehabilitation occurring on site in 2019.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure valid from 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register 20150804 C and D ID47432_Approval to clar.pdf Environmental Induction May 2015 v1 Final
M38/326	10	1	Land clearing	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	Compliant	Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS. No evidence of progressive rehabilitation occurring on site.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure valid from 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/326	11	1	Infrastructure	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	Not Applicable	Not relevant to this operation during 2014	2018 MCP
M38/326	12	1	Waste Disposal	All rubbish and scrap being progressively disposed of in a suitable manner.	Compliant	Waste is disposed of via landfill or removal off site	Site Inspection (8 February 2016)
M38/326	13	1	Rehabilitation	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	Non Compliant	No evidence of progressive rehabilitation.All rehabiliation activities are to be referred to the Mine Closure Plan	Mt Weld 2017 Mine Closure Plan

Mining Tenement - M38/326

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Indistry Regulation and Safety under the *Mining Act 1978*

Date Commenced: 26/11/1984
Date Expired: 25/11/2026

M38/326	19	2	Reporting	The lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: March.	Compliant		
M38/326	23	1	Rehabilitation	Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability.	Compliant		
M38/326	24	1	Rehabilitation	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self sustaining, functional ecosystems comprising suitable, local provenance species or alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.	Compliant		
M38/326	25	1	Closure	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMIRS. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMIR's website: 2021	Compliant	Updated Mine Closure Plan 2017- approved 2018.	Mt Weld 2017 Mine Closure Plan 2014 AER Acknowledgement of AER submission 17/3/2015
M38/326	31	1	Reporting	At the time of the close-out of the tailings storage facility and prior to rehabilitation, a further review by a geotechnical/engineering specialist will be required to be submitted to the Executive Director, Resource and Environmental Compliance, DMIRS. This report shall review the status of the structure and its contained tailings, examine and address the implications of the physical and chemical characteristics of the materials and present and address the results of all environmental monitoring. The rehabilitation stabilisation works proposed and any on-going remedial requirements shall also be addressed.	Compliant		

Mining Tenement - M38/327

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced: 27/11/1991
Date Expired: 26/11/2033

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
M38/327	3	1	Exploration	All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.	Compliant	All the previous sites requiring rehabilitation were confirmed and hole caps were ordered. A new program of drill pad construction, rehabilitation and monitoring have been formulated in conjunction with the Lynas Environmental Department and will be finalised prior to the next exploration program	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/327	4	2	Exploration	All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.	Opportunity for Improvement	Appropriate procedures in place to rehab exploration disturbance. However, all tasks had not been completed at the time of the inspection. The remainder of the progressive rehabiliation tasks need to be completed., as reported in the Rehabiliation report.	MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabiliation Trial Design Report.
M38/327	5	1	Waste Disposal	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration programme.	Compliant	Waste is disposed of via landfill or removal off site	2019 Environmental Compliance Audit (Jan 2020)
M38/327	6	2	General	Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.	Compliant	Topsoil has been removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS.	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/327	8	5	General	The construction and operation of the project and measures to protect the environment being carried out generally in accordance with the document titled: "Notice of Intent - Expansion of Mt Weld Borefield" dated 7 January 1996 and retained on Department of Minerals and Energy File No. 2242/96; (Reg ID 33811) "Mt Weld Rare Earth Project - Stage 2 Expansion Revised Mining Proposal _ Part 1 M38/326, L38/98, M38/58, M38/59, M38/327" dated 19 January 2012 signed by Greg Kaeding, Senior Environmental Specialist and retained on Department of Mines and Petroleum File No. EARS-MPMCP-33811 (MP Reg ID 53140) "Mining Proposal for Lynas Corporation: Mt Weld Rare Earths Project Mining Campaign 2" dated 11 November 2014 signed by Deborah Cahill and retained on Department of Mines and Petroleum File No. EARS-MP-53140 as Doc ID 3260283 (MCP Reg ID: 54212)"Mt Weld Rare Earths Project Mine Closure Tenements: M38/58, M38/59, M38/326, M38/327 and L38/98" dated 28 June 2016 signed by Anthony Malloch, and retained on Department of Mines and Petroleum file no. EARS-MCP-54212 as Doc ID 4347372; (MP Reg ID 71255) "TSF3 and Production Expansion Mining Proposal Mt Weld Rare Earth Project" dated 13 January 2018 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5506839; (MCP Reg ID 71255) "Mt Weld Rare Earth Project Mine Closure Plan" dated 14 December 2017 signed by Tony Malloch, and retained on Department of Mines, Industry Regulation and Safety File No. EARS-MPMCP-71255 as Doc ID 5496496 Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail.	Compliant	The 2015 Environmental Compliance audit covers the requirements of the relevant mining proposals, documents and correspondence	2015 Compliance Audit
M38/327	9	1	Land Clearing	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.	Compliant	Environmental induction and training includes points to keep cleared areas to a minimum.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure valid 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register Environmental Induction May 2015 v1 Final
M38/327	10	1	Rehabilitation	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.	Compliant	Topsoil is being removed and stored prior to mining. Topsoil stockpiles are labelled and tracked via GPS.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure valid 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
M38/327	11	2	Decommissioning	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Executive Director, Environment Division, DMP.	Not Applicable	Not relevant to this operation during 2019	Not applicable in 2019
M38/327	12	1	Waste Disposal	All rubbish and scrap being progressively disposed of in a suitable manner.	Compliant	Waste is disposed of via landfill or removal off site	2019 Environmental Compliance Audit (Jan 2020)

Mining Tenement - M38/327

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced: 27/11/1991
Date Expired: 26/11/2033

M38/327	13	1	Rehabilitation	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure.
M38/327	19	3	Reporting	A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month specified in tenement conditions in the year specified below, unless otherwise directed by an Environmental Officer, DMIRS. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMIRS's website: 2021	Compliant	Mine Closure plan was updated and submitted to DMP in Dec 2017, and approved in 2018. This MCP includes preliminary completion criteria. These will be refined as agreed land-uses are settled, and research and investigation tasks are completed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan;
M38/327	20	1	Reporting	The Lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, minesite environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report is to be submitted each year in: March.	Compliant		
M38/327	23	1	Rehabilitation	Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability.	Compliant		
M38/327	24	1	Rehabilitation	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self sustaining, functional ecosystems comprising suitable, local provenance species or alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.	Compliant		
M38/327	29	1	Closure	At the time of the close-out of the tailings storage facility and prior to rehabilitation, a further review by a geotechnical/engineering specialist will be required to be submitted to the Executive Director, Resource and Environmental Compliance, DMIRS. This report shall review the status of the structure and its contained tailings, examine and address the implications of the physical and chemical characteristics of the materials and present and address the results of all environmental monitoring. The rehabilitation stabilisation works proposed and any on-going remedial requirements shall also be addressed.	Compliant		

Mining Proposal - REG ID: 5573

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 30/03/2007
Date Expired: Not Applicable

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	The overburden will be placed on a designated stockpile area and some of this material will be used for construction of roads. The overburden stockpiles, which will ultimately cover 60 ha and be 25 m high, will be constructed for long term stability, contoured to emulate natural landforms of the region.	Not Applicable	Not relevant to this operation during 2019 audit	
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	Low grade ore will be stockpiled adjacent to the pit and may ultimately be processed if future economic parameters allow. If these low-grade ore stockpiles are not processed by the end of the mine life, they will be returned to the pit.	Not Applicable	Not relevant to this operation during 2019 audit	
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	Construction of the waste dump will be progressive with rehabilitation at the end of each mining campaign taken as far as commensurate with future waste dump extension. The general design parameters of the final waste dump are as follows and are indicated in Figure 7:	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure.
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	10m vertical lifts. Maximum dump height 30 m (455 in RL);	Compliant	Constructed as per Proposal. Refer the lastest Mine Closure Plan (2018)	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	20° final batters, rehabilitated slope 18°;	Compliant	Constructed as per Proposal. Refer the lastest Mine Closure Plan (2018)	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	5 in berms after each 10 m lift to be approximately horizontal with a crossfall to the waste dump wall for drainage and to be built to within 0.2 in of design elevation;	Compliant	Constructed as per Proposal. Refer the lastest Mine Closure Plan (2018)	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	Surface of waste dumps to be kept generally level by providing a super-elevation within 20 in of the crest to allow for compaction and slump;	Compliant	Constructed as per Proposal. Refer the lastest Mine Closure Plan (2018)	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	Clay sediment waste will be confined to internal zones of the dump with at least 2 m of sand and gravel alluvium encasement.	Compliant	Constructed as per Proposal. Refer the lastest Mine Closure Plan (2018)	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Mt Weld Rare Earths Project - Mining Proposal 5573	3.2.1	Dec-06	Mine Overburden	'Footprint' (including toe bunds) of 49.5 ha	Compliant	Constructed as per Proposal. Refer the lastest Mine Closure Plan (2018)	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Mt Weld Rare Earths Project - Mining Proposal	4.1	Dec-06	Land Clearing	Only the open pit and access road will remain cleared on closure of the mine	Not Applicable	Not relevant to this operation during 2019	Not applicable in 2019
Mt Weld Rare Earths Project - Mining Proposal 5573	4.2.2.1	Dec-06	Surface Water	On completion of mining, the pit will be left as a void, protected by a bund wall, and the waste rock dump will be located to the east of the pit. The void is expected to become partially filled with water as the groundwater levels recover following cessation of the dewatering activities. Groundwater flow through the pit is expected to be sufficient to prevent any significant increase in salinity levels.	Not Applicable	Not relevant to this operation during 2019	Not applicable in 2019.
Mt Weld Rare Earths Project - Mining Proposal 5573	4.2.2.2	Dec-06	Surface Water	Bunds and diversion channels around the Project area will be constructed so that clean surface runoff is re-joined to the natural drainage system immediately downslope of the protected facilities (Figure 3) and discharged to re-establish sheet flow characteristics rather than forming a channel. Areas of vegetation will be retained between Project components wherever practicable, to reduce scouring.	Compliant	Surface water which passess through the concentrator plant area is conveyed to the Plant Run Off Pond and allowed to evaporate. The Flood control Drain to the east and Storm Water Diversion Drain east of TSFs and Evaporation Ponds are in good conditon.	2019 Environmental Compliance Audit (Jan 2020)
Mt Weld Rare Earths Project - Mining Proposal 5573	4.4.1	Dec-06	Vegetation Management	Cleared vegetation will also be stockpiled and used in rehabilitation activities as a seed source, mulch and to provide habitat refuges for native fauna species.	Compliant	Sighted Vegetation stockpiles but are not labelled.	2019 Environmental Compliance Audit (Jan 2020); MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan

Mining Proposal - REG ID: 6040

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 11/06/2008
Date Expired: Not Applicable

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
Letter entitled "Response to DoIR Queries - Proposed Concentration Plant at Mt Weld, Lynas Corporation Ltd" dated 2 May 2008 signed by Peter Jansen - Environ Senior Consultant and retained on Department of Industry and Resources File No. E0037/200704		2-May-08	Closure of Evaporation Pond	Lynas commits to defining a suitable method for closure and rehabilitation of the evaporation pond as part of the closure plan for the Project. Options for closure may involve either capping and rehabilitation or completely removing all infrastructure and embankments, before rehabilitating the level site. Regardless, it is expected that the closure strategy for the evaporation pond would involve allowing the residual standing water to evaporate before undertaking selective soil sampling and analysis for key environmental parameters at the pond base and walls.	Compliant	Covered in Mine Closure Plan but not relevant to this operation during 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure
Letter entitled "Response to DoIR Queries - Proposed Concentration Plant at Mt Weld, Lynas Corporation Ltd" dated 2 May 2008 signed by Peter Jansen - Environ Senior Consultant and retained on Department of Industry and Resources File No. E0037/200706		2-May-08	Closure of Evaporation Pond	The cleared evaporation site will then be ripped and seeded as part of standard revegetation procedures, with natural drainage returned as far as practicable.	Compliant	Covered in Mine Closure Plan but not relevant to this operation during 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure
Letter entitled "Response to DoIR Queries - Proposed Concentration Plant at Mt Weld, Lynas Corporation Ltd" dated 2 May 2008 signed by Peter Jansen - Environ Senior Consultant and retained on Department of Industry and Resources File No. E0037/200708		2-May-08	Material for Closure of TSF	Materials required for rehabilitation and closure of the TSF will be segregated and stockpiled in proximity to the TSF, taking into account the required geotechnical properties of the material that are required for each layer of capping. Prior to stockpiling of this material, Lynas understands that a separate application for clearing of vegetation may be required.	Compliant	Proposed clearing must undergo approval process before activity commences. Sighted soil Stockpiles for Evap Ponds.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan Site Inspection (8 February 2016) Mt Weld_Surveying_Topsoil and Armouring Material Register 301218
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Dust	Lynas will progressively rehabilitate unused disturbed areas of the site, to promote vegetation growth and minimise dust generation.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial - DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Dust	Any topsoil stockpiles not used immediately for rehabilitation will also be seeded to promote vegetation and minimise dust generation.	Compliant	Topsoil stockpiles sighted during visit had stabilising vegetation	MTW-MIN-EV-PRO_00 Dust Procedure MTW-EN-PLA-0007 Topsoil Management Plan Site Inspection (8 February 2016)
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Fauna	Lynas would participate in an appropriate programme to control feral animals (goats and rabbits), in consultation with Agriculture WA and local pastoral owners, prior to the commencement of rehabilitation.	Compliant	Field inspection identified feral animal trapping is being conducted based on sightings, not schedule and is conducted occasionally in conjunction with Goldfields site	MTW-EN-PRO-0014_0 Animal Trapping and Handling Procedure Feral Animal Trapping Record
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Fauna	In addition, Lynas will: * Check the integrity of capping on exploration or other boreholes; and	Not Applicable	Closed. Works approval has expired. This is regulated under Minings Act 1978.	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan; TW-GE-PRO-0006 Drill Site Rehabilitation Procedure
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Rehabilitation	Rehabilitation of the tailings surface will commence upon termination of tailings deposition	Not Applicable	Closed. Works approval has expired. Due to level of mineral recovery from the high grade ore, the tailings is considered ore reserve. On this basis, this material will likely be re-processed, as such, the TSF tailings deposition has not terminated.	MTW-PR-FLO-0007 Tailings Storage Process; MTW-EN-PLA-0008 Mt Weld Mine Closure Plan

Mining Proposal - REG ID: 6040

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 11/06/2008
Date Expired: Not Applicable

Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Rehabilitation	During construction of the Project, vegetation will be cleared and topsoil and overburden to 300 mm depth will be removed for later use in rehabilitation	Compliant	Topsoil Management Plan has been developed that includes for 200-300mm to topsoil to be stripped and stockpiled for future rehabilitation purposed.	MTW-EN-PLA-0007 Topsoil Management Plan
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Rehabilitation	During construction of the Project, vegetation will be cleared and topsoil and overburden to 300 mm depth will be removed for later use in rehabilitation	Compliant	Topsoil Management Plan has been developed that includes for 200-300mm to topsoil to be stripped and stockpiled for future rehabilitation purposed.	MTW-EN-PLA-0007 Topsoil Management Plan
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Rehabilitation	Rehabilitation of the tailings surface will commence upon termination of tailings deposition	Not Applicable	Not relevant to this operation during 2019	Not applicable in 2019
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Rehabilitation	During construction of the Project, vegetation will be cleared and topsoil and overburden to 300 mm depth will be removed for later use in rehabilitation	Compliant	Topsoil Management Plan has been developed that includes for 200-300mm to topsoil to be stripped and stockpiled for future rehabilitation purposed.	MTW-EN-PLA-0007 Topsoil Management Plan
Proposed Concentration Plant Mining Proposal and Works Approval No. W4440 ,9 April 2008		9-Apr-08	Rehabilitation	Rehabilitation of the tailings surface will commence upon termination of tailings deposition	Not Applicable	Not relevant to this operation during 2015. Rehabilitation management requires further information	

Mining Proposal - REG ID: 31872

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 6/10/2011
Date Expired: Not Applicable

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earth Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager		4-Oct-11	TSF Closure Plan	At closure the TSF will be capped and revegetated. The final downstream embankment batters have been designed with a 2.5H: 1V slope for ease of rehabilitation and will be stable under both normal operating and seismic loading conditions and allows for revegetation to commence prior to closure.	Not Applicable	Not relevant to this operation during 2019	
Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earth Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager		4-Oct-11	TSF Closure Plan	Based on the geochemistry results available to date, the tailings have been classified as chemically benign. However, due to low radiation levels of the tailings, Mt Weld Mining has elected to cap the facility.	Not Applicable	Not relevant to this operation during 2019	
Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earth Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager		4-Oct-11	TSF Closure Plan	Whilst the specifics of the capping method must be investigated further, it will comprise a multilayered cover designed to limit infiltration.	Not Applicable	Not relevant to this operation during 2019	
Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earth Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager		4-Oct-11	TSF Closure Plan	The consolidated tails surface will be graded and shaped whereupon coarse material for a capillary break will be sourced from mine waste dumps at Mt Weld. Material with a low fines content will be utilised, and will have sufficient pore or void size to reduce capillary rise above the surface of the tailings into the cover. The coarse waste rock layer will be approximately 500 mm thick and will extend across the tailings surface.	Not Applicable	Not relevant to this operation during 2019	
Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earth Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager		4-Oct-11	TSF Closure Plan	The TSF cap will then be established to include a barrier layer overlying the covering of coarse waste rock. Whilst the methodology for establishing the barrier layer requires further investigation, it is likely to comprise a low permeability, fine-grained oxide material that would be compacted in place to increase its efficiency to act as a barrier to moisture inflow into the tailings.	Not Applicable	Not relevant to this operation during 2019	
Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earth Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager		4-Oct-11	TSF Closure Plan	**Topsoil and subsoil** will then be spread across the top as the final layer. This material will comprise an uncompacted fine-grained material suitable for root growth. It will also provide some protection to the underlying barrier layer from seasonal variations in moisture content. The cover will then be reseeded with shallow rooting plant species.	Not Applicable	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial - DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Mining Proposal for Proposed Second Phase Upgrade of Tailings Storage Facility (TSF) Mt Weld Rare Earth Project Application ID 31872 dated 4 October 2011 signed by Robyn Bell - Manager		4-Oct-11	TSF Closure Plan	Mt Weld Mining will continue to review the proposed TSF closure design with a view to improving it where practicable in accordance with the defined closure objectives. These reviews will consider logistical, geotechnical and environmental aspects as more information becomes available during ongoing operations. Any significant changes to the design will be developed in consultation with the DMP.	Not Applicable	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial - DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure

Mining Proposal REGID: 33811

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 23/04/2012
Date Expired: Not Applicable

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.1	19-Jan-12	Decommissioning	MT Weld anticipates that the post mining land use is pastoral in accordance with the surrounding activities in the region, with grazing the current dominant land use for the Murchison subregion.	Opportunity for Improvement	Not relevant to this operation during 2019. Gaining agreement on the agreed land use forms part of the MCP Research and Investigation tasks schedule between 2019-2021.. The stakeholder engagement strategy needs to expanded to include Dept. of planning land heritage as the underlying land manager. To meet DMIRS guidance on completion criteria development, agreed land use needs to be settled. Stakeholder consultation with key stakeholders will continue and will be documented throughout the life of the project and will help to define the post mining land use and any infrastructure to remain post closure. Limited consultation has been undertaken on end land use; which will restrict the ability for the company to determine appropriate completion criteria.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Stakeholder Engagement
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.1	19-Jan-12	Decommissioning	The TSF, Waste Rock Landform and open pit will be permanent features of the landscape and will not be conducive to pastoral activities. Access to these features will be restricted by fencing or abandonment bunding to prevent pastoral activities on these features. Further detail on proposed TSF closure will be addressed as part of a separate Mining Proposal.	Opportunity for Improvement	Not relevant to this operation during 2019. Gaining agreement on the agreed land use forms part of the MCP Research and Investigation tasks schedule between 2019-2021.. The stakeholder engagement strategy needs to expanded to include Dept. of planning land heritage as the underlying land manager. To meet DMIRS guidance on completion criteria development, agreed land use needs to be settled. Stakeholder consultation with key stakeholders will continue and will be documented throughout the life of the project and will help to define the post mining land use and any infrastructure to remain post closure. Limited consultation has been undertaken on end land use; which will restrict the ability for the company to determine appropriate completion criteria.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Stakeholder Engagement Procedure MTW-EN-PRO-0025_2: 201905 Mt Weld Stakeholder_Engagement_Register
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.1	19-Jan-12	Decommissioning	Mt Weld Mining Pty Limited will retain all mine records and any information and data relevant to mine closure.	Compliant	Document control and record keeping processes are being developed and improved. All documentation for the project is stored in the network computer drives	MTW-EN-PRO-0025_2: 201905 Mt Weld Stakeholder_Engagement_Register
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.2	19-Jan-12	Rehabilitation	Mt Weld Mining's rehabilitation process involves conventional strip, stockpile and replace techniques in which topsoil stripped for land clearance is stockpiled to be later utilised for rehabilitation. After placement of topsoil the area was ripped to a depth of one metre to prohibit excess compaction in the upper layers of the profile.	Compliant	Topsoil is stripped and stockpiled, sign posted.	MTW-EN-PLA-0007 Topsoil Management Plan; Mt Weld_Surveying_Topsoil Armouring Material Register 301218
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Wherever possible, topsoil would be directly applied to areas requiring revegetation rather than stockpiled.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure. MTW-EN-PLA-0007 Topsoil Management Plan
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Progressive rehabilitation of the Project Area including access tracks or roads that are no longer required	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Rehabilitation trials will be undertaken during the life of the project to determine the most efficient method to provide an effective cap and rehabilitate the surface of the facility.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure

Mining Proposal REGID: 33811

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 23/04/2012
Date Expired: Not Applicable

Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Monitoring of rehabilitation progress will occur throughout the Project, the results of which will be reported to the DMP and DEC in the Annual Environmental Report.	Compliant	Progressive rehabilitation is reported in the consoldiated AER that is submitted by March of each year.	2018 Mt Weld Annual Environmental Report
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Retain and segregate topsoil and root stock collected during land clearing for future rehabilitation	Compliant	Topsoil Management Plan has been developed. Clearing procedures updated developed and implemented.	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure - effective 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	The final WRL will be contoured and shaped so that slope does not exceed 18°	Not Applicable	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being. This will be a design principle, however, land use, closure research and investigation tasks, may inform whether this is optimum design. Closure Activity Codes have not commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabilitation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	WRL will be capped with a layer of topsoil or friable material and deep ripped (on the contour)	Not Applicable	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. This will be a design principle, however, land use, closure research and investigation tasks, may inform whether this is optimum design. Closure Activity Codes have not commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabilitation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	The TSF cap will include a covering of coarse waste rock approximately 500 mm thick to provide a capillary break between the tailings and the topsoil covering.	Not Applicable	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. This will be a design principle, however, land use, closure research and investigation tasks, may inform whether this is optimum design. Closure Activity Codes have not commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabilitation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	All of the TSF final landform will be subject to revegetation.	Not Applicable	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. This will be a design principle, however, land use, closure research and investigation tasks, may inform whether this is optimum design. Closure Activity Codes have not commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabilitation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Rehabilitation and revegetation of the downstream embankment slope of the TSF will commence as soon as possible after construction on the final embankment is complete.	Not Applicable	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabilitation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Areas around the Concentration Plant and associated infrastructure will be deep ripped and also seeded. Since the project timeframe is likely to exceed the viability of seed in some stockpiles provenance seed will be necessary to supplement natural regeneration.	Not Applicable	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT MTW-EN-XX_2019_0 WRL Rehabiliation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	The coarse waste rock will be covered with oxide mine waste and topsoil, and then reseeded with shallow rooting plant species.	Not Applicable	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. This will be a design principle, however, land use, closure research and investigation tasks, may inform whether this is optimum design. Closure Activity Codes have not commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT WRL Rehabilitation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Rehabilitation	Ensure topsoil stockpiles do not exceed 2m in height and, where practical, be maintained as windrows in preference to larger structures	Opportunity for Improvement	Upon inspection some historical topsoil stockpiles are higher than 2m. It is not practical to disturb and rectify height until material is required for use in rehabilitation efforts	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure - effective 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	The final TSF landform will be designed for positive drainage with capping layers constructed to promote shedding of rainfall off the surface	Not Applicable	This will be a design principle, however, land use, closure research and investigation tasks, may inform whether this is optimum design. Closure Activity Codes have not commenced. Separate TSF decommissioning plan is not yet been developed	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan

Mining Proposal REGID: 33811

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Date Commenced 23/04/2012

Date Expired: Not Applicable

Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	Mt Weld Mining will develop a Mine Closure Plan in accordance with DMP guidelines to define proposed closure strategies for each Project component to ensure site specific closure criteria are met	Compliant	Approved Mine Closure Plan with implmentation schedule. MWM has submitted a MCP 2015, 2017. The next MCP is due by March 2021. Mine Closure plan was updated and submitted to DMP in Dec 2017, and approved in 2018. This MCP includes preliminary completion criteria. These will be refined as agreed land-uses are settled, and research and investigation tasks are completed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Stakeholder Engagement
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	The Mine Closure Plan will be dynamic in nature and will be revised on at least a triennial basis to reflect changes to the Project design, legislation, environmental conditions and research.	Compliant	Mine Closure plan was updated and submitted to DMP in Dec 2017, and approved in 2018. This MCP includes preliminary completion criteria. These will be refined as agreed land-uses are settled, and research and investigation tasks are completed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan;
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	Mt Weld Mining will ensure that all disturbed areas will be progressively rehabilitated in accordance with closure criteria and the proposed pastoral end land use of the Project area.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report.
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	As required by the Ministerial Conditions imposed on the Project, a Decommissioning Management Plan will be prepared at least six months prior to decommissioning of the Mt Weld operations.	Not Applicable	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	The decommissioning strategy will be prepared and implemented to meet the requirements of the DEC and DMP.	Not Applicable	Given the LoM, there is no requirement for decomission management plan. Note that the MCP includes a range of decomissioning tasks for each land form domain.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Stakeholder Engagement Procedure MTW-EN-PRO-0025_2: 201905 Mt Weld Stakeholder_Engagement_Register
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	In order to assess at which point the rehabilitation of the Project is considered 'complete', a set of closure criteria will be developed specifying acceptable measurable levels of soil and landform stability, vegetation characteristics, fauna characteristics and drainage characteristics	Compliant	MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relvant stakeholders, including the sterilisation of land. Final closure criteria still to be developed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Stakeholder Engagement Procedure MTW-EN-PRO-0025_2: 201905 Mt Weld Stakeholder_Engagement_Register
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	10.1	19-Jan-12	Decommissioning	These closure criteria will be defined in a Final Mine Closure Plan and will be monitored post closure.	Compliant	Closure criteria are identified in the MCP for different elements of the site. This criteria has been updated in the 2017 Mine Closure Plan. MWM MCP includes completion citeria for each domain. To enable completion citeria to be define, agreed end land use needs to be agreed with relvant stakeholders, including the sterilisation of land.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Stakeholder Engagement Procedure MTW-EN-PRO-0025_2: 201905 Mt Weld Stakeholder_Engagement_Register
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.1/10.1	19-Jan-12	Decommissioning	The final land use will be determined in consultation with key stakeholders during the life of the Project. Appropriate completion criteria for the final land use will be determined and agreed to by the key stakeholders.	Opportunity for Improvement	Stakeholder consultation with key stakeholders will continue and will be documented throughout the life of the project and will help to define the post mining land use and any infrastructure to remain post closure. Limited consultation has been undertaken on end land use; which will restrict the ability for the company to determine appropriate completion criteria.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Stakeholder Engagement Procedure MTW-EN-PRO-0025_2: 201905 Mt Weld Stakeholder_Engagement_Register
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.2.1/10.1	19-Jan-12	Rehabilitation	Rehabilitation at Mt Weld would be undertaken progressively throughout the life of the mine and completed following mine closure. Monitoring of rehabilitation progress will occur throughout the Project, the results of which will be reported to the DMP and DEC in the Annual Environmental Report.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.2/10.1	19-Jan-12	Rehabilitation	All compacted areas such as the Concentration Plant site, roads and other infrastructure would be deep- ripped and re-contoured to restore normal drainage patterns where practicable. This will reduce wind and water erosion and aid in the natural collection of seed and infiltration of water.	Not Applicable	Not relevant to this operation during 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
Stage 2 Expansion, Revised mining proposal January 19 2012, Registration ID 33811	9.2/10.1	19-Jan-12	Rehabilitation	Where practicable, ensure soil material and biomass is directly transferred between the source and intended destination within 18-24 months of stockpiling.	Compliant	Topsoil is being stockpiled with no plan to commence rehabilitation yet. Some stockpiles have been stored over 24 months	MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure - effective 1/6/2015 MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan

Mining Proposal REGID: 33811

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced 23/04/2012
Date Expired: Not Applicable

Source	Condition Number	Version	Focus Area	Conditions	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
(Reg ID 43620) "Mt Weld Rare Earths Project Mining Proposal: Proposed Process Water Pond Facility and Modifications to Process Water Management" dated 10 October 2013 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-43620, Doc ID 2561687;		Oct-13	Atmospheric Pollution and Noise	During construction and operation, management strategies to limit atmospheric emissions will include: • Minimise vegetation clearing and, where practicable, progressively rehabilitate all Project areas except the open pit and access roads;	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
(Reg ID 43620) "Mt Weld Rare Earths Project Mining Proposal: Proposed Process Water Pond Facility and Modifications to Process Water Management" dated 10 October 2013 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-43620, Doc ID 2561687;		Oct-13	Atmospheric Pollution and Noise	During construction and operation, management strategies to limit atmospheric emissions will include: • Use cleared vegetation in rehabilitation activities and allow this to decompose rather than burn;	Compliant	Sighted Vegetation stockpiles but are not labelled. No evidence of burning found.	2019 Environmental Compliance Audit (Jan 2020); MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan;
(Reg ID 43620) "Mt Weld Rare Earths Project Mining Proposal: Proposed Process Water Pond Facility and Modifications to Process Water Management" dated 10 October 2013 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-43620, Doc ID 2561687;		Oct-13	Fauna	During construction and operation of the Project, Mt Weld Mining will minimise the disturbance to fauna and habitat by implementation of a Fauna Management Plan that includes the following: • Use of cleared vegetation in rehabilitation to provide refuge for smaller animals and assist in the replacement of fauna habitats (e.g. hollow logs, branches and litter);	Compliant	Sighted Vegetation stockpiles but are not labelled.	2019 Environmental Compliance Audit (Jan 2020); MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan;
(Reg ID 43620) "Mt Weld Rare Earths Project Mining Proposal: Proposed Process Water Pond Facility and Modifications to Process Water Management" dated 10 October 2013 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-43620, Doc ID 2561687;		Oct-13	Vegetation Management	Flora and vegetation impacts are currently managed in accordance with the EPA approved Flora and Vegetation Management Plan (within the EPA approved EMP). Management strategies that are implemented include: • Progressively rehabilitate the Project area, where practicable, including access tracks or roads that are no longer required;	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
(Reg ID 43620) "Mt Weld Rare Earths Project Mining Proposal: Proposed Process Water Pond Facility and Modifications to Process Water Management" dated 10 October 2013 signed by Deborah Cahill - Manager, Environment and Heritage and retained on Department of Mines and Petroleum File No. EARS-MP-43620, Doc ID		Oct-13	Vegetation Management	Implement a vegetation clearing procedure that ensures: • Topsoil and root stock is retained and stockpiled for future rehabilitation works and that stockpiles do not exceed 2 m in height; and • Viable seed banks are, where practicable, collected and preserved for future rehabilitation works.	Compliant	Topsoil Management Plan has been developed that includes for 200-300mm to topsoil to be stripped and stockpiled for future rehabilitation purposed.	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan

TSF2 Mining Proposal REG ID: 47342

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*

Date Commenced	14/07/2014
Date Expired:	Not Applicable

Source	Focus Area	Commitment
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 47342	Flora, Fauna and Ecosystem - Construction and Operations	• Progressively rehabilitate the Project area, where practicable, including access tracks or roads that are no longer required; • Restrict the use of vehicles to established access roads and tracks; • Educate employees and contractors of the impacts of their activities on the native flora and vegetation through an Environmental Induction Programme; and • Conduct annual vegetation health assessments. • Use of cleared vegetation in rehabilitation to provide refuge for smaller animals and assist in the replacement of fauna habitats (e.g. hollow logs, branches and litter); • Inspections of the TSF, EPs and other water holding structures at least every 12 hours; • Implementation of a scheduled maintenance program for all fixed and mobile equipment used on-site to ensure the sound power levels remain at or below nominated levels used to predict noise generation of the project; • Regular coverage of putrescible wastes disposed within the onsite landfill; • Installation of fauna egress matts where applicable on TSF2; • Raising awareness of all site personnel of the potential impact of their activities on native fauna and their obligations for minimisation of these impacts; and • Prohibiting direct contact with native fauna and enforcing that firearms are prohibited onsite (with the exception of firearms for feral animal control held by authorised individuals).
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 47342	Topsoil - Construction and Operations	• Restrict the use of vehicles to established access roads and tracks; and • Implement a vegetation clearing procedure that ensures: o Where practicable, topsoil and root stock is retained and stockpiled for future rehabilitation works and that stockpiles do not exceed 2 m in height; and o Viable seed banks are, where practicable, collected and preserved for future rehabilitation works.
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 47342	Domestic and Industrial Waste Products- Construction and Operations	• Upon decommissioning, temporary structures and facilities will be removed and disposed of appropriately in accordance with the DMP approved Mt Weld MCP.

Mining Campaign 2 Mining Proposal REG ID: 53140

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*

Date Commenced 5/03/2015

Date Expired: Not Applicable

Source	Focus Area	Commitment
MINING PROPOSAL AMENDMENT: Mining Campaign2 ON M 38/58, M 38/59, M 38/326, M38/327 Registration 53140	Flora, Fauna and Ecosystem - Construction and Operations	• Progressively rehabilitate the Project area, where practicable, including access tracks or roads that are no longer required. • Restrict the use of vehicles to established access roads and tracks. • Educate employees and contractors of the impacts of their activities on the native flora and vegetation through an Environmental Induction Programme. • During Mining Campaign 2, Mt Weld Mining will minimise the disturbance to fauna and habitat by implementation of a Fauna Management Plan (within the EPA approved EMP) that includes the following. o Use of cleared vegetation in rehabilitation to provide refuge for smaller animals and assist in the replacement of fauna habitats (e.g. hollow logs, branches and litter). o Inspections of the Pit, TSF, SWROP and other water holding structures at least every 12 hours. o Implementation of a scheduled maintenance program for all fixed and mobile equipment used on-site to ensure the sound power levels remain at or below nominated levels used to predict noise generation of the project. o Regular coverage of putrescible wastes disposed within the onsite landfill. o Raising awareness of relevant personnel and contractors of the potential impact of their activities on native fauna and their obligations for minimisation of these impacts
MINING PROPOSAL AMENDMENT: Mining Campaign2 ON M 38/58, M 38/59, M 38/326, M38/327 Registration 53140	Topsoil - Construction and Operations	• Restrict the use of vehicles to established access roads and tracks. • Implement a vegetation clearing procedure that ensures where feasible topsoil and root stock is retained and stockpiled for future rehabilitation works and that stockpiles do not exceed 2 m in height. • Implement a vegetation clearing procedure that ensures viable seed banks are, where practicable, collected and preserved for future rehabilitation works.
MINING PROPOSAL AMENDMENT: Mining Campaign2 ON M 38/58, M 38/59, M 38/326, M38/327 Registration 53140	Atmospheric Pollution and Noise - Construction and Operations	• Implement equipment maintenance and inspection schedules to ensure that all equipment is operating as per the manufacturer's instructions and within optimal fuel efficiency and sound power ranges. • Minimise vegetation clearing and, where practicable, progressively rehabilitate. • Use cleared vegetation in rehabilitation activities and allow this to decompose rather than burn • Training of staff and contractors in methods to minimise the Projects greenhouse footprint and to encourage identification of opportunities to increase the efficiency of operations. • Where hearing protection is required, signs displaying the symbol for the wearing of hearing protectors as shown in the Australian Standards will be displayed at appropriate locations

TSF2 Mining Proposal REG ID: 55867

Relevant DMIRS Tenement Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*

Date Commenced 11/09/2015
Date Expired: Not Applicable

Source	Commitment	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 55867	Implement a vegetation clearing procedure that ensures:	Not Applicable	See response below	See evidence below
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 55867	Where feasible topsoil and root stock is retained and stockpiled for future rehabilitation works and that stockpiles do not exceed 2 m in height.	Compliant	Topsoil Management Plan has been developed that includes for 200-300mm to topsoil to be stripped and stockpiled for future rehabilitation purposed.	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 55867	Viable seed banks are, where practicable, collected and preserved for future rehabilitation works.	Compliant	Topsoil Management Plan has been developed that includes for 200-300mm to topsoil to be stripped and stockpiled for future rehabilitation purposed.	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 55867	Progressively rehabilitate the Project area, where practicable, including access tracks or roads that are no longer required;	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 2 ON M 38/58 Registration 55867	The current Mt Weld Rare Earths Project Mine Closure Plan (Outback Ecology, 2015) will be updated to accommodate the proposed changes at the next review.	Compliant	Mine Closure Plan submitted in 2018, and approved in 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan

TSF3 and Process Plant Mining Proposal

Relevant DMIRS Mining Proposal Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*

Date Commenced 7/02/2018
Date Expired: Not Applicable

Source	Focus Area	Commitment	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
MINING PROPOSAL AMENDMENT: TAILINGS STORAGE FACILITY 3 ON L 38/98, M 38/58, M 38/59, M 38/326 and M 38/327 Registration 71255	Land Clearing, Flora, Fauna and Ecosystem	• Comply with IMS Clearing and Disturbance Procedure (MTW-EN-PRO-0017) that ensures: o Design the Project layout to minimise clearing requirements; o Proposed clearing areas are clearly demarcated and communicated to operators and contractors involved in clearing; o Where possible use the aid of a spotter; and o Clearing activities are monitored by Mt Weld Mining, with actual disturbance footprints recorded and reported in annual MRF and AER submission to DMIRS. • Topsoil and any soil stored seeds will be managed appropriately to maintain its viability for reapplication during rehabilitation. (The short and long-term viability of Goodenia lyrata seeds is unknown). • Staff and contractors are trained and informed of measures to prevent over-clearing and manage flora and vegetation impacts and incidents.	Compliant	No clearing issues during construction of TSF3 (2018)	MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan: Environmental Induction May 2015 v1 Final

Mine Closure Plan Commitments - December 2017

Relevant DMIRS Mine Closure Plan Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced: 7/02/2018
Next iteration of MCP due: Feb-21

Commitment	Focus Area	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
1. Re-instate natural hydrology upon closure as far as practicable, ensuring any surface water diversion structures which will be retained post closure are suitable, without impacting the integrity of permanent landform features.	Hydrology	Not Applicable	Not relevant to operations in 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
2. Commence the research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule.	Closure	Opportunity for Improvement	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
3. Undertake the decommissioning tasks identified in the Closure Schedule	Closure	Compliant	Not relevant to operations in 2019. A decommissioning management plan has not been prepared as it is not yet required (refer condition 4-1). DWER (OEPA) have acknowledged the MCP and advised that a final Decommissioning Management Plan should be submitted closer to decommissioning, in accordance with condition 8-1 (2016-1468885770884). A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
4. Updating the Legal Obligations Register with any new approvals or licences that may be granted following submission of the 2017 MCP.	Closure Planning	Compliant	The update of the LCR is in progress.	2019 Environmental Compliance Audit (Jan 2020)
5. Design landforms within the constraints of the waste material properties, to ensure physical stability and to minimise erosion.	Rehabilitation	Compliant	Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
6. The physical and chemical characteristics of waste materials and the placement within landforms will be utilised as the basis for selecting appropriate target analogues.	Rehabilitation	Compliant	Materials characteristic study has been commissioned, and will be completed in Q12 2020.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
7. Ensure surface water management is incorporated into the detailed design of landforms to ensure that water runoff is managed effectively to reduce erosion.	Surface Water Management	Not Applicable	Not relevant to operations in 2019. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
8. Rehabilitation of all disturbed areas to the agreed final land use(s).	Rehabilitation	Opportunity for Improvement	Stakeholder consultation with key stakeholders will continue and will be documented throughout the life of the project and will help to define the post mining land use and any infrastructure to remain post closure. Limited consultation has been undertaken on end land use; which will restrict the ability for the company to determine appropriate completion criteria.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
9. Install target rehabilitation monitoring analogues on agreed landform rehabilitation sites, which are representative of post closure Project landforms, or in representative areas undisturbed by mining.	Rehabilitation	Compliant	Rehabilitation monitoring analogues have been installed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Mt Weld Analogue, Rehabiliation and topsoil monitoring 2019.
10. Ensure that the current completion criteria become more comprehensive and detailed in future revisions of the MCP, through the inclusion of quantitative standard values.	Closure Planning	Not Applicable	Not relevant to operations in 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
11. The development of remedial and intervention strategies, (in the event that monitoring demonstrates movement outside of the agreed parameters), and continuing post closure monitoring until agreed completion criteria has been demonstrated to be met.	Closure	Not Applicable	Not relevant to operations in 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
12. Consultation with key stakeholders will continue and will be documented throughout the life of the Project.	Stakeholder Consultation	Opportunity for Improvement	Stakeholder engagement over 2019 was approvals focussed. MWM could benefit from early engagement with DPLH and PLB regarding reaching in principle agreement on end-land use of water diversion infrastructure.	Stakeholder engagement procedure; Stakeholder register.
13. Abandonment bunds will be in place at closure in accordance with DMIRS guidance.	Closure	Not Applicable	Not relevant to operations in 2019.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
14. Sourcing locally-provenance seed for use in rehabilitation. The seed will be appropriately cleaned and stored subsequent to being utilised.	Rehabilitation	Compliant	Seed has been used for some works, and was sourced locally.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan
15. All infrastructure will be removed at closure, unless a signed legal transfer of asset agreement is in place.	Decommissioning	Not Applicable	Not relevant to operations in 2019. A conceptual decommissing plan is detailed in the current approved Mine Closure Plan (MCP).	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan

Mine Closure Plan Commitments - December 2017

Relevant DMIRS Mine Closure Plan Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the *Mining Act 1978*
Date Commenced: 7/02/2018
Next iteration of MCP due: Feb-21

16. Undertaking a Preliminary Site Investigation (PSI) to progress the mine closure planning and to ensure potentially contaminated sites identified at Mt Weld project are managed in accordance with the Contaminated Sites Act (WA) 2003 (CS Act).	Auditing	**Opportunity for Improvement**	MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan

Mine Closure Plan Commitments - Approved February 2018

Relevant DMIRS Mine Closure Plan Conditions - Administered by the Department of Mines, Industry Regulation and Safety under the Mining Act 1978
Next iteration of MCP due in 2021
Action with 2-3 Year Timeframe tracked in STEMS

Domain	Feature	Knowledge Gap	Associated Risk	Investigative tasks	Investigative Task Timeframe	Responsibility	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
Site-wide	**Side-wide**	Stakeholder interest in infrastructure, and liability handover, in particular site roads and bores.	Residual liability for remnant infrastructure due to lack of clarity regarding ownership and responsibility for removal of infrastructure;	Obtain signed agreements for the responsibility for any infrastructure or features such as roads to remain post closure. Written acceptance from all applicable parties to take responsibility for any remaining infrastructure or features will have to be provided in the MCP prior to closure	5 Years from Closure	Corporate	Opportunity for Improvement	Stakeholder consultation with key stakeholders will continue and will be documented throughout the life of the project and will help to define the post mining land use and any infrastructure to remain post closure. Limited consultation has been undertaken on end land use; which will restrict the ability for the company to determine appropriate completion criteria.	STEMS
		Environmental legacies and compliance with the *CS Act 2003*	Potential risk posed to ecological receptors via uptake of potential contaminants in soil/groundwater (vegetation used for rehabilitation) limiting rehabilitation success, and potential migration of contaminants to groundwater and surrounding vegetation.	Develop a register of point source contaminants Develop a sampling analysis and quality plan (SAQP) in accordance with the CS Act, CS Regulations and the DER Assessment and Management of Contaminated Sites Guidelines 2014 and remediate areas where required; and Continue to update the contaminated soils inventory and prepare a sampling and analysis plan and remediate areas where required.	2 to 3 years (2020-2021)	Environment Department	Opportunity for Improvement	MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule.	STEMS
		Species to be utilised in rehabilitation	Post mining landscape not returning to a functioning ecosystem. Failure to relinquish site due to inability to achieve completion criteria.	Continue analogue and rehabilitation monitoring to finalise seed mixes.	2 to 3 years (2020-2021)	Environment Department	Compliant	Rehabilitation monitoring analogues have been installed.	MTW-EN-PLA-0008 Mt Weld Mine Closure Plan; Mt Weld Analogue, Rehabilitation and topsoil monitoring 2019.
		The viability of seed within the topsoil stockpiles is unknown due to stockpiling for extended periods	Inability to rely on the topsoil stockpiles as a seed resource	Collect local provenance seed, clean and store appropriately, or identify a source for a suitable locally-provenance seed mix. Determine quantity of seed or plants required, and sources of these, for revegetation of entire project site.	5 years from closure	Environment Department	Opportunity for Improvement	MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule.	MTW-EN-PLA-0007 Topsoil Management Plan
		Management of material hazardous to human health during closure works	Contaminated / hazardous materials that could be deemed hazardous during closure works are not identified.	Develop a comprehensive hazardous materials register for the mine. This includes (but not limited to): Naturally Occurring Radioactive Materials (NORM), Synthetic Mineral Fibre's (insulation) hydrocarbons (including quantities), polychlorinated biphenyls (PCB's) (including quantities), asbestos and any other identifiable contaminated/hazardous material that could be deemed hazardous during closure works.	2 to 3 years (2020-2021)	Environment Department/ Safety Department	Opportunity for Improvement	MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule.	MTW-EN-PLA-0002_0 Waste Management Plan MTW-EN-PRO-0013_0 Environmental Spill Sampling and Investigation Procedure
		Volumes of competent material required for closure	• Inadequate volumes of competent material for: o TSF 1 and 2 closure design; o Abandonment bund construction; o Permanent water diversion structures; o Successful armouring of slopes preventing erosion.	Assessment of required volumes of competent material. Rainfall simulation trials and/or in situ slope rehabilitation trials to determine adequate armouring ratios.	2 to 3 years (2020-2021)	Environment Department	Opportunity for Improvement	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	STEMS
		• Final Surface Water Management strategy	• Incorrect drainage across the project area leading to erosion scour and water ponding causing a decline in vegetation health from shadowing and/ or ponding.	• Develop a site Mine Closure Surface Water Management Plan, focused on re-establishing the natural drainage lines and sheet flow	2 to 3 years (2020-2021)	Environment Department	Opportunity for Improvement	MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule.	STEMS

Radiation Management Plan Mount Weld Lanthanide (Rare Earths) Project

Document Name: MTW-MT-PLA-0001 8 Radiation Management Plan - List of Commitments Table
Version 8

Document Name	Version	Part	Commitment	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
MTW-MT-PLA-0001 Radiation Management Plan 2017	Nov-17	11	Prior to the close out of the project Lynas Corporation will submit to the State mining engineer a plan for the final disposal of tailings stored in the tailings storage facility or, if tailings are to be further processed, the closeout plan proposal would consider the disposal of tailings contained in the future tailings disposal facility. The following considerations and amendments to the current radiation monitoring program will become effective during construction and operation of the proposed TSF and associated dewatering infrastructure; • The mine waste material to be used for construction of TSF 3 will be monitored, as it is removed from the waste dump, by assay at the Mt Weld laboratory and by gamma radiation checks to ensure that no mineralised waste is utilised for the construction of TSF 3. • The current personal and high volume dust monitoring programs will be expanded to include the new TSF area. • Decontamination of vehicles involved with haulage and deposition of tailings will be subject to current vehicle decontamination protocols prior to leaving site. • Three new monitoring bores will be installed and included in the current water monitoring regime. • Similar to current operational areas at Mt Weld, all areas within the new TSF facilities where there is expected to be radioactively contaminated surface water will have infrastructure to ensure that contaminated water is directed to dispersion channels or collected in sedimentation ponds prior to release. • Water sampling from new TSF monitoring bores every six months for concentration of Ra226 and Ra228. • Gamma radiation surveys of the TSF area every six months. • Any employee who will be spending the majority of their time in this area will be issued a TLD badge.	Not Applicable	Implementation is conducted via the Radiation Management Plan_KASA .	MTW-MT_PLA-0001_8 Radiation Management Plan_KASA. Annual Occupational & Environmental Radiation Monitoring Report April 2018 – March 2019

Environmental Management Plan - Version 9

Last revision May-15

Source	Section Number	Version	Focus Area	Condition / Commitment	C/OFI/NC	2019 Audit Response	2019 Audit Evidence
Environmental Management Plan		Version 9 (May 2015)	Summary	The Mine Closure Plan (MCP) states that technical studies to be undertaken during operations include: • hydrogeological/ground water modelling; • contamination/ ecotox/radiation hazard studies; • pit lake recharge/water quality studies. The recommended geochemical modelling and investigation of potential ecological impacts has been added to the EMP version 8 to ensure these aspects are undertaken during the studies stated in the MCP.	Compliant	Ongoing water modelling work	
Environmental Management Plan	6.1.8	Version 9 (May 2015)	Erosion and Sedimentation Monitoring	Erosion management techniques will continue to be employed to address any observed scarification or gullying. This will include either diverting stormwater flows and/or reducing the velocity of surface flows in the affected area. Rehabilitation of eroded sites will be undertaken as soon as practicable.	Compliant	Surface water monitoring locations are in place, and procedures relating to this monitoring are followed. Inspections recorded in STEMS	MTW-EN-SOP-0003_0 Surface Water Monitoring Inspection Procedure STEMS
Environmental Management Plan	6.2.6.1	Version 9 (May 2015)	Groundwater Abstraction	During construction and operation of the Project, Mt Weld Mining will continue to minimise the impact to the carbonatite aquifer by: • Ongoing review of the Mine Closure Plan taking into account outcomes from ongoing monitoring, such that closure objectives for the pit void and water quality are achieved following closure.	Compliant		2017 MWM Mine Closure Plan
Environmental Management Plan	6.3.4	Version 9 (May 2015)	Flora and Vegetation Management Performance Indicators and Targets	Rehabilitation to be undertaken progressively.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Environmental Management Plan	6.3.6.1	Version 9 (May 2015)	Clearing and Land Disturbance	Retain cleared vegetation for re-spreading during rehabilitation;	Compliant	Sighted Vegetation stockpiles but are not labelled.	2019 Environmental Compliance Audit (Jan 2020); MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan;
Environmental Management Plan	6.3.6.2	Version 9 (May 2015)	Topsoil	• Remove topsoil (essentially the top 10 cm that has the majority of seed and propagules), rootstock, log debris and leaf litter for future use in rehabilitation programs. If possible, stockpiled topsoil should be directly replaced on disturbed areas as this increases the success of seedling establishment and propagule regeneration; and • Stored topsoil stockpiles should not exceed 2 m in height. Handling and stockpiling of moist (or wet) topsoil should be avoided where practicable.	Compliant		MTW-EN-PLA-0007 Topsoil Management Plan

Environmental Management Plan - Version 9

Last revision May-15

Environmental Management Plan	6.3.6.3	Version 9 (May 2015)	Rehabilitation	• Progressively rehabilitation of the Project Area including access tracks or roads that are no longer required; and • Shape waste dumps so that the slope does not exceed 18 degrees. The waste rock dump will be capped with a 100mm layer of topsoil or friable material and deep ripped (on the contour) to break any compaction, enhance infiltration and graft the growth media with the underlying waste material.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Environmental Management Plan	6.3.6.4	Version 9 (May 2015)	Weed management	• Minimise the introduction and spread of invasive weeds through the use of approved herbicides and by maintaining vehicle hygiene via the use of appropriate blow-down or wash-down facilities for vehicles that are entering the Project area. Light vehicles restricted to main roads (e.g. those used for daily transport of personnel to and from site) will not be required to implement hygiene measures unless they have been off-road, or are intended to be used off-road within the Project area; and • Inspect all disturbed and rehabilitated areas for weeds (particularly after rainfall events) and treating infested areas.	Compliant	Weed inspections completed	STEMS; MTW-EN-PLA-0003 Weed Management Plan
Environmental Management Plan	6.3.7.1	Version 9 (May 2015)	Rehabilitation Monitoring Programme	The progress of rehabilitation will be monitored on an annual basis following the main growing season (e.g. following winter rainfall). The objective of this monitoring is to assess the success of progressive rehabilitation activities so that techniques can be modified if necessary to improve the revegetation success. Rehabilitation monitoring will be undertaken by a botanist, or personnel who have been trained in plant species recognition and monitoring methodologies.	Not Applicable	No progress rehab to be monitored, however analogue sites are being installed	
Environmental Management Plan	6.3.7.1	Version 9 (May 2015)	Rehabilitation Monitoring Programme	Rehabilitation monitoring transects will be utilised with the number of transects, location, spacing and size of these transects based on the area and type of rehabilitation or vegetation being monitored, to adequately represent the rehabilitation success of the site overall. The rehabilitation monitoring transects will be established by a qualified botanist. Control transects will be maintained in undisturbed areas away from the influence of the Project or access roads, to provide a suitable benchmark for comparison of rehabilitated sites.	Not Applicable	No progress rehab to be monitored, however analogue sites are being installed	
Environmental Management Plan	6.3.7.1	Version 9 (May 2015)	Rehabilitation Monitoring Programme	The following parameters will be measured as a minimum, based on a per metre square unit initially (unit area may increase as vegetation becomes established to accommodate larger shrubs or trees): • Plant species present; • Density of each species (estimate if >20/m^2); • Total live foliage cover (percentage estimate); • Density and cover of individual weed species if present; and • Approximate soil litter cover (percentage estimate).	Not Applicable	No progress rehab to be monitored, however analogue sites are being installed	
Environmental Management Plan	6.3.8	Version 9 (May 2015)	Flora and Vegetation Management Contingencies	Inspections of disturbed and rehabilitated areas indicate new infestations of, or spread of weeds.	Compliant		MTW-EN-PLA-0003 Weed Management Plan
Environmental Management Plan	6.3.8	Version 9 (May 2015)	Flora and Vegetation Management Contingencies	Rehabilitation monitoring indicates poor rehabilitative success.	Compliant		
Environmental Management Plan	6.3.8	Version 9 (May 2015)	Flora and Vegetation Management Contingencies	Post-clearing inspections indicate proper topsoil protocols not followed.	Compliant		MTW-EN-PRO-0017 Clearing and Disturbance Procedure

Environmental Management Plan - Version 9

Last revision May-15

Environmental Management Plan	6.4.4	Version 9 (May 2015)	Fauna Management Performance Indicators and Targets	Rehabilitation to be undertaken progressively.	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Environmental Management Plan	6.4.6	Version 9 (May 2015)	Flora and Vegetation Management Implementation Strategy	During construction and operation of the Project, Mt Weld Mining will minimise potential impacts on fauna and their habitats by the following measures: • Implement the vegetation management measures outlined in Section 6.3.6 to minimise the disturbance to native fauna habitats. This will include progressive rehabilitation of disturbed areas to encourage the return of native fauna;	Compliant	Project fully constructed - only small sections of clearing to expand facilities is required	This LCR MTW-EN-PRO-0017 Clearing and Disturbance Procedure Environmental Induction
Environmental Management Plan	6.4.6	Version 9 (May 2015)	Flora and Vegetation Management Implementation Strategy	During construction and operation of the Project, Mt Weld Mining will minimise potential impacts on fauna and their habitats by the following measures: • Use of cleared vegetation in rehabilitation to provide refuge for smaller animals and assist in the replacement of fauna habitats (e.g. hollow logs, branches and litter).	Compliant	Sighted Vegetation stockpiles but are not labelled.	2019 Environmental Compliance Audit (Jan 2020); MTW-EN-PRO-0017 Clearing and Disturbance Procedure MTW-EN-FRM-0001_0 Internal Clearing and Disturbance Certificate Clearing and Disturbance Certificate Register MTW-EN-PLA-0007 Topsoil Management Plan;
Environmental Management Plan	6.6.4	Version 9 (May 2015)	Greenhouse Gas Performance Indicators and Targets	Rehabilitation to be undertaken progressively	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size.	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure

Environmental Management Plan - Version 9

Last revision May-15

Environmental Management Plan	6.6.6	Version 9 (May 2015)	Greenhouse Gas Implementation Strategy	During construction and operation of the Project, it is the responsibility of the Registered Manager to see that the following management actions are implemented: • Minimise vegetation clearing and progressively rehabilitate all Project areas except the open pit and access roads;	Compliant	Given the LoM, appropriated levels of progressive rehabilitation is occurring on site. MWM MCP includes completion criteria for each domain. To enable completion criteria to be define, agreed end land use needs to be agreed with relevant stakeholders, including the sterilisation of land. Rehabilitation of exploration sites have been undertaken; a series of in situ slope rehabilitation trials (Western (2014); and Eastern WRL) have commenced. Final landform designs not yet completed and are awaiting the outcome of material characterisation studies and the in situ slope rehabilitation trials to determine adequate armouring ratios on the WRL. A trial "procedure" is in preparation. Exploration rehabilitation trials have been undertaken and are currently being monitored. MWM need to ensure research, investigations and trials presented in this Mine Closure Plan within the time period outlined in Closure Implementation Schedule. Particularly, the assessment of required volumes of competent material; materials balance reconciliation; impact of the zone of pit instability, with conceptual land form design to ensure the proposed development footprint is of adequate size	MTW-EN-PLA-0008 Mt Weld Mine Closure MTW-EN-PRO-0017_0 Clearing and Disturbance Procedure MTW-EN-SOP-0015_0 Exploration Rehabilitation Trial -DRAFT; MTW-EN-XX_2019_0 WRL Rehabilitation Trial Design Report. MTW-GE-PRO-0006 Drill site rehab procedure
Environmental Management Plan	6.6.6	Version 9 (May 2015)	Greenhouse Gas Implementation Strategy	During construction and operation of the Project, it is the responsibility of the Registered Manager to see that the following management actions are implemented: • Use cleared vegetation in rehabilitation activities and allow this to decompose rather than burn;	Compliant	Sighted Vegetation stockpiles but are not labelled.	2019 Environmental Compliance Audit (Jan 2020); MTW-EN-PRO-0017 Clearing and Disturbance
Environmental Management Plan	6.6.7	Version 9 (May 2015)	Greenhouse Gas Monitoring	Mt Weld Mining will monitor and record: • Total areas of vegetation cleared; • Total areas rehabilitated; • Total fuel usage for site (power generation, boilers, mining fleet, on-site vehicles etc); • Annual Greenhouse Key Performance Indicators: • Mining intensity (tonnes CO 2 -e/tonne of Ore mined); and • Production intensity (tonnes CO 2 -e/tonne of Rare Earths Concentrate produced). • Any initiatives taken to reduce greenhouse gas emissions.	Compliant		MTW-EN-PRO-0017 Clearing and Disturbance Procedure
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	Mt Weld will install analogues on site, which represent the Project landscape	Compliant		2017 MCP
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	The quantitative standards presented in the mine closure plan are indicative only and will be refined based on data from local Mt Weld analogue sites. Mt Weld will re-define quantitative standards during operations and will provide in the next iteration of the MCP.	Compliant		2017 MCP
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	Mt Weld will redefine the erosion quantitative standards based on material characterisation.	Compliant		2017 MCP
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	Mt Weld will design the landform to minimise erosion.	Compliant	Final landform designs pending. Trials on slope rehab underway	2017 MCP
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	Mt Weld will undertake detailed material characterisation of existing and future waste material.	Compliant		2017 MCP
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	Mt Weld will develop a soil and waste inventory to facilitate appropriate landform design.	Compliant	Soil inventory in place. Waste inventory being developed.	2017 MCP
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	Mt Weld will re-instate natural hydrology upon closure as far as practicable.	Compliant		2017 MCP
Environmental Management Plan	7	Version 9 (May 2015)	Mine Closure and Rehabilitation	Mt Weld will complete all of the research, investigation and trials presented in the mine closure plan, and present the results of these investigations in the next iteration of the MCP.	Compliant		2017 MCP

Water Resource and Pipeline Agreement

Mt Weld Mining Pty Ltd - GSM Mining Company Pty Ltd - October 2016

1	Specific details of the Water use agreement are confidential in nature and subsequently have not been listed within this legal compliance register. Mt Weld Mining Limited (Lynas) are cognisant of their obligations under this agreement in relation to operational and closure aspects.

Appendix B Mt Weld – Stakeholder Engagement Register

Date of contact	LYC Contact	Contact and Position	Medium	Location	Main Topics of Discussion	Follow up Actions	Item Type	Path
7/02/2018	Tony Malloch	DMIRS: Laura Copeland	Letter		APPROVAL FOR MINING PROPOSAL WITH A MINE CLOSURE PLAN- TSF 3 AND PRODUCTION EXPANSION MINING PROPOSAL MT WELD RARE EARTH PROJECT ON L 38/98, M 38/58, M 38/59, M 38/326 and M 38/327. REGISTRATION ID: 71255 Tenement Conditions updated		Item	WA/OPS/Lists/WA Community Liaison Register
7/02/2018	Adam Cargill	Karen Caple - Acting Executive Director. DMIRS Resource and Environment Compliance	Letter	Letter via email	APPROVAL FOR MINING PROPOSAL WITH A MINE CLOSURE PLAN- TSF 3 AND PRODUCTION EXPANSION MINING PROPOSAL MT WELD RARE EARTH PROJECT ON L 38/98, M 38/58, M 38/59, M 38/326 and M 38/327. REGISTRATION ID: 71255	Nil	Item	WA/OPS/Lists/WA Community Liaison Register
24/10/2017	Adam Cargill Anthony Peters **Stantec:** Kim Bennett Rob Irwin John Leavy ATC Williams	DMIRS: Dan Endacott Damian Montague Laura Copeland Jan de Lange	Meeting,	100 Plan St. East Perth	Discussion of proposed TSF 3 design Closure strategy of TSf 1&2 and TSF 3 Response to DMIRS comments on previous MCP Identified key knowledge gaps related to 2017 version of the MCP and acceptability of presenting the MCP inclusive of these gaps provided timelines were presented for addressing them DMIRS accepted the proposed design of TSF3 being an unlined structure ue to the low permeability of the basement materials and the consolidated tails. The previously approved water shedding closure strategy for TSF1&2 is acceptable at this stage of operation due to the long mine life and adequate time for further studies regarding tails consolidation to inform if DMIRS's preferred option of a store and release cover system is viable. Knowledge gaps, including finalised completion criteria are acceptable for this MCP provided that timelines are presented for adressing them	Lynas agress to the comments of DMIRS and will include the listed items in the 2017 MCP submision.	Item	WA/OPS/Lists/WA Community Liaison Register
18/07/2016	Adam Cargill	OEPA - Floyd Brown	Email		Mine Closure Plan receipt confirmation. A Decommissioning Management Plan should be submitted closer to decommissioning in accordance with condition 8-1 of MS476	Nil	Item	WA/OPS/Lists/WA Community Liaison Register
24/05/2016	Adam Cargill	Adam Cargill, Environmental Advisor	DMP Mine Closure Plan Review	Via Email	Dear Adam My name is Alex Ruschmann and I am the assessing officer for the Mt Weld Mine Closure Plan. I am writing to request additional information and some changes to the MCP to continue the assessment. Could you please provide the following information: 1. The MCP states large amounts of the existing WRL will be utilised for the construction of TSF2. The proposed pit extension will also increase the proportion of radioactive material within the dump from 5% to 40%. Management of radioactive waste has also been highlighted as a current knowledge gap for the WRL. What management actions are in place to ensure radioactive material is not used for the construction of the TSF and that additional radioactive material to be mined will be fully encapsulated with the WRL? 2. The title of the MCP is a bit confusing as it ends in 'Plan.0' and I am not sure if anything was left off at the end or if the '.0' should even be there. 3. Please remove the exploration tenements E38/2224, E38/2359, E38/2558 from the title of the MCP. These do not have tenement conditions that require the submission of an MCP. The miscellaneous tenement 38/224 also does not have any tenement conditions that require the submission of an MCP. Please remove this tenement from the MCP or justify why it has been included. 4. Figure 2.2 displays a proposed topsoil stockpile on the eastern side of the storm water diversion channel for the process plant and TSF. This location is not appropriate as it will be subject to flooding and erosion. This proposed topsoil stockpile needs to be relocated to an area that is not subject to flooding. 5. Could you please forward me the report prepared by Outback Ecology in 2014 titled 'Mt Weld Project: Assessment of topsoil and mine waste materials'. This report should also be attached to the MCP as an appendix. Other items have been identified during the assessment but these can be address in the [illegible] of the MCP in 2018/2019	Adam Cargill to provide response to DMP queries	Item	WA/OPS/Lists/WA Community Liaison Register
29/09/2011	Robyn Bell	Kim Bennett Outback ecology	Phone call	Robyns Office	Finalise Mine Closure plan		Item	WA/OPS/Lists/WA Community Liaison Register
26/08/2011	Robyn Bell, Outback Ecology Melissa Bolton and Kim Bennett	DMP Katherine Mansis and Janine Cameron, DEC David Pickle and Jarrod	Meeting	DMP Kalgoolrie	Mine closure		Item	WA/OPS/Lists/WA Community Liaison Register
26/08/2011	Robyn Bell, Outback Ecology Melissa Bolton and Kim Bennett	DMP KAtherine Mansis and Janine Cameron	Meeting	DMP Kalgoorlie	Mine Closure Plan layout discussion		Item	WA/OPS/Lists/WA Community Liaison Register
25/08/2011	Tony Hadley, John Croall, Robyn Bell	Various Stakeholders	Meeting	Laverton Shire hall	Mine Closure Stakeholder Meeting, Laverton		Item	WA/OPS/Lists/WA Community Liaison Register
12/08/2011	Robyn Bell, Erin Levee	Annette Nykiel, LLCCA	Meeting	Lynas office, then lunch	Mine Closure Meeting planning of Wongatha bus, LLCCA volunteers for tea/coffee/hall hire, Isiah, Wirrapanda Foundation, Ask Janet: Resident policies, Jayden Max Employment.		Item	WA/OPS/Lists/WA Community Liaison Register
8/08/2011	John Croall, Robyn Bell, Mike Vaisey	DOW, DMP, Kasa, Outback Ecology	Meeting	Lynas boardroom	Mine Closure Stakeholder Meeting, Perth		Item	WA/OPS/Lists/WA Community Liaison Register

Appendix C Mt Weld – Waste Characterisation Study

MT WELD WASTE MATERIALS CHARACTERISATION

PREPARED FOR **LYNAS CORPORATION**

September 2020

Stantec

QUALITY STATEMENT

PROJECT MANAGER	PROJECT TECHNICAL LEAD
Tracy Schwinkowski	Kim Bennett

PREPARED BY		
Mary-Anne Lowe	…………………………………………	23 / 06 / 2020
CHECKED BY		
Kim Bennett	…………………………………………	23 / 06 / 2020
REVIEWED BY		
David Jasper	…………………………………………	18 / 06 / 2020
APPROVED FOR ISSUE BY		
Kim Bennett		07 / 09 / 2020

PERTH
Ground Floor, 226 Adelaide Terrace, PERTH, WA 6000
TEL +61 (08) 6222 7000

REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
0.1	19/06/20	Draft	MA. L	KB	DJ	
0.4	23/06/20	Draft	MA. L	KB	DJ	KB
	29/08/20	Client Review	Adam Cargill			
1.0	7/09/2020	Final Report	MA. L	KB	KB	KB

Executive Summary

Mt Weld Mining Pty Ltd, a wholly owned subsidiary of Lynas Corporation Ltd (Lynas), operates the Mt Weld Rare Earths Mine. Lynas are currently planning mining operations for the Mining Campaign 4 Open Pit cutback at Mt Weld.

Stantec Pty Ltd (Stantec) was commissioned in 2019 to conduct a materials characterisation assessment for the Mining Campaign 4 Open Pit cutback. For this assessment, there was a focus on materials that may potentially be used for armouring purposes or require encapsulation. These materials have been previously identified and characterised, however, require further characterisation as improved understanding of the material has resulted in an expanded classification. The materials identified for characterisation in this study were Calcrete limestone (CC), Lake clay (LC), and Alluvium (AL).

Sampling of these materials was conducted by Lynas and analysis conducted by Stantec. Analysis included the characterisation of physical, chemical and geochemical properties.

Physical Characteristics

The waste materials sampled (CC, LC and AL) were analysed for physical parameters of texture, gravel percentage, stability, strength, drainage and water retention. The materials vary in according to the resource. The variation in physical characteristics was largely due to the variation in soil texture, the CC material was a loam to silty clay with 23% coarse content, the LC was a clay with no coarse material, and AL was sand to sandy loam with 24% coarse content. While the CC material was structurally stable due to carbonates the LC both swelled and dispersed and the AL material partially dispersed. The material of the CC and LC both exceeded the limit of 60 kilopascals (kPa) for soil strength that indicate it to be potentially problematic, with the LC indicating hard setting, while the AL material was very weak. Due to the swelling tendencies and higher clay contents the CC and LC had extremely slow drainage while the AL had very rapid drainage. Water retention showed that CC and LC had moderate effective plant available water and the AL had low effective plant available water.

Chemical Characteristics

The chemical parameters tested in this material were pH, salinity, effective cation exchange capacity (eCEC), sodicity and nutrient contents. The chemical characteristics of the resource material were considerably more uniform between the different waste materials. The results showed all resource materials were moderately alkaline on the pH_{CaCl} scale and the salinity only varied from slightly saline to non-saline. The effective cation exchange capacity was notably higher (very high) in the LC, likely due to the significantly higher clay content, however, the CC and AL materials were still high. The exchangeable sodium, indicating sodicity and instability, showed the CC and AL materials were both sodic while the LC reported to be highly sodic.

Ammonium-nitrogen did not vary greatly between materials, while the AL had a greater nitrate-nitrogen than the CC and LC materials. The phosphorus and sulphur concentrations were low in all materials, while the potassium was extremely high for the AL material and high for the CC and LC materials.

Geochemical Characteristics

No material was problematic for its acid base accounting results, with all of the CC material presenting as acid consuming while the LC and AL materials present as acid consuming and non-acid forming. The only exceedance of the Geochemical Abundance Index, indicating enrichment was for sulphur in the LC material.

Exceedances of total elements in the CC material included arsenic, cadmium, nickel and zinc, with cadmium exceeding the Interim sediment quality guidelines (ISQG)-high threshold and zinc exceeding its environmental investigation level (EIL) threshold. The LC material exceeded for arsenic, chromium, lead and nickel, exceeding both the EIL and ISQG-high thresholds for arsenic, while exceeding the ISQG-high threshold for nickel and not the EIL. The AL material exceeded thresholds for chromium and nickel, however, these did not exceed the EIL or ISQG-high. There were no exceedances in the dissolved elements for the CC material. For the LC and AL materials, however, there were exceedances in soluble aluminium, chromium, cobalt, copper, lead, nickel and zinc.

Preliminary Soil Resources and Recommendations

The CC material has a variable coarse material fraction and therefore is recommended for different uses based on these variations. The material is structurally stable but has a low hydraulic conductivity and has a tendency for hard setting. With the low coarse content material, it is recommended that this is encapsulated within a landform and not placed on a landform surface. For the CC material with a higher coarse content, it is recommended that this be used for rock armouring. Given the different uses it is recommended that the calcrete material, from now, is mined and stockpiled separately as Calcrete – soft and Calcrete – coarse.

The LC materials are not recommended for use on landform surfaces, due to their low coarse content, extremely slow drainage, and tendency for hard setting. Additionally, the LC material is characterised as having properties that increase erosivity. The LC material could potentially be used in scenarios where low hydraulic conductivity is required and erosion is not an issue, it is, therefore, suitable for its current utilisation as a tailings impermeable liner.

The AL material has a large coarse material fraction and therefore has potential as rock armouring. The soil faction of the material, however, is also partially dispersive and sodic, and so potentially has a propensity for erosion. The course fraction has also been noted to break-up under compaction (pers comm. Adam Cargill 2020), consequently an understanding of the material durability before use it is recommended in addition to minimal traffic compaction on application. The use of the material is also recommended for the lower, flatter slopes of landforms with appropriate construction for the capture of sediments.

An inventory of all waste materials previously identified, and their characterisation has also been compiled.

Abbreviations

ABC	Ambient background concentration
ACL	Added contaminant limit
ANZECC	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
ASLP	Australian Standard Leaching Procedure
ASRIS	Australian Soil Resource Information System
BoM	Bureau of Meteorology
DEC	Department of Environment and Conservation
DER	Department of Environmental Regulation
DIIS	Department of Industry, Innovation and Science
DMIRS	Department of Mines, Industry Regulation and Safety
dS/m	deciSiemens per metre
EC	Electric conductivity
eCEC	Effective cation exchange capacity
EIL	Environmental Investigation Level
ePAW	Effective plant-available water
ESP	Exchangeable sodium percentage
GAI	Geochemical Abundance Index
GIL	Groundwater investigation level
GIS	Geographical Information Systems
ha	Hectare
ISQG	Interim sediment quality guidelines
IBRA	Interim Biogeographic Regionalisation for Australia
K_{sat}	Saturated hydraulic conductivity
kg	Kilogram
km	Kilometres
kPa	Kilopascals
LOR	Limit of Reporting
LSL	Lower storage limit
meq/100g	Milliequivalents per 100 grams of soil
mg/kg	Milligrams per kilogram
mg/L	Milligrams per litre
m	Metre
mm	Millimetres
mm/hr	Millimetres per hour
MoR	Modulus of Rupture

NEPM	National Environmental Protection Measure
NORM	Naturally Occurring Radioactive Material
PAW	Plant-available water
pH_{CaCl}	Soil pH measured in a 0.01M calcium chloride solution suspension
pH_{w}	Soil pH measured in a 1:5 soil water suspension
PSD	Particle size distribution
RL	Relative Level
Stantec	Stantec Australia Pty Ltd
µS/cm	microSiemens per centimetre
USL	Upper storage limit
WRL	Waste rock landform

Glossary

Aggregate (or ped)	A cluster of primary particles separated from adjoining peds by natural planes of weakness, voids (cracks) or cutans.
Clay	The fraction of mineral soil finer than 0.002 mm (2 µm).
Coarse fragments	Particles greater than 2 mm in size.
Electrical conductivity	The ability of a soil to conduct an electrical charge, related closely to the salinity of a soil.
Exchangeable sodium percentage	When sodium cations (Na+) dominate the total exchangeable cations on soil exchange surfaces. Soil with Na+ cations in excess of more than 6% are deemed sodic.
Massive soil structure	Coherent soil, no soil structure, separates into fragments when displaced. Large force often required to break soil matrix.
Modulus of Rupture (MoR)	This test is a measure of soil strength and identifies the tendency of a soil to hard-set as a direct result of soil slaking and dispersion.
Plant-available water	The ability of a soil to hold that part of the water that can be absorbed by plant roots. Available water is the difference between field capacity and permanent wilting point.
Single grain structure	Loose, incoherent mass of individual particles. Soil separates into individual particles when displaced.
Soil pH	The negative logarithm of the hydrogen ion concentration of a soil solution. The degree of acidity or alkalinity of a soil expressed in terms of the pH scale, from 2 to 10.
Soil structure	The distinctness, size, shape and arrangement of soil aggregates (or peds) and voids within a soil profile. Can be classed as 'apedal', having no observable peds, or 'pedal', having observable peds.
Soil strength	The resistance of a soil to breaking or deformation. 'Hardsetting' refers to a high soil strength upon drying.
Soil texture	The size distribution of individual particles of a soil.
Subsoil	The layer of soil below the topsoil or A horizons, often of finer texture (i.e. more clayey), denser and stronger in colour. Generally considered to be the 'B-horizon' above partially weathered or un-weathered material.

Lynas Corporation

Mt Weld Waste Materials Characterisation

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1. Introduction

Mt Weld Mining Pty Ltd, a wholly-owned subsidiary of Lynas Corporation Ltd (Lynas), operates the Mt Weld Rare Earths Mine, located approximately 35 kilometres (km) southeast of Laverton, in the Murchison region of Western Australia (**Figure 1-1**) The pre-mining land use of the area was pastoral, although the area was de-stocked prior to 2007 and before mining commenced.

Lynas are currently undertaking mine planning for the Mining Campaign 4 Open Pit cutback. The focus of this study has been the characterisation of the waste units generated from the Mining Campaign 3 pit cutback. These materials have previously been identified and characterised, however, it was recognised that further characterisation would result in an improved understanding of the materials that are proposed to be mined during the Stage 4 Mining Campaign and their appropriate onsite management and utilisation. The materials identified for characterisation in this study were Calcrete limestone (CC), Lake clay (LC), and Alluvium (AL). The findings of this study have resulted in an improved understanding of the classification of the key lithological units and refinement of the waste material inventory.

1.1 Report Scope and Objectives

The specific objectives of this investigative task were to;

- review existing information pertaining to waste rock materials at Mt Weld;
- review recent information on material types to select representative mine waste samples;
- laboratory analysis of the physical, chemical and geochemical properties of the mine waste samples collected by Lynas;
- development of an updated mine waste material inventory for life of mine (LOM), detailing volumes and characteristics of the mine waste materials (depending on availability of disturbance footprint and waste material volume information); and
- preliminary recommendations for the optimal use and placement of waste materials for future rehabilitation activities, specifically regarding suitability for armouring purposes or encapsulation requirements.

The assessment of waste resources was conducted in accordance with the following guidelines:

- Department of Mines, Industry Regulation and Safety (DMIRS), Statutory Guideline for Mine Closure Plans (DMIRS 2020, Part 1);
- Department of Mines, Industry Regulation and Safety (DMIRS), Mining Proposal Guidance – how to prepare in accordance with the Statutory Guidelines (DMIRS 2020, Section 8.3); and
- Department of Industry, Innovation and Science (DIIS) Leading Practice Sustainable Development Program for the Mining Industry – Preventing Acid and Metalliferous Drainage Handbook (DIIS 2016).

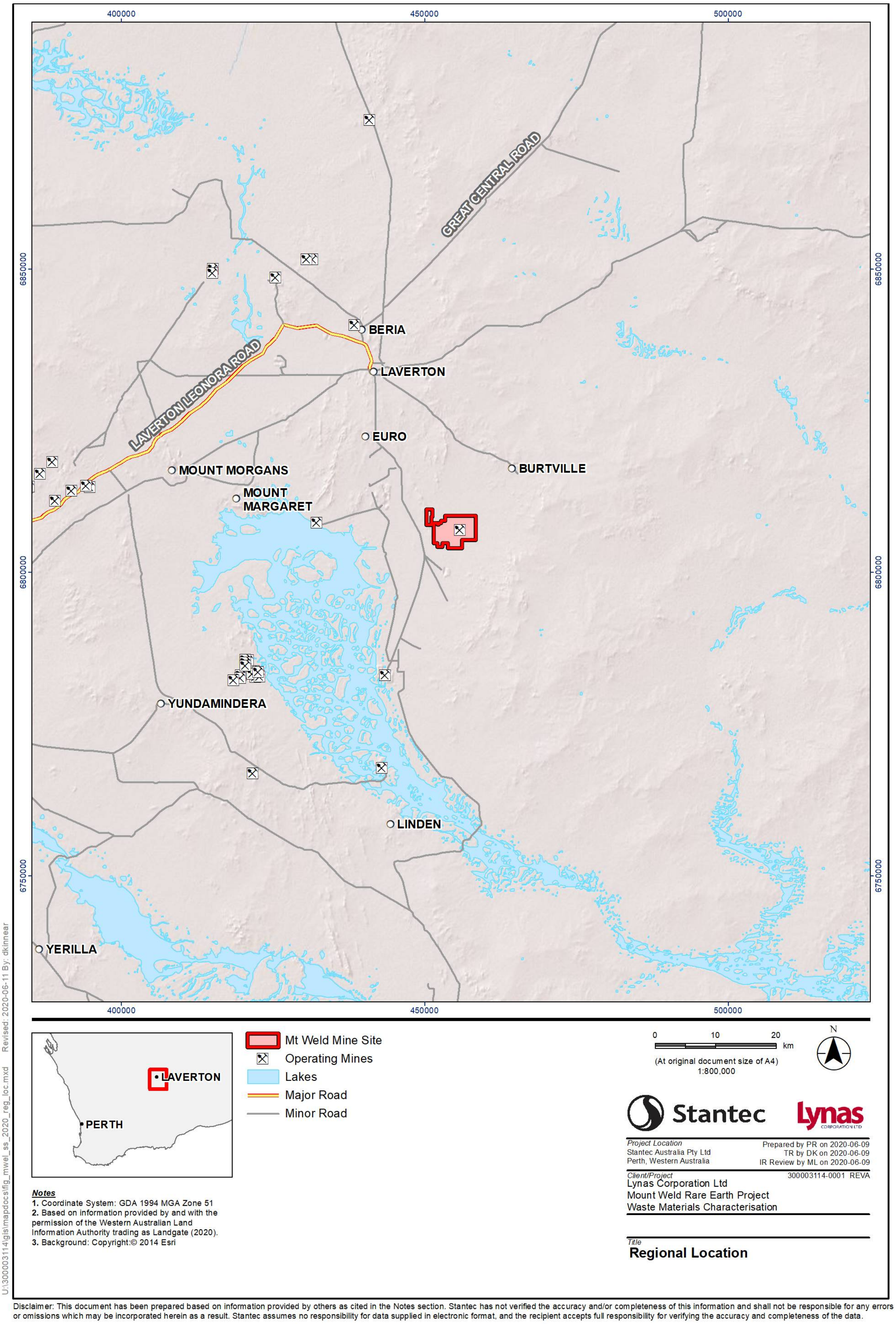

Figure 1-1: Regional location of the Mt Weld Mine Site

2. Background Information

2.1 Biogeographical Context and Land Use

Mt Weld Mine lies within East Murchison subregion of the Murchison bioregion, as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) classification system (Thackway and Cresswall 1995). The subregion covers an area of 7,847,996 ha and is characterised by internally draining salt lakes within palaeodrainage systems.

The geology comprises extensive areas of elevated sandplains with minimal dune development, broad plains of red-brown soils, and breakaway complexes are also prolific across the landscape. Vegetation associations are dominated by mulga woodlands, hummock grasslands, saltbush shrublands and *Tecticornia* shrublands, particularly adjacent to salt lakes. There are numerous listed flora and fauna species known to occur within the subregion, as well as potentially important habitat hosting diverse biological assemblages (Thackway and Cresswall 1995).

The East Murchison subregion hosts numerous land uses, including grazing of native pastures which, together with mining (mostly gold and nickel) accounts for approximately 86% of total land use. The Mt Weld mine lies within Mt Weld Station, an historic sheep station, which has been destocked. Unallocated Crown Land and Crown Reserves accounts for a further 11%, while conservation estates account for less than 2% of total land use. The majority of the subregion has been extensively degraded by grazing (Cowan 2001; McKenzie et al. 2003). The introduction of feral animals and subsequent predation on native fauna is also of concern (Cowan 2001).

2.2 Climate

The Murchison region is characterised by an arid climate with an annual average rainfall of approximately 200 millimetres (mm), and experiences both summer and winter rainfall (Beard 1990; Pringle et al. 1994). Rainfall can be unreliable in this region, with potential for no rainfall in any one month (Pringle et al. 1994). Large rainfall events during summer (November – March) are not uncommon in the region due to tropical low pressure systems that form in the north of Western Australia and track southeast. **Figure 2-1** shows the long term climate averages recorded at the Laverton Aero Weather Station since 1991.

Weather data has been collected since 1994 at the Laverton Aero Station (station number 012305) (BOM 2020), located approximately 30 km northwest of the Mt Weld operation. The station receives an annual average rainfall of 293.1 mm with mean maximum temperatures ranging between 35.6°C in summer (January) and 18.5°C in winter (July) (BOM 2020). The prevailing wind direction is from the west.

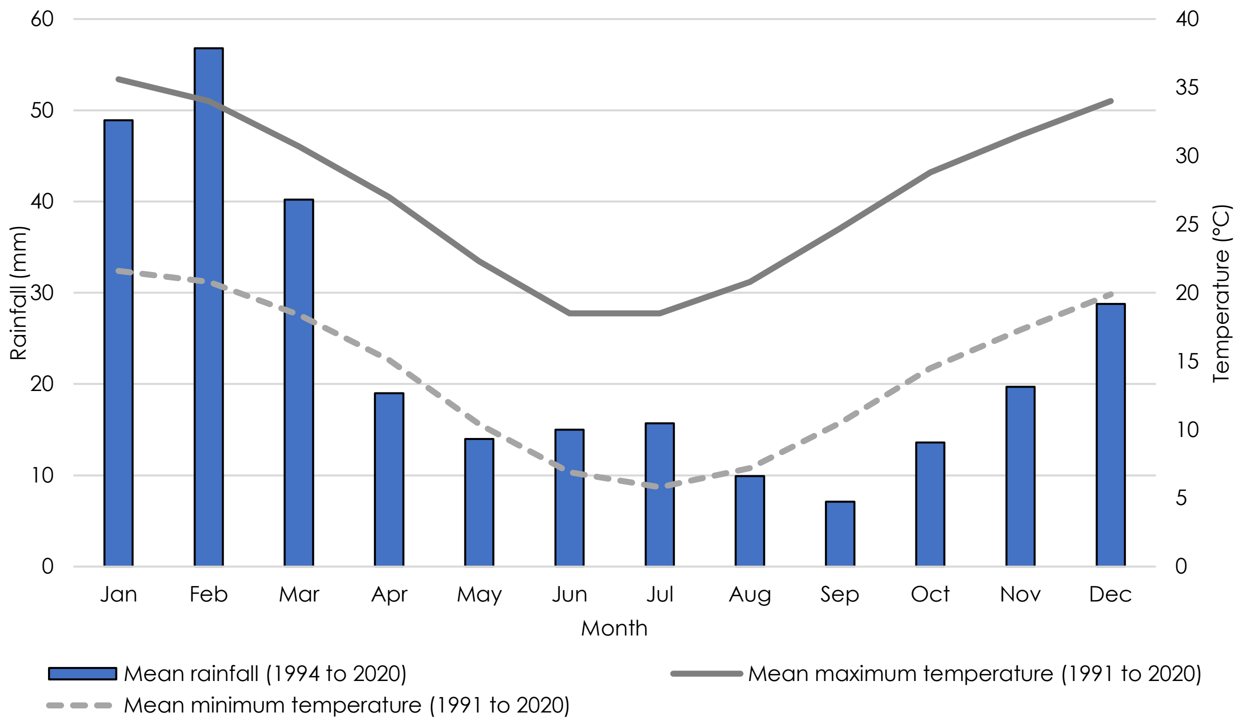

Figure 2-1: Long term climate data (1991 to 2020) recorded at Laverton Aero (Station number 012305) weather station

2.3 Regional and Local Geology

2.3.1 Regional Geology

The Mt Weld mine occurs within the Yilgarn Shield of Western Australia. The area consists mainly of granite and granite-gneiss cut by narrow north-northwest trending belts of Archaean age metasedimentary and metavolcanic rocks, generally referred to as 'greenstone' belts. The land system and landform pattern of the area consists primarily of ironstone hills and ridges that drain to lower colluvial and alluvial plains (Pringle et al. 1994).

2.3.2 Local Geology

Geology of the Mt Weld Carbonatite comprises a subcircular stock of carbonate-rich granitoid, intruded into Archaean volcanogenic basement rocks. A northwest-trending dolerite dyke transects the intrusive, subdividing it into two approximately equal (western and eastern) parts. Surrounding the carbonatite is a glimmeritic alteration zone. A 30-metre (m) thick sequence of superficial formations overlies the carbonatite. These formations comprise transported alluvial sands, calcrete and lacustrine clays (Dames and Moore 2001).

The surface geology (**Figure 2-2**) shows a large representation of colluvium and some sedimentary rocks.

2.3.3 Soils and Landforms

The Mt Weld mine site intersects with five different regional land systems, these being the Brooking system, Gundockerta system, Jundee system, Mindura system and Monk system (**Figure 2-3**). The system most prominently intersecting is the Monk system which is largely characterised by hardpan plains and loamy tracts (Pringle et al. 1994).

The mine site intersects one regional soil unit (**Figure 2-4**), the BE15 unit (ASRIS, 2014). This soil unit is characterised by gently undulating bedrock with stony and gravelly pavements intersected by seasonal streams. The main soils are shallow earthy loams (Um5.3) with shallow red earths (Gn2.12), both underlain by red-brown hardpan. Within this unit it is also common to have inclusions of soils from adjoining units.

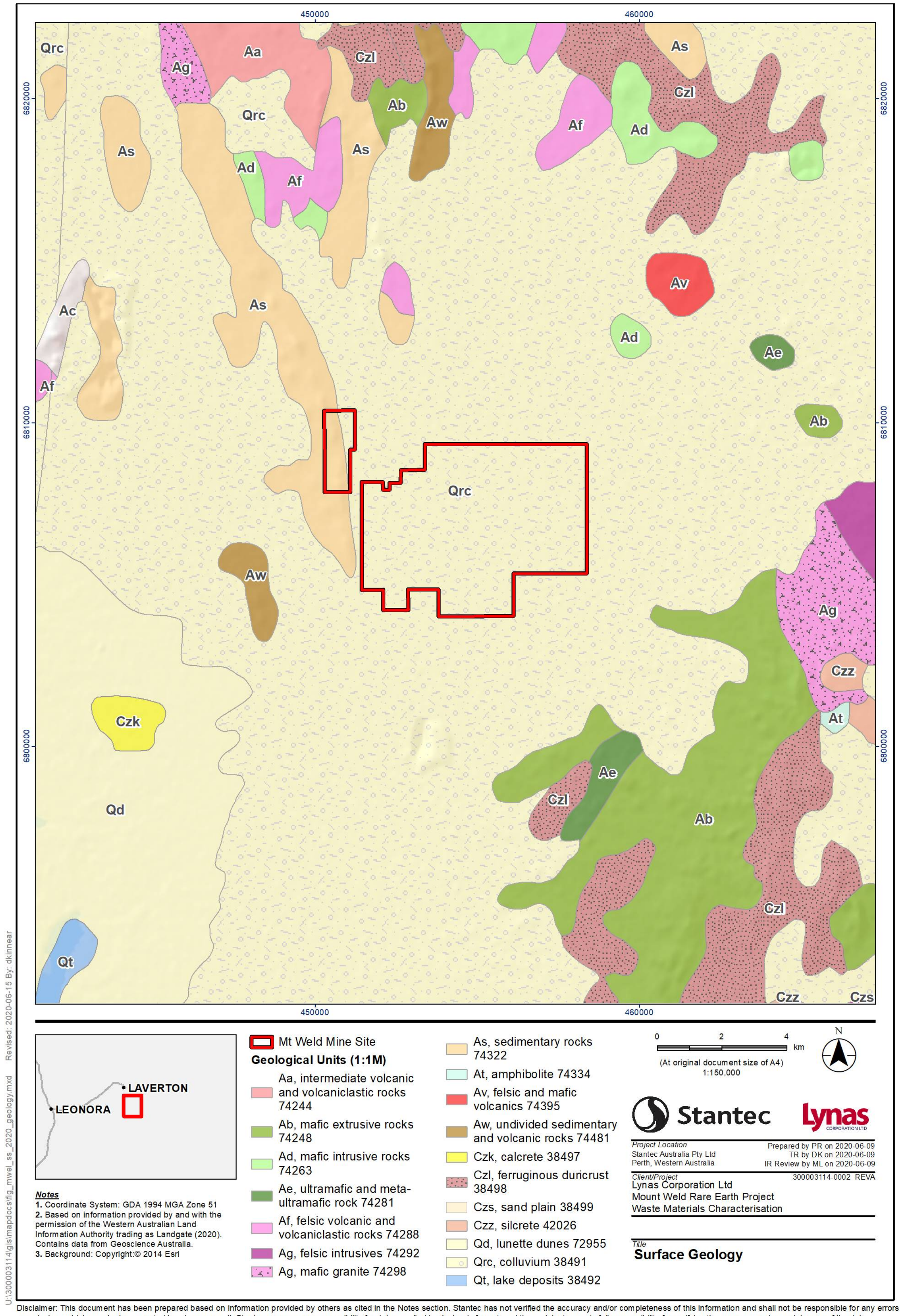

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Figure 2-2: Geological units of the Mt Weld mine site area

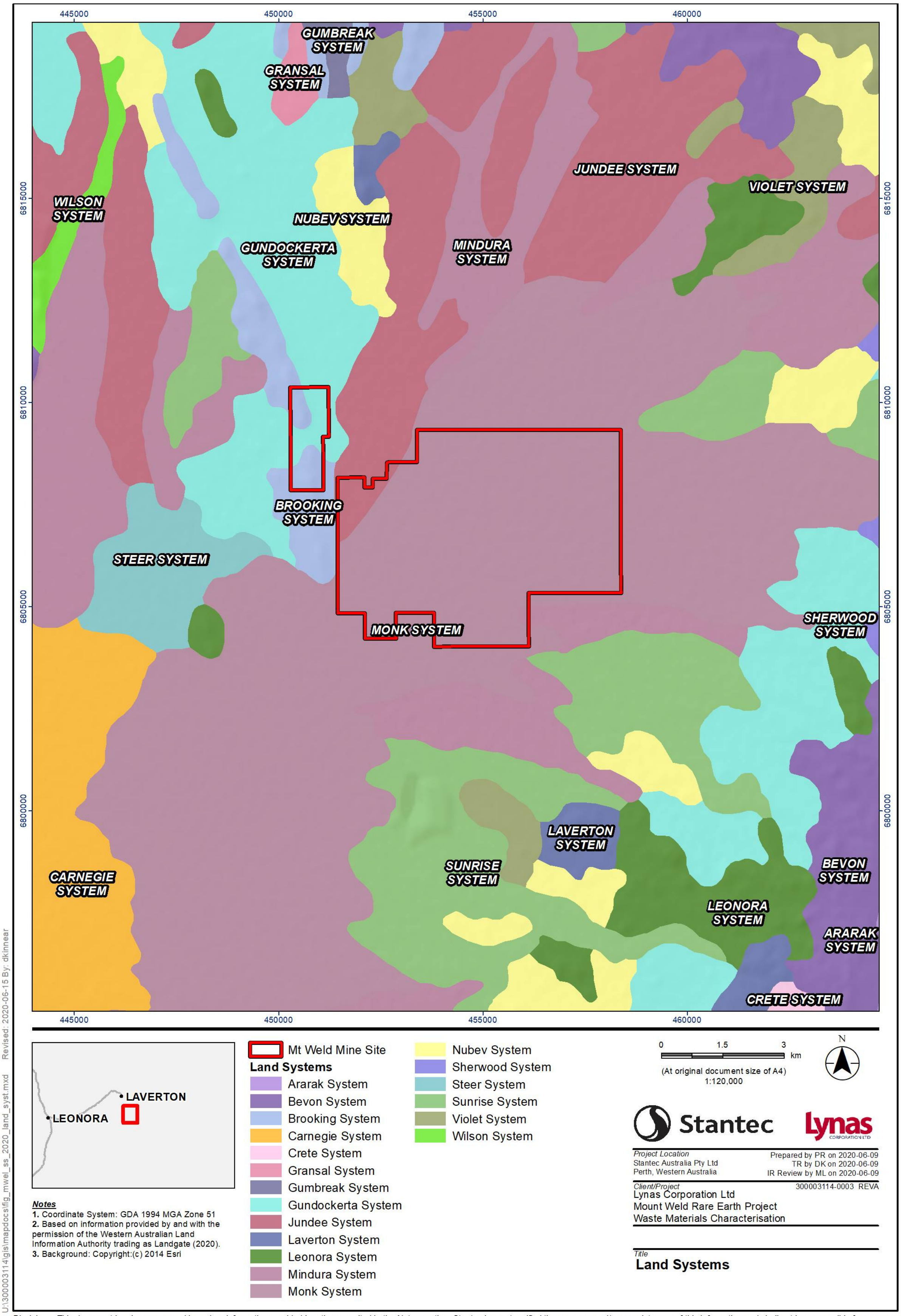

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Figure 2-3: Land Systems of the Mt Weld mine site area

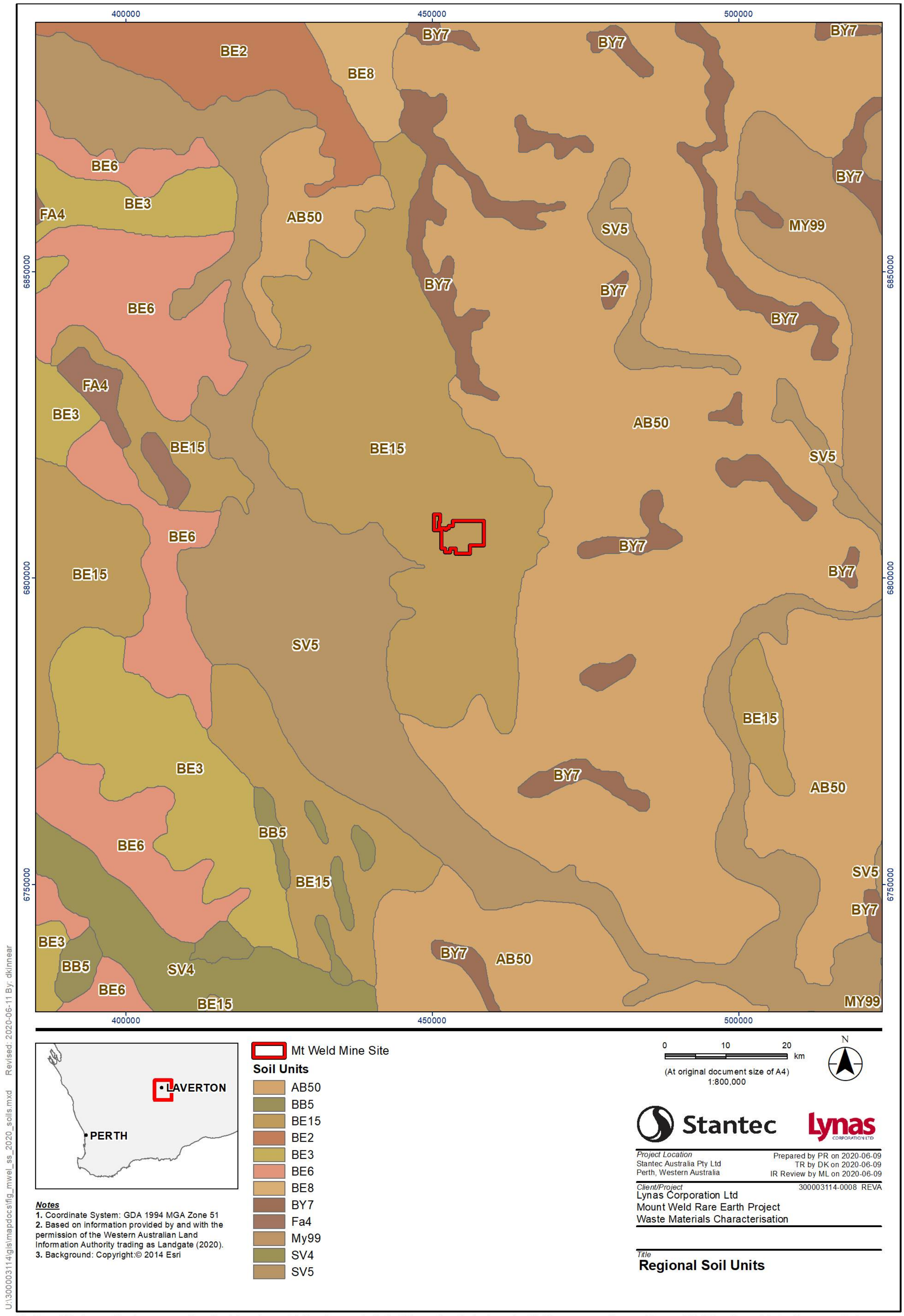

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Figure 2-4: Soil units of the Mt Weld mine site area

Specifically, the Mt Weld mine is located on an alluvial plain that comprises deposits of highly oxidised, quartz and ironstone sand/gravel. There has been minimal development of soil profile within the alluvial plain. Organic material is incorporated in surface sand directly beneath isolated mulga shrubs and thickets, otherwise organic material is sparse. Leaf litter and seeds concentrate around generally dormant, ground hugging, *Eremophila* shrubs and sparse wanderrie grass. It has been observed that during the infrequent sheet-flood events, surface water up to 10 centimetres (cm) deep, lifts the organic debris and washes it across the Project area to form thick banks and tidemarks in the stream system to the west and south (Stantec, 2017).

The alluvial sequence over the rare earths deposit has been modified to some extent by groundwater which has largely resulted in weakly consolidated alluvium below the water table and strongly cemented alluvium above (i.e. in the upper 14 m of the alluvial sequence).

In diamond core samples, it is very difficult to discern any difference in the structure or composition of the vertical profile from around 14 m depth to the surface, except that the strong cementing, which is evident in most of the profile is weaker in the top half metre or so closest to the surface (Stantec, 2017). The hundreds of shallow pits constructed and backfilled during the course of exploration and definition drilling attest to the homogeneity of the surface alluvium profile across the entire 5 km by 4 km area of the Mining Leases.

2.4 Surface Hydrology

Regional drainage comprises three broad parallel drainage systems flowing to the southeast towards the Nullarbor Bioregion. Within the Mt Weld mine area, land gently slopes west from the ranges towards Lake Carey, which is on one of these broad drainage systems. Windich Creek is located west of the Mt Weld mine area and is a predominant tributary of the lake. There is also a large catchment to the east of the Mt Weld mine, the eastern-most portion of which has undulating topography, with runoff via a system of natural drainage channels. The lower portion of the catchment is much flatter and drainage is poorly defined, with runoff likely driven by sheet flow in a westerly direction during heavy rainfall (Environ 2006).

The total surface area within the catchment divide and north of the Golden Ring Well creeks is approximately 389 km^2, although the effective catchment area impacting the site is estimated at 10.95 km^2. Regardless, management of surface water is via protection measures including bunding and diversion channels. Bunds and diversion channels around the Mt Weld mine area have been constructed to ensure that surface runoff re-joins the natural drainage system immediately downslope (Environ 2006).

2.5 Hydrogeology

Groundwater Resources comprise two aquifer systems overlying the fresh carbonatite bedrock at Mt Weld (Dames & Moore 2001):

- An unconfined aquifer (superficial aquifer) of regional extent formed by the superficial formations, with local basal elevation of about 400 mRL. The natural water table was originally at an elevation of 410 to 411 mRL, about 15 m below the ground.
- A confined/semi-confined aquifer (weathered carbonatite aquifer), formed by the carbonatite regolith. This aquifer is known to occur from 315 to 395 mRL, although is of limited extent below 355 mRL. Natural groundwater levels were originally similar to the water table elevations within the superficial aquifer.

The superficial and weathered carbonatite aquifers are separated by discontinuous beds of lacustrine clay. Vertical leakage occurs between the aquifers in areas where the lacustrine clays are absent and via bedding features, structural features and the numerous boreholes within the carbonatite area. Regional groundwater flow is towards the southwest and Lake Carey, with recharge largely a result of groundwater through flow (Dames and Moore 2001).

The water is drawn from a sub-circular weathered carbonatite aquifer, which is divided into almost equal western and eastern parts by a poorly permeable dolerite dyke. The weathered carbonatite aquifer is overlain by a superficial aquifer that has been largely dewatered for several years (URS 2005). It has been estimated that the groundwater resource storage component may be effectively depleted in six to seven years, meaning abstraction is unsustainable in the longer term (AECOM 2017; Stantec 2019).

3. Methods

3.1 Sampling

A total of 18 samples were collected from three re-characterised materials (**Table 3-1**), with some contamination in the first calcrete sample (CC01). These samples were taken from stockpiles, waste rock landforms (WRLs), and windrows across the Mt Weld site (**Figure 3-1**). Samples were selected and collected by Lynas personnel and were dispatched to Stantec after radiation sampling.

Locations of sampling points in relation to their stockpiles can be seen in **Figure 3-2**, **Figure 3-3** and **Figure 3-4**. These stockpiles showing stockpile volumes as calculated from the survey of the stockpile.

Table 3-1: Sample identification and material type

Sample ID	Sample Date	Landform	Coordinates (GDA94, UTM Zone 51J)		Material Description
			Easting	Northing	
CC01	04-03-20	Lake clay stockpile	0455358	6807593	Calcrete limestone
CC02	04-03-20	Calcrete limestone dump pile	0456322	6807485	Calcrete limestone
CC03	04-03-20	Calcrete limestone dump pile	0456427	6807522	Calcrete limestone
CC04	07-03-20	Calcrete limestone windrow	0456252	6807534	Calcrete limestone
CC05	07-03-20	Calcrete limestone windrow	0456265	6807554	Calcrete limestone
CC06	07-03-20	Calcrete limestone windrow	0456283	6807591	Calcrete limestone
LC01	04-03-20	Lake clay stockpile	0455388	6808137	Lake clay
LC02	04-03-20	Lake clay stockpile	0455393	6807515	Lake clay
LC03	04-03-20	Lake clay stockpile	0455377	6807582	Lake clay
LC04	04-03-20	Lake clay stockpile	0455370	6807590	Lake clay
LC05	04-03-20	Lake clay stockpile	0455366	6807586	Lake clay
LC06	04-03-20	Lake clay stockpile	0455362	6807575	Lake clay
AL01	04-03-20	Alluvium stockpile	0454850	6807468	Alluvium
AL02	04-03-20	Alluvium stockpile	0454826	6807470	Alluvium
AL03	04-03-20	Alluvium stockpile	0454815	6807446	Alluvium
AL04	04-03-20	Alluvium stockpile	0454811	6807419	Alluvium
AL05	04-03-20	Alluvium stockpile	0454820	6807400	Alluvium
AL06	07-03-20	Windrow alluvium dump pile	0457107	6806352	Alluvium

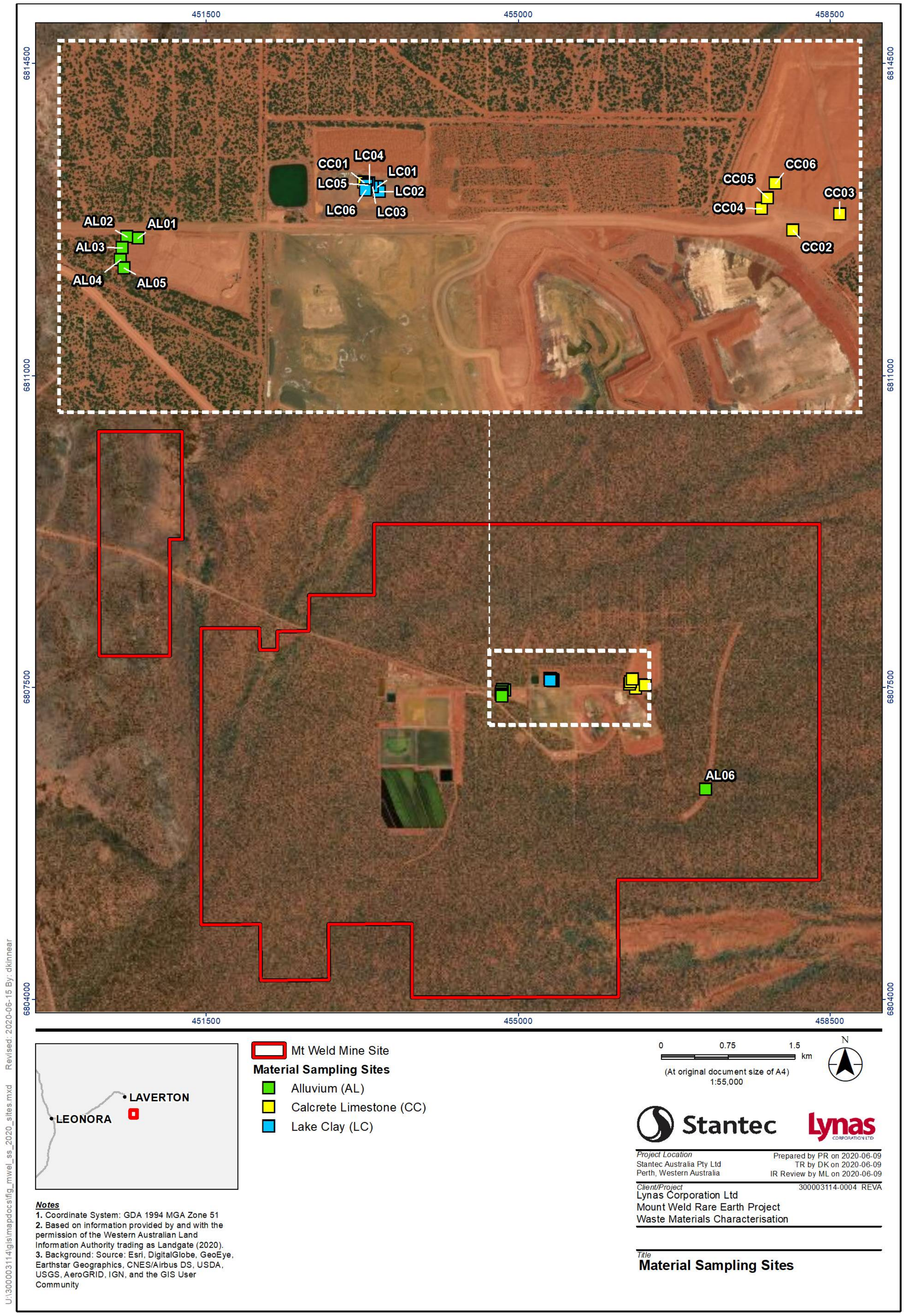

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Figure 3-1: Locations of Mt Weld sampling sites

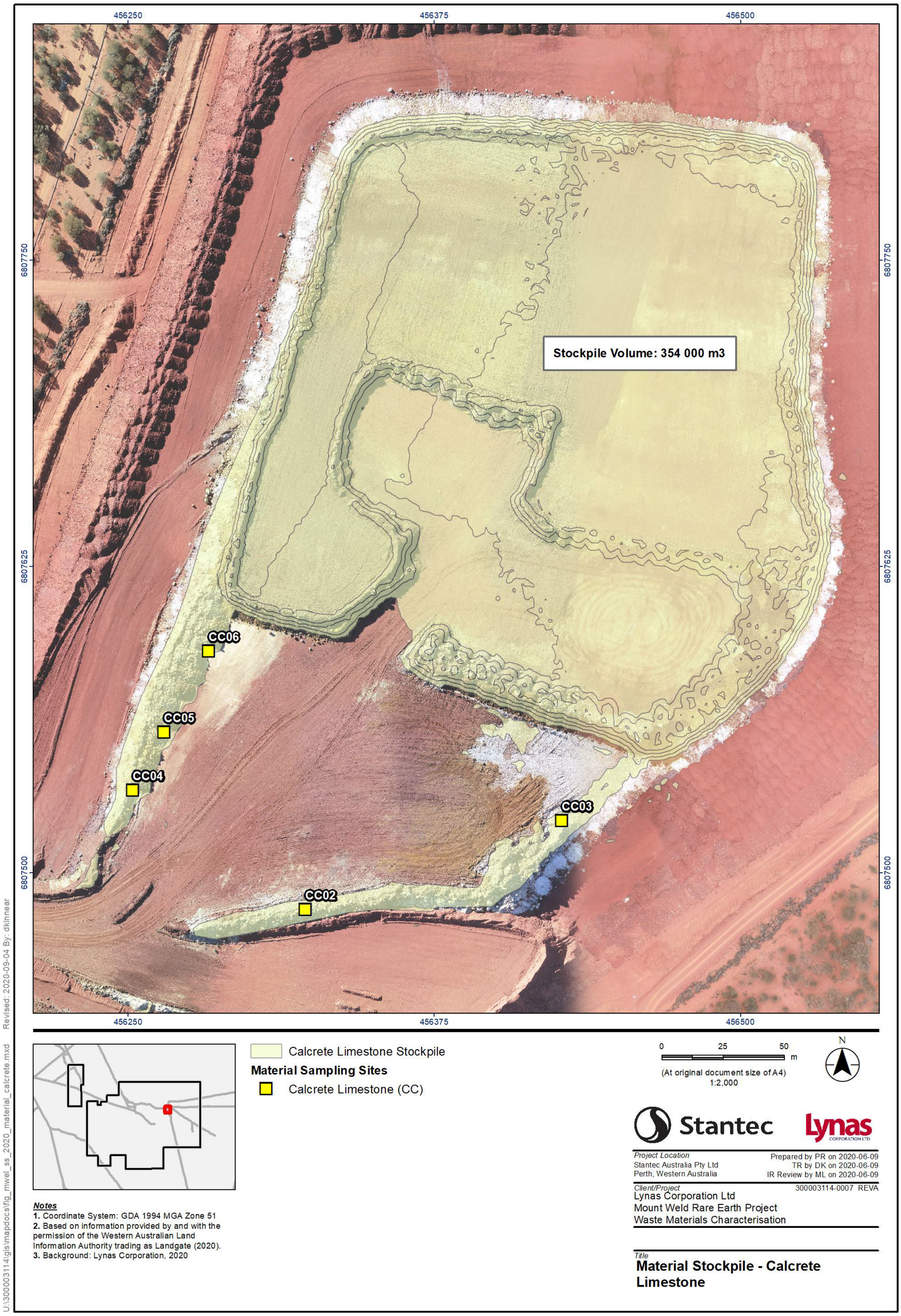

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Figure 3-2: Calcrete limestone stockpile and sampling sites, with stockpile volume

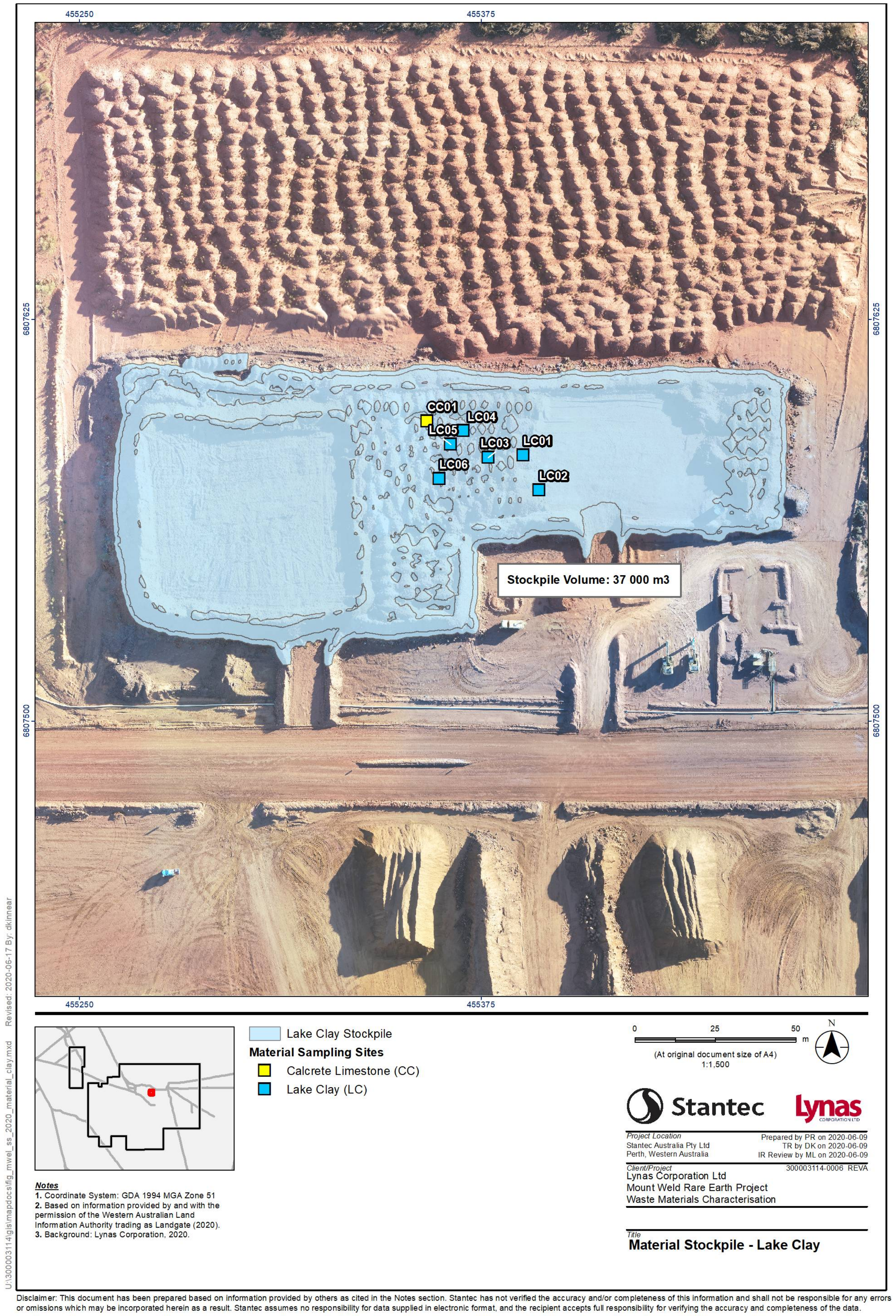

Figure 3-3: Lake clay stockpile and sampling sites, with stockpile volume and including one calcrete sampling site

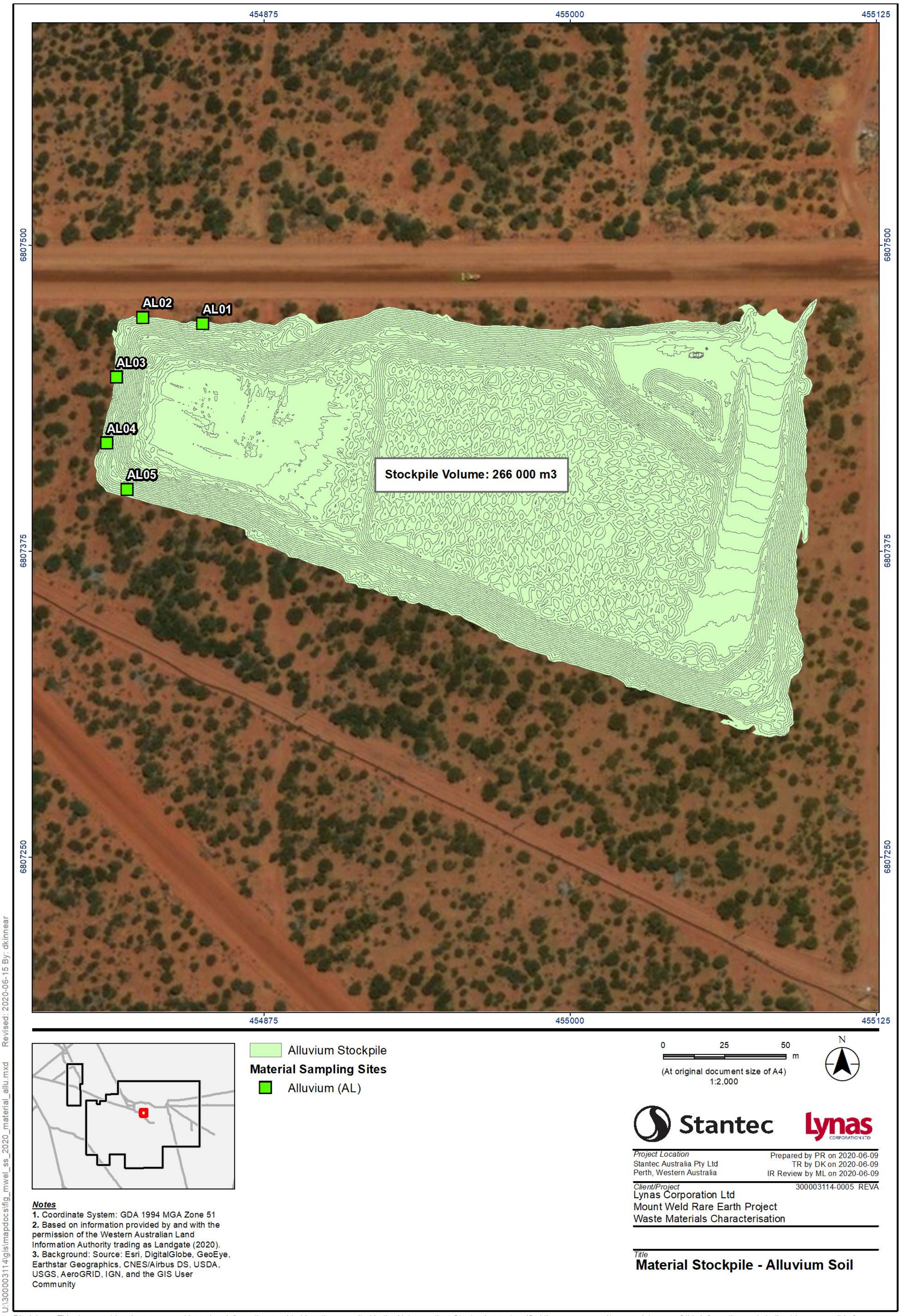

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Figure 3-4: Alluvium stockpile and sampling sites, with stockpile volume

3.2 Testwork and Procedures

Laboratory testwork was conducted at the Stantec in-house laboratory for the majority of soil physical testing. Samples were also sent to ALS Environmental Laboratory for remaining physical, chemical and geochemical analysis. All soil testwork procedures are developed in accordance with standard analytical procedures to assess material erodibility and properties related to the support of plant growth (Rayment & Lyons, 2011). Descriptions of procedures and methods of assessment are described in **Appendix E**.

Ten samples were selected for the full suite of test, nine samples were identified as representative samples (three in each material), with CC01 additionally selected due to understand its potential differences.

Further to the standard preparation of splitting and sieving samples, the Lake clay samples, that had dried into a hard aggregate, were also hand crushed. This process allowing access to the soil fraction (<2 mm) of the material without breaking further into smaller particle sizes.

All laboratory results are provided in **Appendix C**, with primary laboratory reports from **Appendix D**.

4. Results

4.1 Physical Characteristics

4.1.1 Texture and Particle Size

Texture classifications for the soil sized fraction (<2 mm) of the materials ranged from Sand to Heavy clay (**Appendix C, Table C-1**). Analysis of particle size distribution (PSD) was undertaken on ten selected representative samples. The CC samples ranged from silty loam to silty clay with clay contents from 16 to 51% (**Figure 4-1**), with CC01 containing the highest silt content by 5%, however sitting within range for all other samples. Clay content was highest in the LC with all samples identified as clay and an average content of 81.5%, while the AL had the highest sand content with an average of 84.8% (**Figure 4-1**).

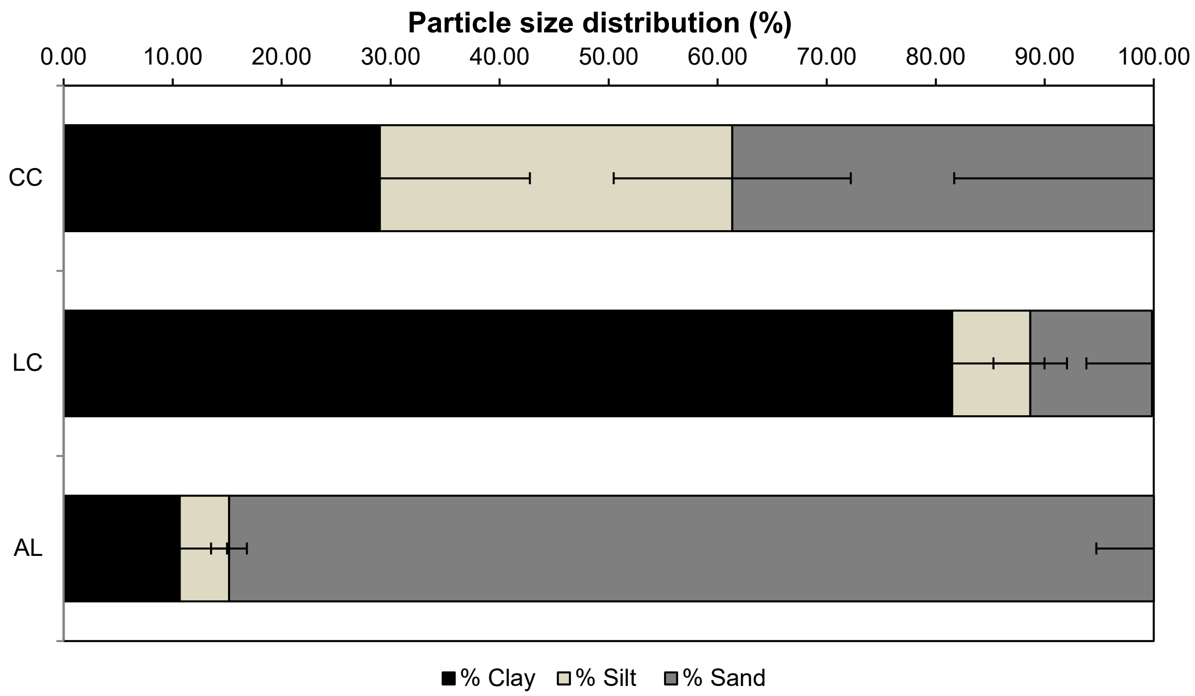

Figure 4-1: Mean particle size distribution of the soil fraction (<2 mm) of materials collected in the Mt Weld mine site

Error bars indicate standard deviation

The coarse fraction (>2 mm) content of the samples varied according to sample material (**Figure 4-2**). The average coarse material of the CC and AL samples were 23.2% and 76.0%, respectively, however no coarse material was found in the LC material. Though the LC material appeared to be gravel, this was hard set clay and no coarse material was found after hand crushing.

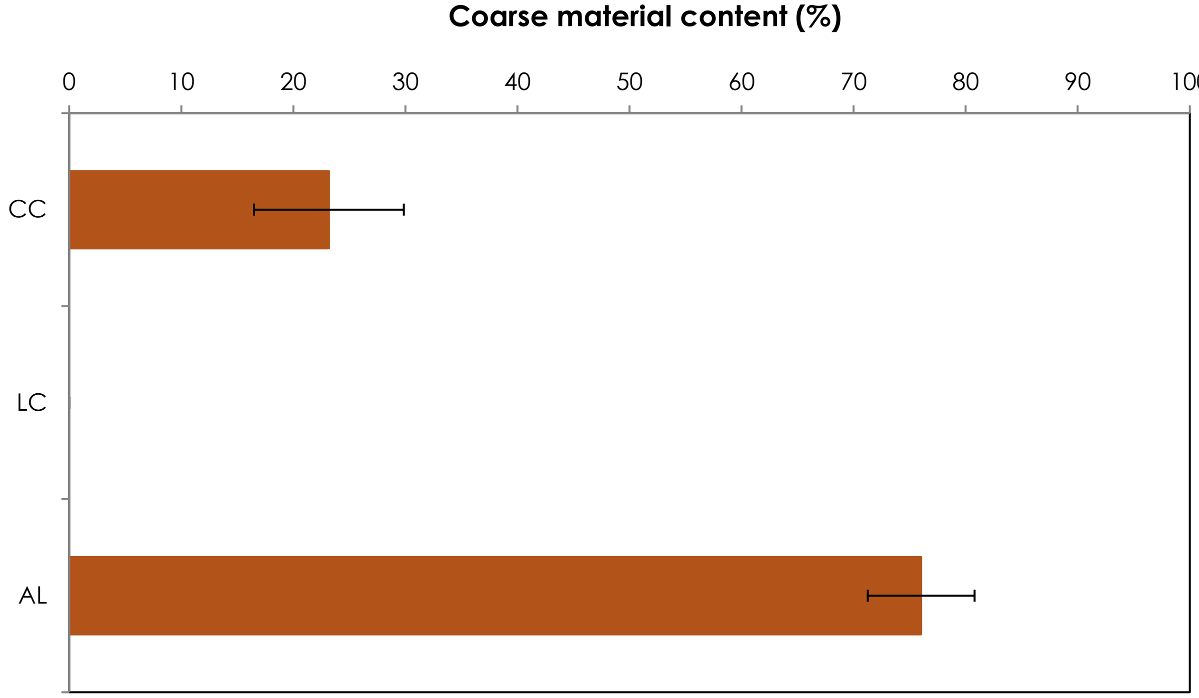

Figure 4-2: Mean coarse material (>2 mm) content of materials collected in the Mt Weld mine site

Error bars indicates standard deviation

4.1.2 Structural Stability

The materials sampled had highly variable structural stability of their soil fraction (<2 mm) as analysed by the Emerson aggregate test described in the Australian Standards (Standards Australia,1997). Classes ranged from Class 2 to 8 initially, while after 20 hours they ranged from Class 1 to 4 (**Appendix C, Table C-1**). Within the CC samples, all re-moulded samples were a final class 4, indicating the presence of stabilising carbonates, however, an aggregate in the CC01 sample was identified as Class 2, indicating partial dispersion. LC samples showed inconsistent results on different aggregates with a Class 2 identified in LC03, LC04 and LC05, while all re-moulds identified Class 1, indicating complete dispersion. No aggregates were found within the AL samples, however, on the re-mould all samples were identified as Class 2.

The CC01, CC04 and all LC samples were initially identified as Class 7, signifying that they contain swelling clays. While the rest of the CC samples and AL01 and AL04 initially identified as Class 8 as they did not slake, disperse, or swell, and the rest of the AL samples were identified as Class 2.

4.1.3 Material Strength

The material strength, as determined by the Modulus of Rupture test (MoR) on the soil fraction (<2 mm) material, exceeded the 60 kPa MoR threshold in the CC and LC materials (**Figure 4-3**). The average strength was 127.8 kPa for the CC material, 446.2 kPa for the LC material and only 2.3 kPa for the AL material. Some of the AL material was rated as 0 kPa as the samples fell apart with the removal of the paper ring. The CC01 material strength was within the range of the other CC samples (**Appendix C, Table C-1**).

The substantially higher MOR result for the CC and LC materials indicates a potentially problematic tendency towards structural decline and hard setting, upon disturbance and repeated wetting and drying, which could result in issues with seedling emergence, vegetation establishment, and root penetration.

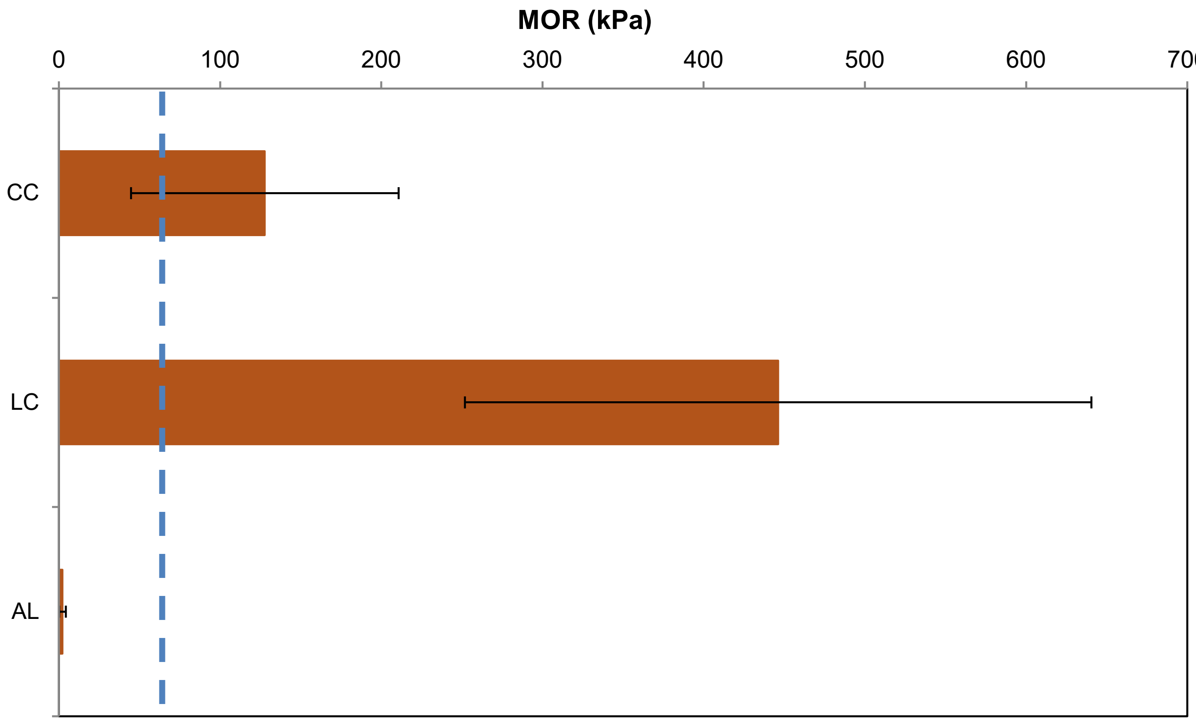

Figure 4-3: Mean soil strength (Modulus of Rupture; MOR) of the material's soil fraction (<2 mm) collected in the Mt Weld mine site

Dashed line signifying 60 kPa strength threshold; error bars indicates standard deviation

4.1.4 Saturated Hydraulic Conductivity

Ten un-sieved representative samples from the Mt Weld samples were assessed for saturated hydraulic conductivity (Ksat). Both the CC and LC materials were classified as Extremely slow due to their clay contents, especially the swelling clays which caused water to be stopped from entering the material, (**Table 4-1**). The CC materials took longer than 30 hours to reach saturation in all but one of the samples. Sample CC05 reached saturation within 20 hours and had a drainage rate of 0.78 mm/hr (Very slow). Samples of the LC material did not reach saturation even after 72 hours of soaking. The AL material, however, had a drainage class of Very rapid with a Ksat of 1235 mm/hr, indicating high infiltration with little to no resistance to water flow in the material.

Table 4-1: Drainage classes and mean saturated hydraulic conductivity (Ksat) rates of materials collected in the Mt Weld mine site

Soil Resource Material	Ksat (mm/hr)	Drainage Class
CC	0.20	Extremely slow
LC	0.00	Extremely slow
AL	1235	Very rapid

4.1.5 Water Retention

The same ten representative samples of the soil fraction (<2 mm) of each material were assessed for water retention characteristics, and exhibited slightly different trends according to material type (**Figure 4-4**). The LC material held the most water and lost water at the slowest rate, with the average upper storage limit (USL) and lower storage limit (LSL) containing 70% and 53% water. The CC material had the highest variation between samples, with the CC01 sample retaining the most water, but on average the CC material contained 46% water at USL and 22% at LSL. AL retained the lowest water content with 34% at the USL and 16% at the LSL.

Plant-available water (PAW) is calculated as the difference between the upper storage limit (USL) and lower storage limit (LSL) with all samples showing moderate PAW. The PAW average range was between 15.3% in the LC material and 28.2% in the CC material (**Appendix C, Table C-1**).

When the coarse material (>2 mm) content was accounted for, the effective PAW (ePAW) declined to an average of 4.3% in the AL material with a maximum of 19.5% in the CC material, the LC remaining the same due to the lack of coarse content. From this conversion the CC and LC materials remain as showing moderate ePAW, while the AL material was reduced to low ePAW with the addition of the coarse fraction.

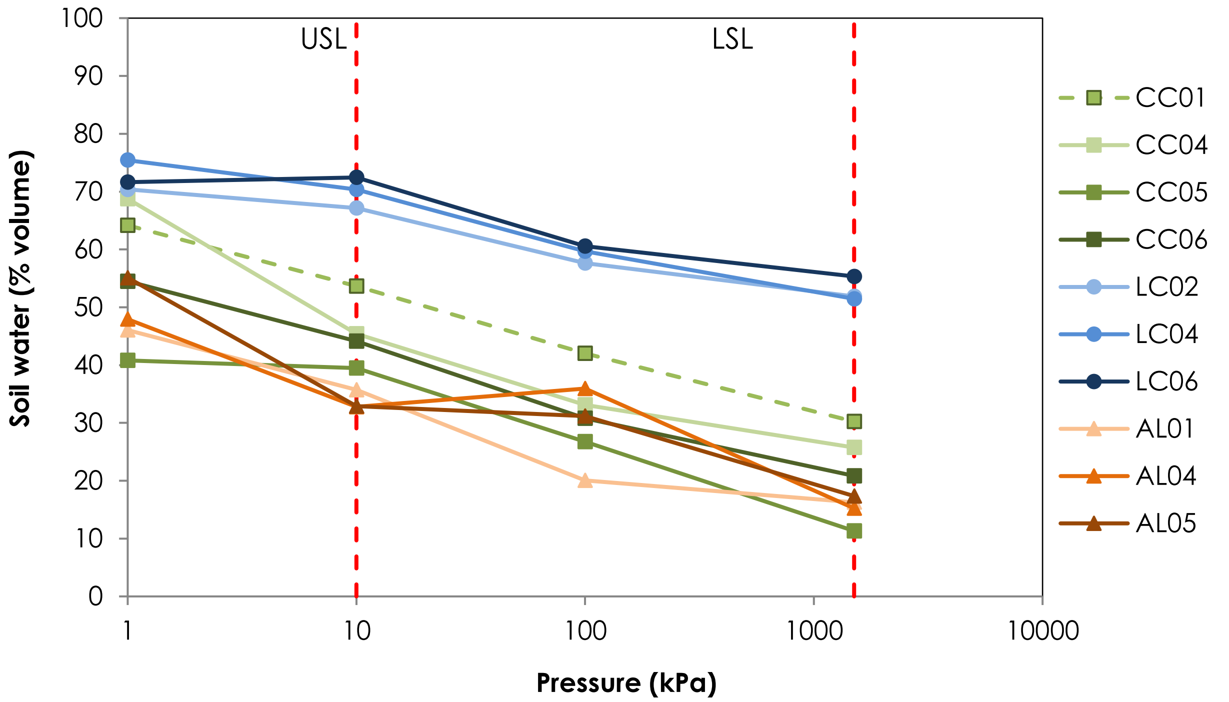

Figure 4-4: Water retention characteristics of material soil fraction (<2 mm) collected in the Mt Weld mine site

USL indicates upper storage limit, LSL indicates lower storage limit.

4.2 Chemical Characteristics

4.2.1 Soil pH and Salinity

Soil pH_w for the different materials (<2 mm) ranged from moderately to strongly alkaline, with the lowest pH_w in the LC material, reporting 8.7, the highest in the CC, reporting 9.47 (**Table 4-2**). On average, all soil pH_{CaCl} values were moderately alkaline ranging from 7.56 in the AL material to 7.9 in the CC material. For both pH measurements CC01 reported the lowest or equal lowest measurement, this, however, remained within the class of the other CC measurements.

Average electrical conductivity (EC) was lowest in the LC material with 0.2 dS/m while it was highest in the CC material with 0.3 dS/m (**Table 4-2**). This classified the LC as non-saline, while the CC and AL were classified as slightly saline.

Table 4-2: Mean soil pH and EC values of the soil fraction (<2 mm) of materials collected at the Mt Weld mine site

Waste Resource Material	pH_w (pH units)	Class	pH_{CaCl} (pH units)	Class	EC (dS/m)	Salinity Class
CC	9.47 ± 0.27	Strongly alkaline	7.90 ± 0.32	Moderately alkaline	0.29 ± 0.19	Slightly saline
LC	8.70 ± 0.14	Moderately alkaline	7.68 ± 0.15	Moderately alkaline	0.19 ± 0.11	Non-saline
AL	9.07 ± 0.24	Moderately alkaline	7.57 ± 0.24	Moderately alkaline	0.32 ± 0.13	Slightly saline

± indicates standard deviation

4.2.2 Exchangeable Cations and Exchangeable Sodium Percentage

The calculated effective cation exchange capacity (eCEC) was measured on the soil fraction (<2 mm) of each material and rated as high for CC and AL materials and very high for the LC material (Moore, 1998; **Table 4-3**). The lowest eCEC was in the CC material with an average of 14.9 meq/100g, while the highest was in the LC with an average of 36.1 meq/100g. The higher values for eCEC in the LC is likely due to the higher clay content with all exchangeable cations increasing in their contribution. The largest contributor of cations in the CC and LC material was magnesium while calcium was the largest contributor to the AL material (**Figure 4-5**). The CC01 sample had the same pattern of contribution as the other CC samples.

The exchangeable sodium percentage (ESP) was calculated on the soil fraction (<2 mm) material to provide an indication of soil sodicity. The results indicate that on average LC is considered highly sodic and CC and AL considered sodic (**Table 4-3**), however four of the six AL samples were greater than 15 and therefore were considered highly sodic (**Appendix C, Table C-2**).

Table 4-3: Mean soil effective cation exchange capacity (eCEC) and exchangeable sodium percentage (ESP) values of material soil fraction (<2 mm) collected in the Mt Weld mine site

Waste Resource Material	eCEC (meq/100g)	Class	ESP (%)	Class
CC	14.9 ± 3.7	High	6.92 ± 3.1	Sodic
LC	36.1 ± 5.4	Very High	15.07 ± 1.7	Highly sodic
AL	17.4 ± 2.9	High	14.10 ± 4.8	Sodic

± indicates standard deviation

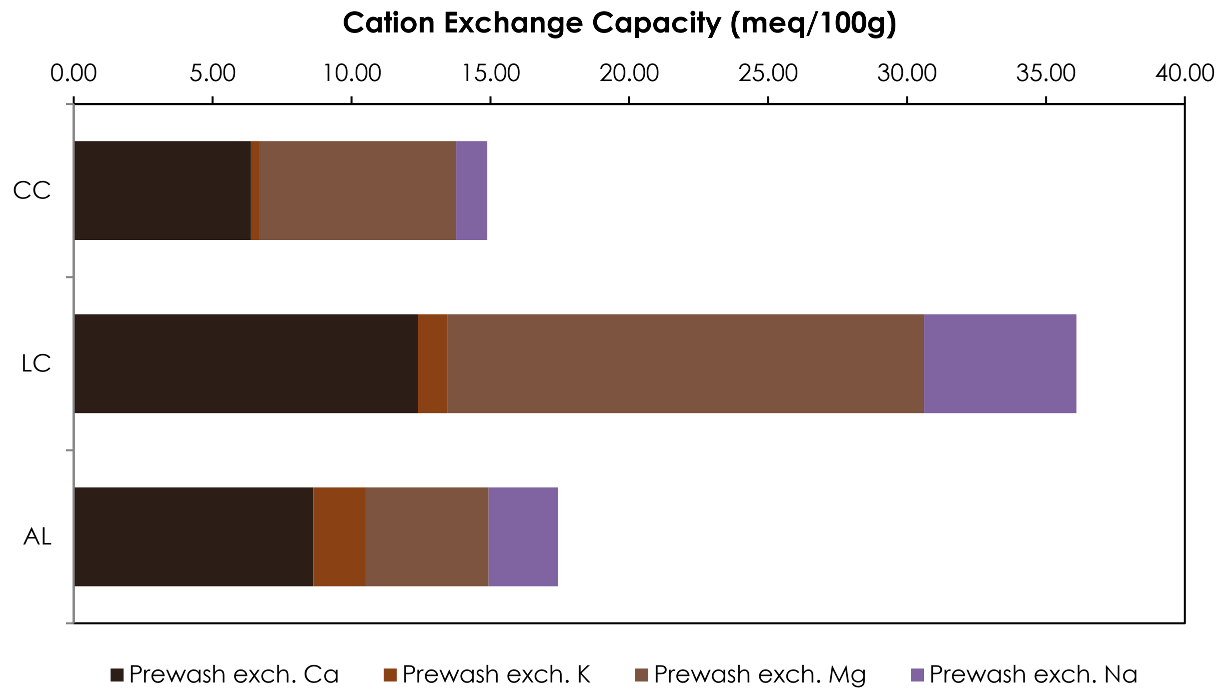

Figure 4-5: Mean effective cation exchange capacity (eCEC) of material soil fraction (<2 mm) collected in the Mt Weld mine site

4.2.3 Plant Available Nutrients

The amount of ammonium-N was highest in the CC and the lowest in the LC material, ranging from 1.5 to 3.8 mg/kg, while nitrate-N was highest in the AL sample and lowest for LC sample, ranging from 15.6 to 35.6 mg/kg (**Table 4-4**).

Plant-available phosphorus was low, below detection limit (<5 mg/kg) in all materials (**Table 4-4**). Potassium was rated extremely high for the AL materials, high for the LC material and low for the CC material. Sulphur was low in all samples with one sample within the CC material, below the detection limit of 10 mg/kg.

The CC01 sample was within range of all other CC samples for all plant available nutrients.

Table 4-4: Mean plant-available nutrients of the soil fraction (<2 mm) material collected in the Mt Weld mine site

Waste Resource Material	Plant-available Nutrients (mg/kg)				
	Ammonium-N	Nitrate-N	Phosphorus	Potassium	Sulphur
CC	3.8 ± 1.0	20.7 ± 11.7	<5	318 ± 101	<63 ± 48
LC	1.5 ± 0.3	15.6 ± 1.0	<5	830 ± 105	76 ± 11
AL	3.5 ± 3.5	35.6 ± 21.6	<5	1428 ± 224	51 ± 34

± indicates standard deviation; < indicates the detection limit was reached in testing for at least one of the samples within the average

4.3 Geochemical Characteristics

4.3.1 Paste pH and Salinity

All samples collected from the Mt Weld site reported circum-neutral to alkaline paste pH, with values ranging from 7.8 to 8.9 (**Appendix C, Table C-3**). The lowest average paste pH was reported in the AL material with an average of 8.0 and the highest was 8.5 in the CC material.

Paste EC was varied, with salinity values between 284 from 1810 µS/cm. The lowest average paste EC was reported for the CC with 849 µS/cm, while the highest was for the AL material with 962 µS/cm.

4.3.2 Acid Generation Potential

All 18 samples reported sulphide sulphur percentages lower than the 0.3%S limit indicator of acid mine drainage (AMD) risk, with all samples below the 0.1% sulphur (S) limit for acid consuming materials (**Appendix C, Table C-3**). Total sulphur percentage was below 0.03% in all samples and below the detection limit of 0.01% in eight of those samples. The lowest average sulphate sulphur was reported for the AL material with 245 mg/L and the highest for LC with 457 mg/L.

The calculated acid potential (AP) ranged from -0.14 to 0.49 kg H_2SO_4/t, while neutralisation potential (NP; equivalent to acid neutralisation capacity (ANC)) ranged from 11 to 878 kg H_2SO_4/t (**Appendix C, Table C-3**). Due to the relatively high NP in all samples, all values for net acid producing potential (NAPP) were negative, ranging from -878 to -11 kg H_2SO_4/t. All samples also had a NP/AP ration greater than 2 (ranging from 89 to 89,241), indicating a high probability the material will remain circum-neutral in pH (**Figure 4-6**). For these samples, the ABA results suggest that these materials are not likely to have a net production of acid if oxidised.

The CC material had the highest average NP and the lowest average AP. The AL material had the lowest average NP, while the LC material had the highest average AP (**Appendix C, Table C-3**).

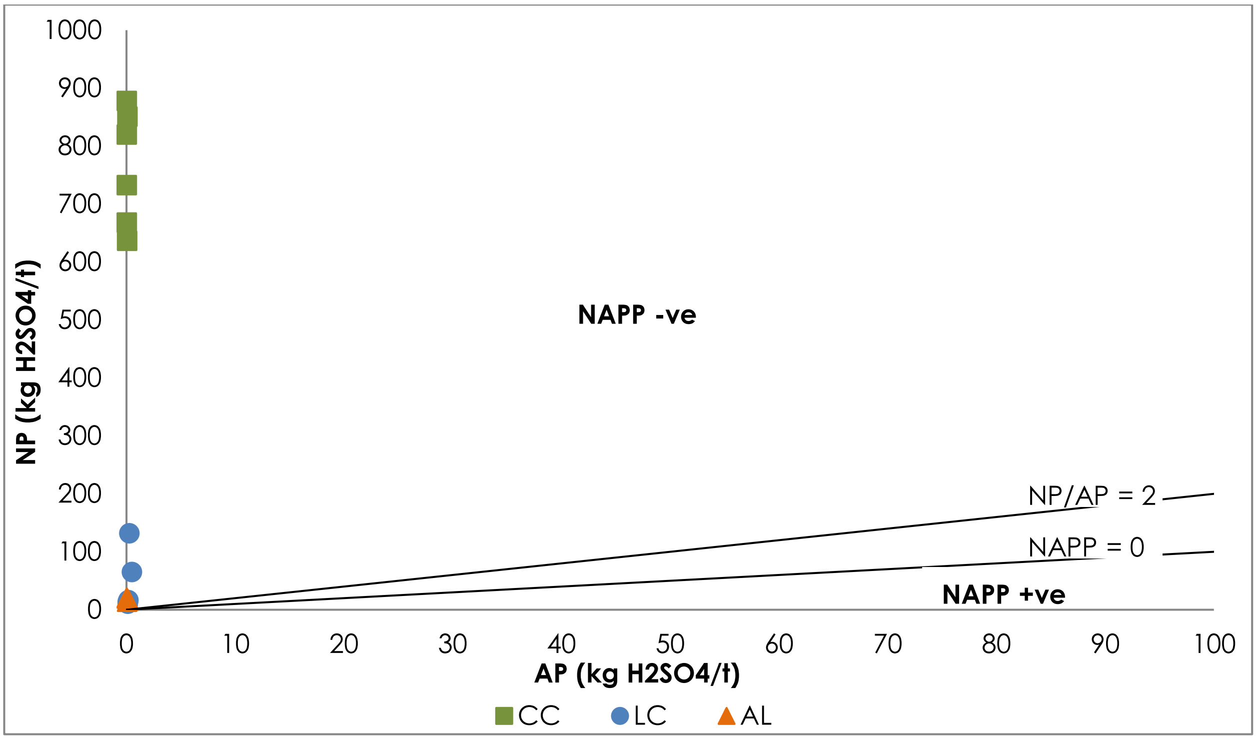

Figure 4-6: Acid base accounting plot for material soil fraction (<2 mm) collected in the Mt Weld mine site

4.3.3 Acid Base Accounting Classification

Acid base accounting (ABA) classification is based on the calculated NAPP, NAG_{pH}, NP/AP and %S, classifying into acid consuming (AC), non-acid forming (NAF)-barren, NAF, uncertain (UNC), and potentially acid forming (PAF).

In total nine samples were classified as AC, all from the CC material, two from the LC material and one from the AL material (**Table 4-5**; **Figure 4-7**).

The rest of the samples were classified as NAF-barren (**Table 4-5**; **Figure 4-7**). The difference between the AC and NAF-barren samples was that the calculated NAPP of the NAF-barren samples were not less than -20 kg H_2SO_4, however, these were less than 0 kg H_2SO_4 such as to classify them NAF. These samples were classified as NAF-barren due to their sulphide sulphur less than 0.1%S.

It is noted that NAPP was calculated using a conservative approach, and that AP is potentially over-estimated on the basis of the assumption that all sulphur in the samples was present as the sulphide mineral pyrite.

It is noted that NP (ANC equivalent) was likely underestimated for one sample and over-estimated for five other samples. This was indicated as it was found that one sample (LC01) exceeded the upper limit for the fizz rating test (NP 100 kg H2SO4/t) and another five samples (LC03, LC06, AL01, AL02, LC03) exceeded the lower limit (NP 40 kg H2SO4/t; **Appendix C, Table C-3**). This is unlikely to change their classifications due to the extremely low calculated AP.

Table 4-5: ABA classification for material soil fraction (<2 mm) collected in the Mt Weld mine site

Waste Resource Material	Acid consuming (AC)	Non-acid forming (NAF-barren)	Non-acid forming (NAF)	Uncertain (UNC)	Potentially acid forming (PAF)
CC	6				
LC	2	4			
AL	1	5			

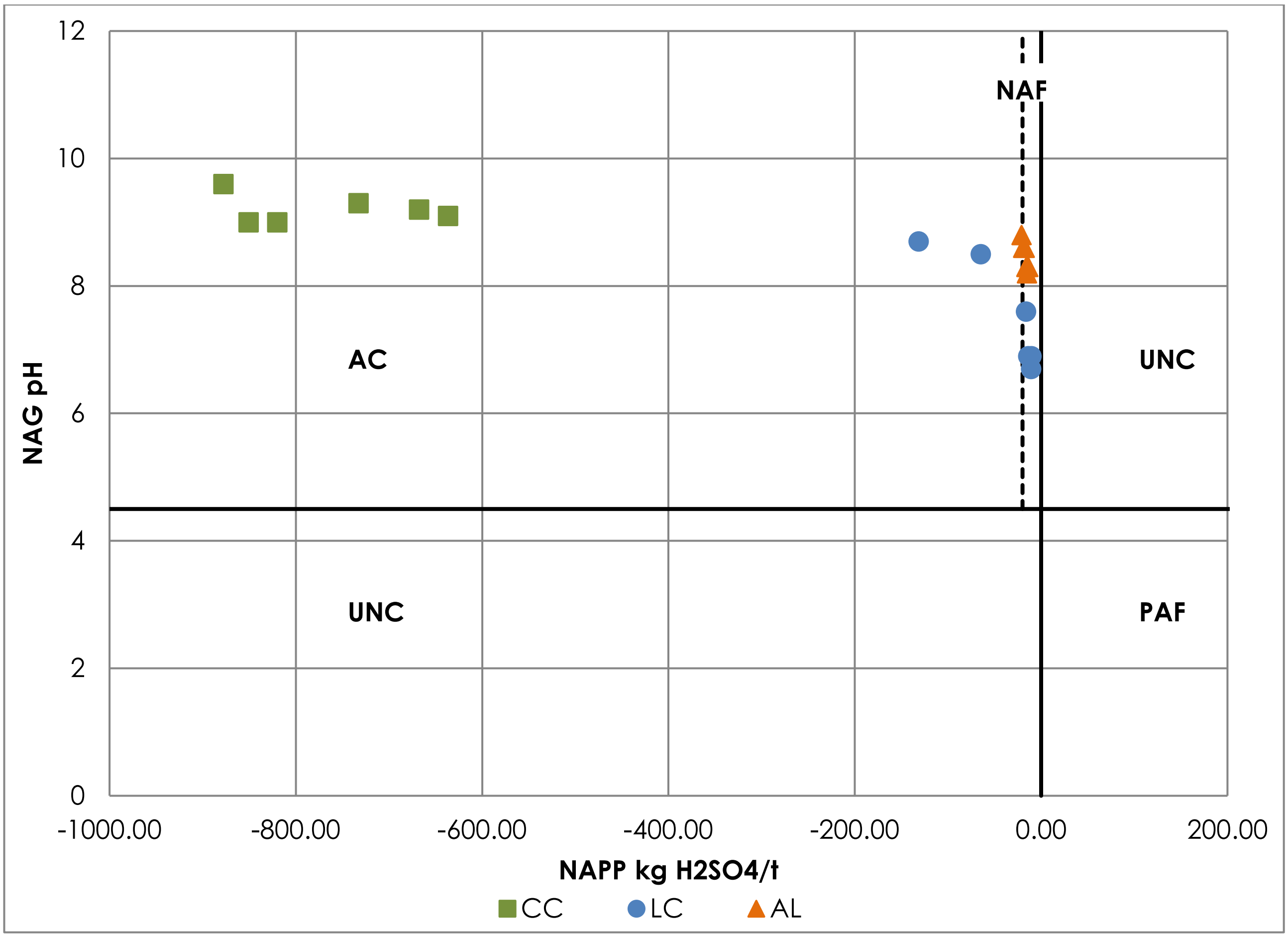

Figure 4-7: Geochemistry summary plot for material soil fraction (<2 mm) collected in the Mt Weld mine site

4.3.4 Elements of Potential Environmental Concern

4.3.4.1 Geochemical Abundance Index

The Geochemical Abundance Index (GAI) analysis is a screening tool which compares elemental concentrations to known crustal abundances and can flag potential issues that warrant additional investigation (see **Appendix E** for methods). Sulphur exceeded GAI > 3 in the LC material (**Appendix C, Table C-4**), suggesting the potential for elemental toxicity for sulphur in the LC materials. Although GAI indicates an enrichment this is not considered to be an environmental concern.

4.3.4.2 Total Element Concentrations

Total element concentrations in the Mt Weld materials were assessed relative to the ISQG and local EIL trigger levels (ANZECC, 2000; NEPM, 2013). Local EIL trigger values were calculated to account for the natural enrichment of the area (**Appendix E, E.3.1**).

In the CC material, trigger values were reached by arsenic, cadmium, nickel and zinc (**Appendix C, Table C-5).** The ISQG – high for cadmium was only triggered for one sample, while the EIL for zinc was only triggered for one sample. The ISQG – low for arsenic and zinc were also triggered for one sample each, while also triggering the zinc EIL for the same sample that triggered the zinc ISQG - low.

In the LC material, trigger values were reached by arsenic, chromium, lead and nickel (**Appendix C, Table C-5)**. The ISQG – high for arsenic was triggered for one and ISQG – low for another sample, both triggering the EIL for arsenic. The ISQG – low for chromium, lead and nickel were triggered for two, two and five samples respectively, further triggering the ISQG – high and the EIL for nickel in one of those samples.

In the CC material, trigger values were reached by chromium and nickel (**Appendix C, Table C-5)**. Only ISQG – low triggers were reached for both chromium and nickel, exceeding for two and six samples respectively.

4.3.4.3 Soluble Element Concentrations

The concentrations of elements of potential environmental concern in deionised (DI) water leachates for the soil material sampled are considered in terms of exceedances to the Groundwater Investigation Level (GIL) Marine Water, Australian and New Zealand Environmental and Conservation Council (ANZECC) Marine Water and Livestock Drinking Water (LDW) (ANZECC, 2000; DER, 2014; NEPM, 2013;). Exceedances to these limits were reported for aluminium, chromium, cobalt, copper, lead, nickel and zinc (**Appendix C, Table C-6**). No exceedances were reported for CC samples.

In the LC material, triggers were reached by aluminium, chromium, cobalt, copper, lead, nickel and zinc. The LDW limit of aluminium was exceeded for all samples. Chromium exceeded GIL levels by all samples and further exceeded by the ANZECC level by one sample. Cobalt exceeded the GIL level for four samples while copper exceeded the GIL and ANZECC levels for all samples. Lead exceeded the GIL for three samples, further exceeding the ANZECC level for one sample. Nickel exceeded GIL levels for all samples, while zinc exceeded the GIL levels for all samples and further exceeded the ANZECC level for four samples.

In the AL material, triggers were reached by aluminium, chromium, cobalt, copper, lead, nickel and zinc. Aluminium exceeded the LDW limit in five of the AL samples. Chromium exceeded the GIL level one sample, while cobalt exceeded the GIL level for all samples. Copper exceeded the GIL in all samples, further exceeding the ANZECC levels for four AL samples. Lead exceeded the GIL for one sample, while nickel exceeded GIL levels for all AL samples, and zinc exceeded GIL levels for two AL samples.

4.3.4.4 Element Leaching

Additional testing using the Australian Standard Leaching Procedure (ASLP) was commissioned by Lynas for the LC and CC materials (**Table 4-6**). This information provides additional information on the characteristics of these materials and their leachability.

The CC material showed an exceedance of the ANZECC LDW threshold for cadmium in pH 2.9, signifying that the CC will leach cadmium in acidic conditions to level that are unsafe for livestock. In the CC material there was also an exceedance of the Class 1 landfill leachable concentration for mercury in pH2.9, signifying that in acidic conditions the CC material will leach mercury to levels exceeding the Class 1 landfill regulations. However, it is noted that Mt Weld site has a Class 2 category landfill and that the pH measured in these materials was alkaline and unlikely to become acid forming.

Table 4-6: Additional data of Australian Standard Leaching Procedure (ASLP) in pH 2.9 and de-ionised water (DIW) for the LC and CC materials

Element	LC		CC	
	ASLP pH2.9	ASLP DIW	ASLP pH2.9	ASLP DIW
Arsenic	<LOR	**0.0004**	<LOR	**0.0002**
Cadmium	**0.0001**	<LOR	**0.0410**	<LOR
Chromium	**0.0002**	<LOR	**0.0154**	<LOR
Cobalt	<LOR	**0.01**	<LOR	<LOR
Copper	<LOR	<LOR	**0.01**	<LOR
Iron	<LOR	**0.82**	**0.66**	<LOR
Lead	<LOR	<LOR	<LOR	<LOR
Manganese	**0.02**	**0.01**	**2.887**	<LOR
Mercury	<LOR	<LOR	**0.02**	<LOR
Nickel	**0.004**	<LOR	**0.006**	<LOR
Selenium	<LOR	<LOR	<LOR	<LOR
Thorium	**0.0001**	**0.0002**	**0.0001**	<LOR
Uranium	**0.0414**	**0.0002**	**0.0428**	**0.0011**
Zinc	<LOR	<LOR	**0.89**	<LOR

Exceeds Class 1 Landfill Leachable Concentration ASLP Guideline (DER, 2019)
Exceeds ANZECC Livestock Drinking Water Guideline (ANZECC, 2000)

<LOR indicates results below the limit of reporting

4.4 Preliminary Materials Resource Inventory

The development of a soil resource inventory has been shown to be an effective method of planning for the most suitable and efficient use of available soil resources for landform design, construction and rehabilitation. A preliminary inventory of potential soil resources has been developed for Mt Weld (**Table 4-7**), based on the characterisation of the WRL materials discussed in this report. Utilisation of this inventory by site personnel will help inform management and handling procedures of these materials on site, with respect to salvage, storage and / or use as a construction and or rehabilitation resource in future mining, rehabilitation and mine closure activities.

The coarse content of the CC material is extremely variable, with a range of 5% to 95% noted in the field. It is recommended that the material with the lower to moderate coarse content is buried within a constructed landform. While the material is considered benign in its chemical properties, it is alkaline and has extremely slow drainage, and tendency for hard setting indicates that it is not suited as a surface material. However, the material with higher coarse contents is likely to act in a more conducive behaviour for a surface coverage, such as a rock armouring, when mixed with a topsoil material that would diminish any hard setting potential and lower the pH. According to Stantec (2014), there are a range of topsoils in stockpile with non-hard setting characteristics and that are strongly to moderately acidic. The topsoil to be mixed with this rock cover should be selected for these characteristics.

It is recommended that the LC material either be buried in a constructed landform or used as an impermeable liner for tailings dam construction. The lack of coarse content, it's extremely slow drainage, and its hard setting properties, coupled with its tendency for erosion due to its sodicity and structural instability, indicate that it is not suitable as a surface material. The material, however, because of these properties, could act effectively as an impermeable liner in dam construction.

The AL material has a large coarse material fraction and therefore could potentially be used for rock armouring. The material, however, is also partially dispersive and sodic and so has a propensity for erosion. It has also been noted on site that the course fraction of the AL material has a tendency to breakup under compaction. The use of the material therefore is recommended for the upper flat surfaces of landforms, or lower, flatter slopes. The construction of sediment bunds around the toe of the landforms to collect sediments that may wash off is recommended. It is also recommended that the course fraction is tested for durability and traffic is minimised over the material.

An indicative volume of the 'waste resource material' was calculated for the total volume of current stockpiles on the Mt Weld. Following further definition of future mine development and disturbance footprints, the actual volumes of the Mt Weld resources can be re-calculated.

It should be noted that the tests performed for this report are based upon material from grab samples, therefore cannot entirely inform the characteristics of the resource identified in **Table 4-7**,and can only be considered as indicative.

Table 4-7: Preliminary Soil Resource Material inventory for material soil fraction (<2 mm) collected from the Mt Weld mine site in 2020

Waste Resource Material	Estimated Volume [1]	Key Characteristics	Recommendations for Use in Construction and or Rehabilitation
Calcrete limestone	Current: 354,000 m^3 After stage 4: 1,150,000 m^3	• 22% clay, 23% coarse material (estimates of between 5% and 95% in the field). • Predominantly structurally stable with some shrink swelling clays and hard setting. • Extremely slow drainage with moderate ePAW. • Moderately alkaline, slightly saline, sodic. • High CEC, predominantly low in nutrients. • All NAF, all AC. • No GAI exceedance, other exceedances in arsenic, cadmium, nickel, and zinc.	• Rock armouring for higher course contents. • Buried within constructed landform for lower course contents.
Lake clay	Current: 37,000 m^3 After stage 4: 37,000 m^3	• 82% clay, no coarse material. • Structurally unstable with shrink swelling clays and hard setting. • Extremely slow drainage with moderate ePAW. • Moderately alkaline, non-saline, highly sodic. • Very high CEC, predominantly low in nutrients. • All NAF, 2 AC, 4 NAF-barren. • GAI exceedance for sulphur, other exceedances in aluminium, arsenic, chromium, cobalt, copper, lead, nickel and zinc.	• Buried within constructed landform. • Tailings dam lining.
Alluvium	Current: 266,000 m^3 After stage 4: 2,406,000 m^3	• 3% clay, 76% coarse material. • Structurally unstable and very low strength. • Very rapid drainage with low ePAW. • Moderately alkaline, slightly saline, sodic. • High CEC, predominantly low in nutrients. • All NAF, 1 AC, 5 NAF-barren. • No GAI exceedance, other exceedances in aluminium, chromium, cobalt, copper, lead, nickel and zinc.	• Rock armouring for lower slopes of the waste rock landforms.

1. Volumes as given by Lynas indicating current stockpile volumes, not indicative of future expansion.

4.4.1 Previous Resource inventory

Comparing the current inventory with previous descriptions of the waste materials there are some changes to the characteristics (**Table 4-8**). Variation from the previous inventories include:

- the reclassification of calcrete into Calcrete - soft and Calcrete - coarse;
- the recognition that lake clay does not have gravel material but is a hard-panned clay; and
- Alluvium previously may have included a mixture with a clayey material.

Alluvium has previously been described as a clayey material, however, the material characterised as a component of this study is at most a loam with a high coarse content (**Table 4-9**). The material now classified as Alluvium is also structurally unstable, likely due to its sodicity, and has low strength. The coarse content and large particles also lead to rapid drainage and low ePAW. It has been noted previously that during the mining process some sedimentary rock within the Alluvium has been broken down to clay fractions and therefore this has influenced the texture observed. At times Alluvium has also been noted to have some thin horizons of enriched iron content (<3 cm every few vertical meters) with weak iron oxide cementation.

Calcrete has been described in previous inventories; however, these have been both clay and limestone. For future inventory, it is recommended that Calcrete - soft be classified as the material that has a higher clay content, a moderate drainage speed, some dispersive materials, however, no sodicity (**Table 4-9**). While Calcrete - coarse is a material with loamy texture, slow drainage, structurally stable, though hard setting, and sodic.

The lake clay characteristics have mostly been classified similarly to previous years with the note that it is uncertain if previous years have noted hardpan clay as gravel or if there has been a mixing with another gravel material (**Table 4-8**). Previously lake clay has also been referred to as lacustrine clay. This material is a medium to heavy clay, with slow water movement, and has shrink/swell and hard setting tendencies.

Mineralised waste has been characterised previously as a material with a clay to medium heavy clay texture along with a moderate coarse content (**Table 4-9**). While it is non-dispersive it has a tendency for hardsetting and is slow draining with a moderate ePAW. The material is considered naturally occurring radioactive material (NORM) on site and therefore should be managed according to the guidelines outlined in the Mt Weld approved mine closure plan.

Ferricrete has been mentioned in previous studies to describe what is now described as Alluvium. This will not be mentioned further.

Table 4-8: Variation from previously identified WRL waste material classification (Stantec, 2014)

Previous Waste Resource Material	Key Characteristics	Variation	Re-classification
Calcrete	• Clay to medium heavy clay, 63% coarse material. • Variable stability and hard setting. • Moderate drainage speed with moderate ePAW. • Strongly alkaline, non- to slightly saline, non-sodic. • Low to moderate in nutrients. • NAF.	• Higher clay content. • Presence of dispersive material. • Faster drainage speed. • Higher alkalinity, lower salinity, no sodicity.	Calcrete - soft (clay).
Lake clay (also previously lacustrine clay)	• Clay to medium heavy clay, 59% coarse content. • Structurally unstable and hard setting. • Very slow drainage with moderate ePAW. • Moderately alkaline, non- to slightly saline, sodic. • Low to moderate in nutrients. • NAF. • High arsenic.	• Mis-identified coarse content. • Slightly faster drainage. • Higher salinity, lower sodicity.	Lake clay.
Alluvium	• Sandy loam to medium heavy clay, 47% coarse material. • Structurally unstable and low strength. • Moderate drainage speed with moderate ePAW. • Strongly alkaline, non- to slightly saline, sodic. • Low to moderate in nutrients. • NAF.	• Higher clay content, lower coarse material. • Higher strength. • Lower drainage speed, higher water retention. • Higher alkalinity, lower salinity.	Alluvium (containing sedimentary rock material crushed down to clay in mining process).

Table 4-9: Key characteristics of the Mt Weld waste materials

Key characteristics of waste lithologies	
Alluvium	• Encountered between the surface and 30 m depth (425 - 395 RL). • Silty sand to sandy loam, high coarse material. • Structurally unstable and low strength. • Rapid drainage with low ePAW. • Moderately alkaline, slightly saline, sodic. • High CEC, predominantly low in nutrients. • NAF.
Calcrete – soft (clacrete clay)	• Encountered between 25 and 50 m depth (400 – 375 RL). • Clay to medium heavy clay, high coarse material. • Variable stability and hard setting. • Moderate drainage speed with moderate ePAW. • Strongly alkaline, non- to slightly saline, non-sodic. • NAF. • EIL exceedance in cadmium.
Calcrete - coarse (Calcrete limestone)	• Encountered between 50 and 60 m depth (375 – 365 RL). • Loamy, high coarse material. • Predominantly structurally stable with some hard setting. • Slow drainage with moderate ePAW. • Moderately alkaline, slightly saline, sodic. • High CEC, predominantly low in nutrients. • NAF. • EIL exceedance in zinc.
Lake clay	• Encountered between 25 and 35 m depth (400 – 390 RL). • Medium to heavy clay, no coarse material (clay hard panned resembles gravel). • Structurally unstable with shrink swelling clays and hard setting. • Extremely slow drainage with moderate ePAW. • Moderately alkaline, non-saline, highly sodic. • Very high CEC, predominantly low in nutrients. • NAF. • EIL exceedances in arsenic.
Mineralised waste	• Encountered throughout the profile. • Considered NORM. • Clay to medium heavy clay, moderate coarse material. • Predominantly non-dispersive, hardsetting. • Slow drainage, moderate ePAW. • Moderately alkaline, non- to slightly saline. • Moderate to high in nutrients. • NAF. • EIL exceedance in arsenic and zinc.

5. Discussion

Due to the location of the CC01 sample site within the LC stockpile there were concerns that contamination could be a potential issue. It is understood that the material sampled was comprised of a mixed truck containing both LC and CC materials. This was a single paddock dump of CC within the LC stockpile. This data point was not excluded from comparison due to outlier properties as all properties measured for the CC01 location were within the limits of the other CC properties, including the texture which was classified as silty loam.

Swelling clays were noted in all the LC samples, in addition to the CC01 and CC04 samples. The presence of swelling clays in the materials causes an impediment of water through the material; this is observed both in the observation of Emerson stability class and saturated hydraulic conductivity. Though not observed in the Emerson stability class for all the CC samples the impediment of water flow through two of the CC samples suggests that there may be some potential for soil swelling in all CC material.

The predicted volumes of stockpiles and thus the total expected resource material is dynamic, and volumes are currently being calculated by Lynas for their records. It is recommended that both existing and future waste material volumes are quantified for future landform design and rehabilitation planning. Specifically, this will aid in planning rehabilitation prescriptions, such as incorporating competent waste rock materials into surface rehabilitation materials to improve stability and reduce erosion potential.

The elements of concern as given by the GAI suggest that only sulphur in the LC is of concern. While the total elements show a number of exceedances only LC shows exceedance of the EIL for arsenic and one exceedance of the EIL for zinc in the CC material. There were no exceedances of dissolved elements in the CC material, however, there were a number in the LC material, these are unlikely to leach due to the high-water retention capacity and low hydraulic conductivity. The AL material had exceedances of dissolved elements, low water retention and high hydraulic conductivity, however, due to its physical properties this material is better suited as a surface material and not near surface water for contamination potential and availability for plant uptake.

6. Conclusions and Recommendations

The materials assessed in this report had varying physical characteristics, but similar chemical and geochemical characteristics (**Table 6-1**). The difference between the physical parameters will dictate how these materials can be utilised in future as the chemical and geochemical are not of great concern.

The Calcrete limestone (CC) material is a loamy material with around a quarter of the material made up of smaller coarse fragments, however, in the field it was estimated that the coarse fragments were between 5% and 95%. The clay component of the material led to extremely slow drainage and moderate water retention even with the presence of the coarse component. The material was moderately alkaline which was slightly saline and had a high cation exchange capacity due to the clay content. The material is structurally stable, however, has some hardsetting tendencies. While the material presents as sodic this is at the lower end of the scale and paired with the Emerson structural stability rating, the material does not appear likely to be highly erosive.

A critical factor in the use of this CC material is the coarse fraction. It is recommended that the material with lower coarse fraction be buried within a constructed landform due to its hard setting and low drainage rates. The material with higher coarse content, however, is recommended to be used for rock armouring when paired with a topsoil material that would act to diminish any hard setting potential. Further to this it is recommended that in future stockpiling the CC material is split between its distinctive layers of course and soft material properties. This would help organise the materials for appropriate uses.

In contrast to the CC material the texture of the Lake Clay (LC) was a moderate to heavy clay, with no coarse fraction, though the hard-set clay presented as gravel. The properties of the clay lead to moderate water holding capacity with extremely slow drainage. The material was structurally unstable due to dispersion and shrink swelling and was also hard setting when dry. The LC was also moderately alkaline and slightly saline with a very high cation exchange capacity and was highly sodic. The high sodicity and the dispersion capacity of the clay suggests that this material will be highly erosive. Due to the erosive nature of the material it is again, recommended that this material is buried within a constructed landform. However, it could be potentially used in situations where very low hydraulic conductivity is required.

The alluvium (AL) material was sandy to a sandy loam and had a substantial coarse content. The low plant available water does not promote it as a growth medium; however, the very rapid drainage allows for low water penetration constraints. As with the other materials the AL is a moderately alkaline material which is slightly saline and has a high cation exchange capacity. The fine faction in the material had some dispersion potential and was very weak in strength paired with the sodic ESP (at the high end of the scale) this is likely to be an erosive material. The AL material is considered to be the most suitable waste materials for use as surface rock cover. The properties lending to this outcome are the high coarse material fraction and the high sand percentage in soil sized fraction. The material is weak but has high hydraulic conductivity allowing rapid movement of water into the topsoil material below.

The AL material could be used with the following recommendations:

- material from the landform is appropriate for utilisation as a capping resource for the TSF and other landforms on site;
- where possible, coarse materials should be preferentially used, to minimise potential for sediment transport from the surface; and
- sediment capture and surface water control structures (e.g. toe drains and bunds) should be developed to minimise erosion of finer-grained sediment following rainfall events.

The nutrient status of all materials are variable, however, these material are not topsoils and thus this is not of concern. All of the materials showed characteristics that were either acid consuming or non-acid forming, and thus are not of concern. There were multiple exceedances of limits, however, these only exceeded the EIL on two occasions and only sulphur was of concern in the GAI.

Table 6-1: Summary of physical and chemical properties of the Soil Resource Materials collected in the Mt Weld mine site

Waste Resource Material	Physical						Chemical							Geochemical
	Soil Texture[1]	Coarse Material content (%)[2]	Stability, Emerson class[3]	Strength MOR (kPa)	Drainage Ksat (mm/hr)	Water retention (%)[4]	pH $_{CaCl}$	Salinity EC (dS/m)	eCEC (mmol/cm)	ESP (%)	Nutrient Status	Acid base accounting	Elements of concern (Total)[5]	Elements of concern (Soluble)[5]
CC (n =6)	Loam to Silty clay	23	Structurally stable (class 4)	Hard setting (127.8)	Extremely slow (0.2)	Moderate (17)	Moderately alkaline (7.9)	Slightly saline (0.29)	High (14.9)	Sodic (6.9)	Variable	6 × AC	Arsenic, cadmium, nickel, zinc	
LC (n =6)	Clay	0	Structurally unstable with shrink swelling and dispersion (class 7 and 1 – 2)	Hard setting (446.2)	Extremely slow (0.0)	Moderate (17)	Moderately alkaline (7.7)	Non-saline (0.19)	Very High (36.1)	Highly sodic (15.1)	Variable	2 × AC 4 × NAF-barren	Arsenic, chromium, lead, nickel	Aluminium, chromium, cobalt, copper, lead, nickel, zinc.
AL (n =6)	Sand to Sandy loam	76	Partially structurally unstable (class 2)	Weak (2.3)	very rapid (1235.3)	Low (4.3)	Moderately alkaline (7.6)	Slightly saline (0.32)	High (17.4)	Sodic (14.1)	Variable	1 × AC 5 × NAF-barren	Chromium, nickel	Aluminium, chromium, cobalt, copper, lead, nickel, zinc

1. Field texture based on the <2 mm size fraction.
2. Determined for all coarse fragments >2 mm in size.
3. Class categories are described in **Appendix E**.
4. Ranges of effective plant-available water (ePAW, % vol) for selected samples (takes into account coarse material content).
5. Elevated elements with respect to environmental screening criteria (Refer to **Appendix E**).

N/A = not applicable. - = not analysed.

Representative values are presented in brackets. Results are given broad qualitative ratings of good, moderate and poor for each parameter relative to suitability for plant growth and/or overall material stability.

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Appendices

Appendix A Sample Register

Table 1
Sample Register
Mt Weld Waste Materials Characterisation

Sample ID	Date Sampled	Material Description	Landform / Location	Full sample ID	Sample Location		Stantec						
					Easting	Northing	Field Texture	Gravel Content	Soil Colour	Modulus of Rupture	Emerson Aggregate Test	Saturated Hydraulic Conductivity	Water Retention
CC01	04-03-20	Calcrete limestone	Clay stockpile	mwel_19002_CC01	0455358	6807593	X	X	X	X	X	X	X
CC02	04-03-20	Calcrete limestone	Calcrete limestone dump pile	mwel_19002_CC02	0456322	6807485	X	X	X	X	X		
CC03	04-03-20	Calcrete limestone	Calcrete limestone dump pile	mwel_19002_CC03	0456427	6807522	X	X	X	X	X		
CC04	07-03-20	Calcrete limestone	Calcrete limestone windrow	mwel_19002_CC04	0456252	6807534	X	X	X	X	X	X	X
CC05	07-03-20	Calcrete limestone	Calcrete limestone windrow	mwel_19002_CC05	0456265	6807554	X	X	X	X	X	X	X
CC06	07-03-20	Calcrete limestone	Calcrete limestone windrow	mwel_19002_CC06	0456283	6807591	X	X	X	X	X	X	X
LC01	04-03-20	Lake clay	Lake clay stockpile	mwel_19002_LC01	0455388	6808137	X	X	X	X	X		
LC02	04-03-20	Lake clay	Lake clay stockpile	mwel_19002_LC02	0455393	6807515	X	X	X	X	X	X	X
LC03	04-03-20	Lake clay	Lake clay stockpile	mwel_19002_LC03	0455377	6807582	X	X	X	X	X		
LC04	04-03-20	Lake clay	Lake clay stockpile	mwel_19002_LC04	0455370	6807590	X	X	X	X	X	X	X
LC05	04-03-20	Lake clay	Lake clay stockpile	mwel_19002_LC05	0455366	6807586	X	X	X	X	X		
LC06	04-03-20	Lake clay	Lake clay stockpile	mwel_19002_LC06	0455362	6807575	X	X	X	X	X	X	X
AL01	04-03-20	Alluvium	Alluvium stockpile	mwel_19002_AL01	0454850	6807468	X	X	X	X	X	X	X
AL02	04-03-20	Alluvium	Alluvium stockpile	mwel_19002_AL02	0454826	6807470	X	X	X	X	X		
AL03	04-03-20	Alluvium	Alluvium stockpile	mwel_19002_AL03	0454815	6807446	X	X	X	X	X		
AL04	04-03-20	Alluvium	Alluvium stockpile	mwel_19002_AL04	0454811	6807419	X	X	X	X	X	X	X
AL05	04-03-20	Alluvium	Alluvium stockpile	mwel_19002_AL05	0454820	6807400	X	X	X	X	X	X	X
AL06	07-03-20	Alluvium	Windrow alluvium dump pile	mwel_19002_AL06	0457107	6806352	X	X	X	X	X		

Table 1
Sample Register
Mt Weld Waste Materials Characterisation

Material Description	Landform / Location	Full sample ID	ALS Environmental											
			Soil Suite				Metals			AMD				
			pH, EC (1:5) and pH (CaCl)	Nutrients, Organic Carbon	ExCATs with prewash	Particle Size	Total elements (15 NEPM) + Al, Fe	SPLP leach in DI water	Leachable elements (15 NEPM)	Paste pH and EC	Acidity/ Alkalinity	NAPP/ NAG	Sulphate sulphur	TC/TOC/ TIC suite
Calcrete limestone	Clay stockpile	mwel_19002_CC01	X	X	X	X	X	X	X	X		X	X	
Calcrete limestone	Calcrete limestone dump pile	mwel_19002_CC02	X	X	X	X	X	X	X	X		X	X	
Calcrete limestone	Calcrete limestone dump pile	mwel_19002_CC03	X	X	X	X	X	X	X	X		X	X	
Calcrete limestone	Calcrete limestone windrow	mwel_19002_CC04	X	X	X	X	X	X	X	X		X	X	
Calcrete limestone	Calcrete limestone windrow	mwel_19002_CC05	X	X	X	X	X	X	X	X		X	X	
Calcrete limestone	Calcrete limestone windrow	mwel_19002_CC06	X	X	X	X	X	X	X	X		X	X	
Lake clay	Lake clay stockpile	mwel_19002_LC01	X	X	X	X	X	X	X	X		X	X	
Lake clay	Lake clay stockpile	mwel_19002_LC02	X	X	X	X	X	X	X	X		X	X	
Lake clay	Lake clay stockpile	mwel_19002_LC03	X	X	X	X	X	X	X	X		X	X	
Lake clay	Lake clay stockpile	mwel_19002_LC04	X	X	X	X	X	X	X	X		X	X	
Lake clay	Lake clay stockpile	mwel_19002_LC05	X	X	X	X	X	X	X	X		X	X	
Lake clay	Lake clay stockpile	mwel_19002_LC06	X	X	X	X	X	X	X	X		X	X	
Alluvium	Alluvium stockpile	mwel_19002_AL01	X	X	X	X	X	X	X	X		X	X	
Alluvium	Alluvium stockpile	mwel_19002_AL02	X	X	X	X	X	X	X	X		X	X	
Alluvium	Alluvium stockpile	mwel_19002_AL03	X	X	X	X	X	X	X	X		X	X	
Alluvium	Alluvium stockpile	mwel_19002_AL04	X	X	X	X	X	X	X	X		X	X	
Alluvium	Alluvium stockpile	mwel_19002_AL05	X	X	X	X	X	X	X	X		X	X	
Alluvium	Windrow alluvium dump pile	mwel_19002_AL06	X	X	X	X	X	X	X	X		X	X	

Appendix B Site Descriptions

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Site ID: CC01

Client:	Lynas Mt Weld		
Observers:	Lynas: RD, SF, MV, AC		
Date & Time:	15:27 4/3/20		
Datum:	UTM, GDA 94, Zone 51J		
Coordinates:	**Easting:** 0455358 mE	**Northing:**	6807593 mN
Landform:	Single paddock dump amongst clay stockpile		
Site Description:	Clay stockpile - flat		
Material:	Calcrete limestone (dolomitic clay)		

Photo A.b 1 CC01-SO

Photo A.b 2 CC01-SC

Material Description:

Course fragments:

- Angular to sub-angular
- 5%
- 3 cm

Sample Description:

Course fragments:

- Angular to sub-angular
- 5%
- 3-5 cm

Pale grey to white (more white)

Massive clay

Surface crusting:

- <1 cm
- weak

Additional information:

- Stockpile contains some mottled clay
- Predominantly haematitic clay
- Minor ferricrete

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Site ID: CC02

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	15:50 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0456322 mE	**Northing:**	6807485 mN
Landform:	Calcrete limestone dump pile			
Site Description:				
Material:	Calcrete limestone			

Photo A.b 3 CC02-SO

Photo A.b 4 CC02-SC

Material Description:

Course fragments:

- Angular to sub-angular
- 90%
- Up to 200 cm

Sample Description:

Course fragments:

- Angular to sub-angular
- 40%
- Up to 6 cm

Mottled greyish white with some fawn/tan

Massive, occasional nodule of crystalline texture

Additional information:

- Blasted material – fragmentation consistent

Site ID: CC03

Client:	Lynas Mt Weld		
Observers:	Lynas: RD, SF, MV, AC		
Date & Time:	16:07 4/3/20		
Datum:	UTM, GDA 94, Zone 51J		
Coordinates:	**Easting:** 0456427 mE	**Northing:**	6807522 mN
Landform:	Calcrete limestone dump pile		
Site Description:			
Material:	Calcrete limestone		

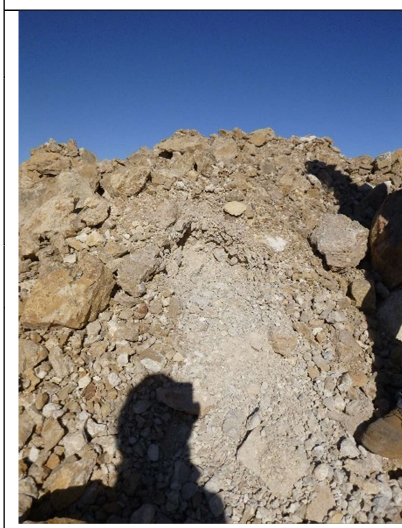

Photo A.b 5 CC03-SO

Photo A.b 6 CC03-SC

Material Description:

Course fragments:

- Angular to sub-angular
- 95%
- Up to 200 cm

Sample Description:

Course fragments:

- Angular to sub-angular
- 85%
- Up to 8 cm

Mottled greyish white with some fawn/tan

Massive, occasional nodules of crystalline texture

Additional information:

- Blasted material – fragmentation consistent

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Site ID: CC04

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV			
Date & Time:	7/3/20 10:41			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0456252 mE	**Northing:**	6807534 mN
Landform:	Calcrete limestone windrow			
Site Description:	Calcrete limestone dump pile			
Material:	Calcrete limestone			

Photo A.b 7 CC04-SO

Photo A.b 8 CC04-SC

Material Description:

Course fragments:

- Angular to sub-angular
- 70%
- 300 cm +

Sample Description:

Course fragments:

- Angular to sub-angular
- 35%
- Up to 6 cm

Mottled greyish white with some fawn/tan

Massive, occasional nodules of crystalline texture

Additional information:

- Blasted material – fragmentation consistent

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Site ID: CC05

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	7/3/20 10:52			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0456265 mE	**Northing:**	6807554 mN
Landform:	Calcrete limestone windrow			
Site Description:	Calcrete limestone dump pile			
Material:	Calcrete limestone			

Photo A.b 9 CC05-SO

Photo A.b 10 CC05-SC

Material Description:

Course fragments:

- Angular to sub-angular
- 50%
- Up to 50 cm

Sample Description:

Course fragments:

- Angular to sub-angular
- 60%
- Up to 7 cm

Massive, occasional nodules of crystalline texture

Additional information:

- Blasted material – fragmentation consistent

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Site ID: CC06

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	7/3/20 11:00			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0456283 mE	**Northing:**	6807591 mN
Landform:	Calcrete limestone windrow			
Site Description:	Calcrete limestone dump pile			
Material:	Calcrete limestone			

Photo A.b 11 CC06-SO

Photo A.b 12 CC06-SC

Material Description:

Course fragments:

- Angular to sub-angular
- 95%
- 300 cm +

Sample Description:

Course fragments:

- Angular to sub-angular
- 90%
- Up to 8 cm

Mottled grey/white with some fawn/tan

Massive, occasional nodule crystalline texture

Additional information:

- Blasted material – fragmentation consistent

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ABN: 17 007 820 322

Site ID: LC01

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	14:41 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0455388 mE	**Northing:**	6808137 mN
Landform:	Lake clay stockpile			
Site Description:	Clay stockpile ~20°			
Material:	Lake clay			


Photo A.b 13 LC01-SO.1


Photo A.b 14 LC01-SO.2

Material Description:

Course fragments:

- Clay
- 100%
- Clay (microscopic)

Sample Description:

Pale grey, pink, black, yellow

Massive clay

Surface crusting:

- <1 cm
- weak

Additional information:

- Stockpile contains some mottled clay
- Predominantly haematitic clay

Photo A.b 15 LC01-SC

Stantec	Stantec Australia 226 Adelaide Terrace, Perth WA 6000 www.stantec.com	TEL +61 (08) 9388 8799 FAX : +61 (08) 9388 8633 ABN: 17 007 820 322	**Site ID: LC02**

Client:	Lynas Mt Weld		
Observers:	Lynas: RD, SF, MV, AC		
Date & Time:	4/3/20 14:50		
Datum:	UTM, GDA 94, Zone 51J		
Coordinates:	**Easting:** 0455393 mE	**Northing:**	6807515 mN
Landform:	Lake clay stockpile		
Site Description:	Clay stockpile - flat		
Material:	Lake clay		

Photo A.b 16 LC02-SO

Photo A.b 17 LC02-SC.1

Material Description:

Course fragments:

- Clay
- 100%
- Clay (microscopic)

Sample Description:

More reds/pinks, pale grey, black, yellow

Massive clay

Surface crusting:

- <1 cm
- weak

Additional information:

- Stockpile contains some mottled clay
- Predominantly haematitic clay

Photo A.b 18 LC02-SC.2

Site ID: LC03

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	14:55 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0455377 mE	**Northing:**	6807582 mN
Landform:	Lake clay stockpile			
Site Description:	Clay stockpile ~20°			
Material:	Lake clay			

Photo A.b 19 LC03-SO

Material Description:

Course fragments:

- Clay
- 100%
- Clay (microscopic)

Sample Description:

Reds/pinks, grey, black

Massive clay

Surface crusting:

- <1 cm
- weak

Additional information:

- Stockpile contains some mottled clay
- Predominantly haematitic clay

 Photo A.b 20 LC03-SC.1  Photo A.b 21 LC03-SC.2	

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Site ID: LC04

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	15:04 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0455370 mE	**Northing:**	6807590 mN
Landform:	Lake clay stockpile			
Site Description:	Clay stockpile - flat			
Material:	Lake clay			


Photo A.b 22 LC04 SC.1


Photo A.b 23 LC04-SC.2

Material Description:

Course fragments:

- Clay
- 100%
- Clay (microscopic)

Sample Description:

Mottled grey and red

Massive clay

Surface crusting:

- <1 cm
- weak

Additional information:

- Stockpile contains some mottled clay
- Predominantly haematitic clay

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Site ID: LC05

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	15:12 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0455366 mE	**Northing:**	6807586 mN
Landform:	Lake clay stockpile			
Site Description:	Clay stockpile - flat			
Material:	Lake clay			


Photo A.b 24 LC05-SO


Photo A.b 25 LC05-SC

Material Description:

Course fragments:

- Clay
- 100%
- Clay (microscopic)

Sample Description:

Mottled grey and red

Massive clay

Surface crusting:

- <1 cm
- weak

Additional information:

- Stockpile contains some mottled clay
- Predominantly haematitic clay
- Minor ferricrete

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Site ID: LC06

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	15:19 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0455362 mE	**Northing:**	6807575 mN
Landform:	Lake clay stockpile			
Site Description:	Clay stockpile - flat			
Material:	Lake clay			

Photo A.b 26 LC06-SO

Photo A.b 27 LC06-SC

Material Description:

Course fragments:

- Clay
- 100%
- Clay (microscopic)

Sample Description:

Mottled grey and red

Massive clay

Surface crusting:

- <1 cm
- weak

Additional information:

- Stockpile contains some mottled clay
- Predominantly haematitic clay
- Minor ferricrete

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Site ID: AL01

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	13:48 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0454850 mE	**Northing:**	6807468 mN
Landform:	TSF construction material – alluvium stockpile			
Site Description:	Waste dump ~ 45-50° slope angle			
Material:	Alluvium			

Photo A.b 28 AL01-SO

Photo A.b 29 AL01-SC

Material Description:

Alluvium, prismatic (blocky)

Course fragments:

- Angular to sub-angular
- 80%
- Up to 100 cm

Sample Description:

Course fragments:

- Angular
- 80%
- 3-5 cm

Haematite reddish pink

Massive

Additional information:

- Consolidated alluvium

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ABN: 17 007 820 322

Site ID: AL02

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	13:53 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0454826 mE	**Northing:**	6807470 mN
Landform:	TSF construction material – alluvium stockpile			
Site Description:	Waste dump ~ 45°			
Material:	Alluvium			

Photo A.b 30 AL02-SO

Photo A.b 31 AL02-SC

Material Description:

Alluvium, prismatic (blocky)

Course fragments:

- Angular
- 70%
- Up to 100 cm

Sample Description:

Course fragments:

- Angular
- 60% large, 40% fine
- 2 - 6 cm

Haematite reddish pink

Massive

Additional information:

- Consolidated alluvium

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Site ID: AL03

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	14:10 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0454815 mE	**Northing:**	6807446 mN
Landform:	TSF construction material – alluvium stockpile			
Site Description:	Waste dump ~ 50°			
Material:	Alluvium			

Photo A.b 32 AL03-SO.1

Photo A.b 33 AL03-SO.2

Material Description:

Alluvium, prismatic (blocky)

Course fragments:

- Angular to sub-angular
- 80%
- Up to 100 cm

Sample Description:

Course fragments:

- Angular to sub-angular (predominantly angular)
- 50% course, 50% fine
- 4 - 7 cm

Haematite reddish pink

Massive

Additional information:

- Consolidated alluvium

 *Photo A.b 34 AL03-SC*	

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Site ID: AL04

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	14:17 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0454811 mE	**Northing:**	6807419 mN
Landform:	TSF construction material – alluvium stockpile			
Site Description:	Waste dump ~ 45-50°			
Material:	Alluvium			

Photo A.b 35 AL04-SO.1

Photo A.b 36 AL04-AO.2

Material Description:

Alluvium, prismatic (blocky)

Course fragments:

- Angular to sub-angular
- 80%

Up to 100 cm

Sample Description:

Course fragments:

- Angular to sub-angular
- 40% course, 60% fine
- 1.5 - 8 cm

Haematite reddish pink

Bimodal

Additional information:

- Consolidated alluvium

Photo A.b 37 AL04-SC

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Site ID: AL05

Client:	Lynas Mt Weld			
Observers:	Lynas: RD, SF, MV, AC			
Date & Time:	14:23 4/3/20			
Datum:	UTM, GDA 94, Zone 51J			
Coordinates:	**Easting:**	0454820 mE	**Northing:**	6807400 mN
Landform:	TSF construction material – alluvium stockpile			
Site Description:	Waste dump ~ 45°			
Material:	Alluvium			

Photo A.b 38 AL05-SO.1

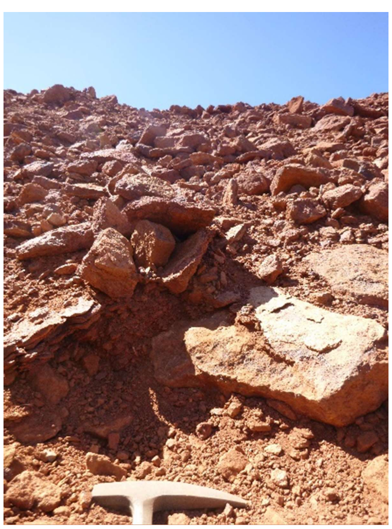

Photo A.b 39 AL05-SO.2

Material Description:

Alluvium, prismatic (blocky)

Course fragments:

- Angular to sub-angular
- 75%
- Up to 150 cm

Sample Description:

Course fragments:

- Angular to sub-angular
- 30% course, 70% fine
- Up to 12 cm

Haematite reddish pink

Massive to bimodal

Additional information:

- Consolidated alluvium

 *Photo A.b 40 AL05-SC*	

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Client:	Lynas Mt Weld		
Observers:	Lynas: RD, SF, MV, AC		
Date & Time:	11:21 7/3/20		
Datum:	UTM, GDA 94, Zone 51J		
Coordinates:	**Easting:** 0457107 mE	**Northing:**	6806352 mN
Landform:	Windrow alluvium dump pile		
Site Description:	Windrow ~40° near floor control drain		
Material:	Alluvium		

Photo A.b 41 AL06-SO

Photo A.b 42 AL06-SC

Material Description:

Course fragments:

- Angular to sub-angular
- 50%
- Up to 70 cm

Sample Description:

Course fragments:

- Angular to sub-angular
- 20% course, 80% fine
- Up to 4 cm

Reddish pink, brown, mottled black

Massive to granular

Additional information:

- Consolidated alluvium

Appendix C Analytical Results

Table 1
Soil Physical Test Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	Particle Size Distribution				Soil Texture		Soil Colour [3]	
			Analyte	Gravel [2] (>2 mm)	Sand (0.06 - 2.00 mm)	Silt (2 - 60 µm)	Clay (<2 µm)	Field Texture	Texture (determined from PSD)	Munsell Colour Code	Munsell Colour Description
			LOR	0.1	1	1	1	NA	NA	NA	NA
			Units	%	%	%	%	NA	NA	NA	NA
			Screening Level	-	-	-	-	-	-	-	-
Material Type	Sample Type	Date Sampled	Sample ID								
Calcrete limestone	Grab sample	04-03-20	CC01	**19**	**31**	**36**	**13**	gritty LC - LMC	Silty Loam	8/1	White
Calcrete limestone	Grab sample	04-03-20	CC02	**13**	**28**	**35**	**24**	LMC	Silty Loam	8/4	Very pale brown
Calcrete limestone	Grab sample	04-03-20	CC03	**20**	**56**	**11**	**13**	v. gritty LC	Loam	8/3	Very pale brown
Calcrete limestone	Grab sample	07-03-20	CC04	**25**	**10**	**26**	**38**	MC - MHC	Silty Clay	6/4	Light yellowish brown
Calcrete limestone	Grab sample	07-03-20	CC05	**31**	**30**	**23**	**17**	gritty LC - LMC	Silty Loam	8/2	Very pale brown
Calcrete limestone	Grab sample	07-03-20	CC06	**30**	**24**	**19**	**27**	MC	Silty Clay Loam	7/4	Very pale brown
Lake clay	Grab sample	04-03-20	LC01	**0**	**6**	**7**	**87**	HC	Clay	5/4	Weak red
Lake clay	Grab sample	04-03-20	LC02	**0**	**10**	**5**	**85**	MHC	Clay	5/4	Weak red
Lake clay	Grab sample	04-03-20	LC03	**0**	**22**	**13**	**65**	MC - MHC	Clay	5/6	Red
Lake clay	Grab sample	04-03-20	LC04	**0**	**8**	**9**	**83**	MC - MHC	Clay	5/6	Red
Lake clay	Grab sample	04-03-20	LC05	**0**	**14**	**4**	**82**	HC	Clay	4/4	Weak red
Lake clay	Grab sample	04-03-20	LC06	**0**	**7**	**5**	**88**	HC	Clay	4/4	Weak red
Alluvium	Grab sample	04-03-20	AL01	**76**	**19**	**1**	**4**	CS	Sandy Loam	5/6	Red
Alluvium	Grab sample	04-03-20	AL02	**75**	**21**	**2**	**3**	LS	Sandy Loam	5/6	Red
Alluvium	Grab sample	04-03-20	AL03	**75**	**22**	**1**	**3**	CS	Sandy Loam	5/6	Red
Alluvium	Grab sample	04-03-20	AL04	**81**	**16**	**1**	**2**	LS	Sandy Loam	4/6	Red
Alluvium	Grab sample	04-03-20	AL05	**69**	**28**	**1**	**3**	LS	Loamy Sand	4/6	Red
Alluvium	Grab sample	07-03-20	AL06	**82**	**17**	**1**	**1**	LS	Sand	4/8	Red

Notes:

- Not analysed / not calculated

1. Coarse material content determined via dry seiving method. b. Additional coarse material size fractions reported as % of total coarse material (>2 mm) content.

2. Gravel content determined via hydrometer method.

3. Soil colour classes derived from Munsell Soil Colour Charts (Munsell, 2000)

4. Soil stability classes derived from Moore, 1998

5. Drainage classes derived from Hunt & Gilkes, 1992

Table 1
Soil Physical Test Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	Soil Stability [4]		Soil Strength	Saturated Hydraulic Conductivity		Water Retention - Soil Sized Fraction			Water Retention - Including Coarse Material	
			Analyte	Emerson Class (inital)	Emerson Class (20 hr)	MOR	K_{SAT}	Drainage Class [5]	USL (10 kPa)	LSL (1500 kPa)	PAW	USL (10 kPa)	PAW
			LOR	NA	NA	0.1	0.001	NA	0.1	0.1	0.1	0.1	0.1
			Units	Class	Class	kPa	mm/hr	Class	%	%	%	%	%
			Screening Level	≥2	≥2	60	-	-	-	-	-	-	-
Material Type	Sample Type	Date Sampled	Sample ID										
Calcrete limestone	Grab sample	04-03-20	CC01	Class 7	Class 2 - 4	**122**	**0.000**	Extremely slow	**53.6**	**30.2**	**23.4**	**43.2**	**18.9**
Calcrete limestone	Grab sample	04-03-20	CC02	Class 8	Class 4	**208**							
Calcrete limestone	Grab sample	04-03-20	CC03	Class 8	Class 4	**27**							
Calcrete limestone	Grab sample	07-03-20	CC04	Class 7	Class 4	**30**	**0.000**	Extremely slow	**45.4**	**25.7**	**19.7**	**34.0**	**14.7**
Calcrete limestone	Grab sample	07-03-20	CC05	Class 8	Class 4	**173**	**0.780**	Very slow	**39.5**	**11.3**	**28.2**	**27.3**	**19.5**
Calcrete limestone	Grab sample	07-03-20	CC06	Class 8	Class 4	**207**	**0.000**	Extremely slow	**44.1**	**20.8**	**23.3**	**31.0**	**16.3**
Lake clay	Grab sample	04-03-20	LC01	Class 7	Class 1	**179**							
Lake clay	Grab sample	04-03-20	LC02	Class 7	Class 1	**487**	**0.000**	Extremely slow	**67.1**	**51.9**	**15.3**	**67.1**	**15.3**
Lake clay	Grab sample	04-03-20	LC03	Class 7	Class 1 - 2	**292**							
Lake clay	Grab sample	04-03-20	LC04	Class 7	Class 1 - 2	**403**	**0.000**	Extremely slow	**70.4**	**51.5**	**18.9**	**70.4**	**18.9**
Lake clay	Grab sample	04-03-20	LC05	Class 7	Class 1 - 2	**663**							
Lake clay	Grab sample	04-03-20	LC06	Class 7	Class 1	**654**	**0.000**	Extremely slow	**72.4**	**55.3**	**17.1**	**72.4**	**17.1**
Alluvium	Grab sample	04-03-20	AL01	Class 8	Class 2	**6**	**1091.340**	Very rapid	**35.7**	**16.3**	**19.4**	**8.7**	**4.7**
Alluvium	Grab sample	04-03-20	AL02	Class 2	Class 2	**2**							
Alluvium	Grab sample	04-03-20	AL03	Class 2	Class 2	**2**							
Alluvium	Grab sample	04-03-20	AL04	Class 8	Class 2	**2**	**313.770**	Very rapid	**32.8**	**15.2**	**17.6**	**6.3**	**3.4**
Alluvium	Grab sample	04-03-20	AL05	Class 2	Class 2	**1**	**2300.900**	Very rapid	**32.9**	**17.3**	**15.6**	**10.4**	**4.9**
Alluvium	Grab sample	07-03-20	AL06	Class 2	Class 2	**0**							

Notes:

- Not analysed / not calculated

1. Coarse material content determined via dry seiving method. b. Additional coarse material size fractions reported as % of total coarse material (>2 mm) content.

2. Gravel content determined via hydrometer method.

3. Soil colour classes derived from Munsell Soil Colour Charts (Munsell, 2000)

4. Soil stability classes derived from Moore, 1998

5. Drainage classes derived from Hunt & Gilkes, 1992

Table 2
Soil Chemical Test Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	Chemical Parameters			Organic Matter	
			Analyte	pH (H_2O)	pH ($CaCl_2$)	EC	Organic Matter	Organic Carbon
			LOR	0.1	0.1	0.001	0.5	0.5
			Units	pH units	pH units	dS/m	%	%
			Screening Level	-	-	-	-	<1.0
Material Type	Sample Type	Date Sampled	Sample ID					
Calcrete limestone	Grab sample	04-03-20	CC01	**9.4**	**7.4**	**0.31**	**0.6**	<0.5
Calcrete limestone	Grab sample	04-03-20	CC02	**9.6**	**7.6**	**0.16**	**1.0**	**0.6**
Calcrete limestone	Grab sample	04-03-20	CC03	**9.8**	**8.1**	**0.15**	**0.8**	<0.5
Calcrete limestone	Grab sample	07-03-20	CC04	**9.4**	**8.0**	**0.27**	**0.5**	<0.5
Calcrete limestone	Grab sample	07-03-20	CC05	**9.6**	**8.2**	**0.219**	**0.8**	<0.5
Calcrete limestone	Grab sample	07-03-20	CC06	**9.0**	**8.1**	**0.65**	**1.1**	**0.7**
Lake clay	Grab sample	04-03-20	LC01	**8.5**	**7.9**	**0.39**	**0.8**	<0.5
Lake clay	Grab sample	04-03-20	LC02	**8.7**	**7.8**	**0.140**	**0.5**	<0.5
Lake clay	Grab sample	04-03-20	LC03	**8.9**	**7.7**	**0.124**	**0.8**	<0.5
Lake clay	Grab sample	04-03-20	LC04	**8.7**	**7.6**	**0.097**	**1.0**	**0.6**
Lake clay	Grab sample	04-03-20	LC05	**8.8**	**7.6**	**0.14**	**1.1**	**0.6**
Lake clay	Grab sample	04-03-20	LC06	**8.6**	**7.5**	**0.23**	<0.5	<0.5
Alluvium	Grab sample	04-03-20	AL01	**8.9**	**7.5**	**0.26**	<0.5	<0.5
Alluvium	Grab sample	04-03-20	AL02	**8.8**	**7.8**	**0.52**	<0.5	<0.5
Alluvium	Grab sample	04-03-20	AL03	**9.1**	**7.8**	**0.30**	**0.5**	<0.5
Alluvium	Grab sample	04-03-20	AL04	**8.9**	**7.2**	**0.44**	<0.5	<0.5
Alluvium	Grab sample	04-03-20	AL05	**9.3**	**7.5**	**0.20**	<0.5	<0.5
Alluvium	Grab sample	07-03-20	AL06	**9.4**	**7.6**	**0.202**	**0.6**	<0.5

Notes:
- Not analysed / not calculated
1. eCEC is calculated from the sum of basic cations (Ca, K, Mg, Na)
2. ESP is calculated from exchangable sodium and eCEC

Table 2
Soil Chemical Test Results
Mt Weld Waste Materials Characterisation

Material Type	Sample Type	Date Sampled	Sample ID	Exchangeable Calcium	Exchangeable Potassium	Exchangeable Magnesium	Exchangeable Sodium	Effective Cation Exchange Capacity[1]	Exchangable Sodium Percentage[2]
			Analyte Grouping	Exchangeable Cations					
			LOR	0.01	0.01	0.01	0.01	1	1
			Units	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%
			Screening Level	-	-	-	-	-	6
Calcrete limestone	Grab sample	04-03-20	CC01	**5.2**	**0.3**	**6**	**0.6**	**12.1**	**5**
Calcrete limestone	Grab sample	04-03-20	CC02	**6.4**	**0.3**	**7.1**	**1.1**	**14.9**	**7**
Calcrete limestone	Grab sample	04-03-20	CC03	**6.9**	**0.3**	**7.2**	**1.1**	**15.5**	**7**
Calcrete limestone	Grab sample	07-03-20	CC04	**8.4**	**0.6**	**10.3**	**2.6**	**21.9**	**12**
Calcrete limestone	Grab sample	07-03-20	CC05	**5.9**	**0.1**	**6**	**1**	**13**	**8**
Calcrete limestone	Grab sample	07-03-20	CC06	**5.5**	**0.3**	**5.8**	**0.3**	**12.0**	**3**
Lake clay	Grab sample	04-03-20	LC01	**9.8**	**0.9**	**13.1**	**3.2**	**27.0**	**12**
Lake clay	Grab sample	04-03-20	LC02	**14.3**	**1.3**	**20.4**	**6.2**	**42.2**	**15**
Lake clay	Grab sample	04-03-20	LC03	**12.6**	**1**	**17.2**	**5.8**	**36.6**	**16**
Lake clay	Grab sample	04-03-20	LC04	**13.7**	**1.1**	**19.6**	**6.2**	**40.6**	**15**
Lake clay	Grab sample	04-03-20	LC05	**12.5**	**1**	**16.7**	**5.9**	**36.1**	**16**
Lake clay	Grab sample	04-03-20	LC06	**11.5**	**1**	**16**	**5.6**	**34.1**	**16**
Alluvium	Grab sample	04-03-20	AL01	**6.8**	**1.7**	**3.6**	**2.3**	**14.4**	**16**
Alluvium	Grab sample	04-03-20	AL02	**9.4**	**1.6**	**3.9**	**1.3**	**16.2**	**8**
Alluvium	Grab sample	04-03-20	AL03	**8.2**	**1.9**	**4.9**	**2.9**	**17.9**	**16**
Alluvium	Grab sample	04-03-20	AL04	**9.9**	**1.7**	**4.2**	**1.4**	**17.2**	**8**
Alluvium	Grab sample	04-03-20	AL05	**7**	**2**	**4.3**	**2.8**	**16.1**	**17**
Alluvium	Grab sample	07-03-20	AL06	**10.5**	**2.4**	**5.6**	**4.3**	**22.8**	**19**

Notes:
- Not analysed / not calculated
1. eCEC is calculated from the sum of basic cations (Ca, K, Mg, Na)
2. ESP is calculated from exchangable sodium and eCEC

Table 2
Soil Chemical Test Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	Plant Available Nutrients				
			Analyte	Ammonium Nitrogen	Nitrate Nitrogen	Phosphorus	Potassium	Sulphur
			LOR	1	1	2	5	5
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
			Screening Level	-	-	-	-	-
Material Type	Sample Type	Date Sampled	Sample ID					
Calcrete limestone	Grab sample	04-03-20	CC01	**4.1**	**21.7**	<5	**329**	**71**
Calcrete limestone	Grab sample	04-03-20	CC02	**2.77**	**9.57**	<5	**313**	**21**
Calcrete limestone	Grab sample	04-03-20	CC03	**5.16**	**5.41**	<5	**273**	**<10**
Calcrete limestone	Grab sample	07-03-20	CC04	**4.52**	**21.1**	<5	**481**	**42**
Calcrete limestone	Grab sample	07-03-20	CC05	**3.83**	**31.6**	<5	**172**	**37**
Calcrete limestone	Grab sample	07-03-20	CC06	**2.62**	**35**	<5	**341**	**142**
Lake clay	Grab sample	04-03-20	LC01	**1.94**	**15.5**	<5	**1010**	**97**
Lake clay	Grab sample	04-03-20	LC02	**1.41**	**15.5**	<5	**900**	**77**
Lake clay	Grab sample	04-03-20	LC03	**1.38**	**14.1**	<5	**742**	**65**
Lake clay	Grab sample	04-03-20	LC04	**1.53**	**15.2**	<5	**801**	**70**
Lake clay	Grab sample	04-03-20	LC05	**1.18**	**16.4**	<5	**760**	**76**
Lake clay	Grab sample	04-03-20	LC06	**1.71**	**16.9**	<5	**764**	**70**
Alluvium	Grab sample	04-03-20	AL01	**0.95**	**17.2**	<5	**1330**	**46**
Alluvium	Grab sample	04-03-20	AL02	**2.25**	**69.9**	<5	**1230**	**81**
Alluvium	Grab sample	04-03-20	AL03	**10.2**	**26.1**	<5	**1320**	**48**
Alluvium	Grab sample	04-03-20	AL04	**2.27**	**43.1**	<5	**1300**	**97**
Alluvium	Grab sample	04-03-20	AL05	**1.27**	**11.8**	<5	**1570**	**20**
Alluvium	Grab sample	07-03-20	AL06	**3.73**	**45.4**	<5	**1820**	**11**

Notes:
- Not analysed / not calculated
1. eCEC is calculated from the sum of basic cations (Ca, K, Mg, Na)
2. ESP is calculated from exchangable sodium and eCEC

Table 3
Geochemical Test Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	Physio-chemical Parameters		NAPP Calculation							
			Analyte	Paste pH	Paste EC	Total Sulphur	Sulphate Sulphur (as SO_4)	Calculated Sulphide Sulphur	Calculated AP[1]	NP (ANC)	Fizz Rating	NAPP[3]	Calculated NAPP[4]
			LOR	0.1	1	0.01	10	0.01	0.3	0.5	-	0.5	-
			Units	pH units	µS/cm	%	mg/kg	%	kg H_2SO_4/t	kg H_2SO_4/t	Fizz units	kg H_2SO_4/t	kg H_2SO_4/t
Material Type	Sample Type	Date Sampled	Sample ID										
Calcrete limestone	Grab sample	04-03-20	CC01	**8.6**	**719**	**0.01**	**440**	**0.00**	**-0.1**	**820.0**	**5**	**-820.0**	**-820.1**
Calcrete limestone	Grab sample	04-03-20	CC02	**8.6**	**604**	<0.01	**220**	**0.00**	**0.1**	**851.0**	**5**	**-851.0**	**-850.9**
Calcrete limestone	Grab sample	04-03-20	CC03	**8.9**	**332**	<0.01	**290**	**0.00**	**0.0**	**878.0**	**5**	**-878.0**	**-878.0**
Calcrete limestone	Grab sample	07-03-20	CC04	**8.7**	**795**	**0.01**	**260**	**0.00**	**0.0**	**637.0**	**5**	**-637.0**	**-637.0**
Calcrete limestone	Grab sample	07-03-20	CC05	**8.3**	**835**	<0.01	**290**	**0.00**	**0.0**	**668.0**	**5**	**-668.0**	**-668.0**
Calcrete limestone	Grab sample	07-03-20	CC06	**8.0**	**1810**	**0.02**	**580**	**0.00**	**0.0**	**733.0**	**5**	**-732.0**	**-733.0**
Lake clay	Grab sample	04-03-20	LC01	**8.3**	**1040**	**0.02**	**370**	**0.01**	**0.2**	**132.0**	**2**	**-131.0**	**-131.8**
Lake clay	Grab sample	04-03-20	LC02	**8.1**	**1050**	**0.03**	**420**	**0.02**	**0.5**	**65.4**	**2**	**-64.5**	**-64.9**
Lake clay	Grab sample	04-03-20	LC03	**8.2**	**590**	**0.02**	**450**	**0.00**	**0.2**	**16.6**	**2**	**-16.0**	**-16.5**
Lake clay	Grab sample	04-03-20	LC04	**7.8**	**744**	**0.02**	**500**	**0.00**	**0.1**	**10.6**	**1**	**-10.0**	**-10.5**
Lake clay	Grab sample	04-03-20	LC05	**8.0**	**1110**	**0.02**	**500**	**0.00**	**0.1**	**11.1**	**1**	**-10.5**	**-11.0**
Lake clay	Grab sample	04-03-20	LC06	**7.9**	**1060**	**0.02**	**500**	**0.00**	**0.1**	**14.1**	**2**	**-13.5**	**-14.0**
Alluvium	Grab sample	04-03-20	AL01	**7.9**	**1110**	<0.01	**240**	**0.00**	**0.1**	**15.3**	**2**	**-15.3**	**-15.2**
Alluvium	Grab sample	04-03-20	AL02	**7.8**	**1310**	<0.01	**330**	**0.00**	**0.0**	**19.6**	**2**	**-19.6**	**-19.6**
Alluvium	Grab sample	04-03-20	AL03	**8.0**	**935**	<0.01	**250**	**0.00**	**0.1**	**14.1**	**2**	**-14.1**	**-14.1**
Alluvium	Grab sample	04-03-20	AL04	**7.9**	**1460**	**0.01**	**360**	**0.00**	**-0.1**	**21.2**	**1**	**-20.9**	**-21.3**
Alluvium	Grab sample	04-03-20	AL05	**8.3**	**284**	<0.01	**170**	**0.00**	**0.1**	**18.0**	**1**	**-18.0**	**-17.9**
Alluvium	Grab sample	07-03-20	AL06	**8.2**	**670**	<0.01	**120**	**0.01**	**0.2**	**16.3**	**1**	**-16.3**	**-16.1**

Notes:

- or NA = Not analysed / not calculated

1. AP Is calculated from Total sulphur % and sulphate sulphur
2. NP is calculated from inorganic carbon
3. NAPP (as reported from lab, calculated using Total sulphur and ANC)
4. Calculated NAPP = AP-NP (Assumes values below detection limit are a whole number)
5. Sample classification criteria (refer to Table 3-3). UNC samples have been given arbitrary classifications for the purpose of recommending management strategies

Table 3
Geochemical Test Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	NAG Calculation			ABA Classification	
			Analyte	NAGpH (OX)	NAG (pH 4.5)	NAG (pH 7.0)	NP/AP	Sample Classification[5]
			LOR	0.1	0.1	0.1	-	-
			Units	pH units	kg H_2SO_4/t	kg H_2SO_4/t	-	-
Material Type	Sample Type	Date Sampled	Sample ID					
Calcrete limestone	Grab sample	04-03-20	CC01	**9.0**	<0.1	<0.1	**5715.2**	AC
Calcrete limestone	Grab sample	04-03-20	CC02	**9.0**	<0.1	<0.1	**10456**	AC
Calcrete limestone	Grab sample	04-03-20	CC03	**9.6**	<0.1	<0.1	**89241.1**	AC
Calcrete limestone	Grab sample	07-03-20	CC04	**9.1**	<0.1	<0.1	**15727.7**	AC
Calcrete limestone	Grab sample	07-03-20	CC05	**9.2**	<0.1	<0.1	**67896.4**	AC
Calcrete limestone	Grab sample	07-03-20	CC06	**9.3**	<0.1	<0.1	**37251.6**	AC
Lake clay	Grab sample	04-03-20	LC01	**8.7**	<0.1	<0.1	**563.3**	AC
Lake clay	Grab sample	04-03-20	LC02	**8.5**	<0.1	<0.1	**134**	AC
Lake clay	Grab sample	04-03-20	LC03	**7.6**	<0.1	<0.1	**109**	NAF-barren
Lake clay	Grab sample	04-03-20	LC04	**6.9**	<0.1	**2.8**	**104.5**	NAF-barren
Lake clay	Grab sample	04-03-20	LC05	**6.7**	<0.1	**4.6**	**109.4**	NAF-barren
Lake clay	Grab sample	04-03-20	LC06	**6.9**	<0.1	**3.8**	**139.0**	NAF-barren
Alluvium	Grab sample	04-03-20	AL01	**8.2**	<0.1	<0.1	**251.1**	NAF-barren
Alluvium	Grab sample	04-03-20	AL02	**8.6**	<0.1	<0.1	**631.3**	NAF-barren
Alluvium	Grab sample	04-03-20	AL03	**8.3**	<0.1	<0.1	**278.0**	NAF-barren
Alluvium	Grab sample	04-03-20	AL04	**8.8**	<0.1	<0.1	**343.6**	AC
Alluvium	Grab sample	04-03-20	AL05	**8.6**	<0.1	<0.1	**135.9**	NAF-barren
Alluvium	Grab sample	07-03-20	AL06	**8.3**	<0.1	<0.1	**88.8**	NAF-barren

Notes:

- or NA = Not analysed / not calculated

1. AP is calculated from Total sulphur % and sulphate sulphur
2. NP is calculated from inorganic carbon
3. NAPP (as reported from lab, calculated using Total sulphur and ANC)
4. Calculated NAPP = AP-NP (Assumes values below detection limit are a whole number)
5. Sample classification criteria (refer to Table 3-3). UNC samples have been given arbitrary classifications for the purpose of recommending management strategies

Table 4
Geochemical Abundance Index Results
Mt Weld Waste Materials Characterisation

	Analyte	Average Total Element Concentration [1]			Average Crustal Abundance[2]	Geochemical Abundance Index		
	Units	mg/kg			(mg/kg or %)	GAI value		
	Material Type	Calcrete	Lake clay	Alluvium		Calcrete	Lake clay	Alluvium
Element	LOR (mg/kg)	n=3	n=7	n=6				
Arsenic	5	**12.5**	**28.7**	**10.5**	6	**0**	**2**	**0**
Barium	10	**163.3**	**538.3**	**175.0**	500	<0	**0**	<0
Beryllium	1	**1.0**	**1.5**	**1.0**	6	<LOR	<0	<LOR
Boron	50	**50.0**	**53.3**	**50.0**	ND	-	-	-
Cadmium	1	**2.7**	**1.0**	**1.0**	0.35	**2**	<1	<1
Chromium	2	**25.3**	**72.0**	**74.8**	70	<0	<0	**0**
Cobalt	2	**14.2**	**11.2**	**11.7**	8	**0**	**0**	**0**
Copper	5	**15.2**	**36.5**	**16.0**	30	<0	**0**	<0
Iron	0.005%	**12.2**	**33.3**	**8.4**	4%	<0	<0	<0
Lead	5	**1129.8**	**175.8**	**552.3**	35	**0**	<0	<0
Manganese	5	**0.1**	**0.1**	**0.1**	1000	<0	<0	<0
Mercury	0.1	**9.8**	**37.0**	**29.7**	0.06 [3]	<0	<0	<0
Nickel	2	**5.0**	**5.0**	**5.0**	50	<3	<3	<3
Selenium	5	**0.0**	**0.0**	**0.0**	0.4 [3]	<LOR	**4**	<LOR
Vanadium	5	**24.5**	**123.8**	**55.3**	90	<0	**0**	<0
Zinc	5	**77.3**	**18.7**	**23.2**	90	<0	<0	<0

Notes
1. Total element content values are mean concentrations (calculated from Table 3)
2. Average crustal abundance in soils derived from Environmental Chemistry of the Elements (Bowen, 1979) as provided in GARD Guide (INAP, 2009)
3. LOR is greater than average crustal abundance. GAI is assessed using LOR as a whole number and result indicated with a '<'
<LOR - element below analytical limit of reporting, effective GAI is less than calculated GAI
ND = No data is published
n denotes number of samples used to determine mean concentration
Shaded cells indicate a GAI value of 3 or greater

Table 5
Multi-element Solids Analytical Results
Mt Weld Waste Materials Characterisation

Material Type	Sample Type	Date Sampled	Analyte Grouping	Physio-chemical Parameters		Elements (Total)			
			Analyte	pH (H_2O)	EC	Arsenic	Barium	Beryllium	Boron
			LOR	0.1	1.000	5.0	10	1.0	50
			Units	pH units	µS/cm	mg/kg	mg/kg	mg/kg	mg/kg
			ABC	-	-	5.5	-	-	-
			EIL	-	-	45	-	-	-
			ISQG - Low	-	-	20	-	-	-
			ISQG - High	-	-	70	-	-	-
Material Type	Sample Type	Date Sampled	Sample ID						
Calcrete limestone	Grab sample	04-03-20	CC01	**9.4**	**312**	**10**	**430**	**1**	<50
Calcrete limestone	Grab sample	04-03-20	CC02	**9.6**	**162**	**12**	**150**	<1	<51
Calcrete limestone	Grab sample	04-03-20	CC03	**9.8**	**151**	**8**	**70**	<1	<52
Calcrete limestone	Grab sample	07-03-20	CC04	**9.4**	**271**	**24**	**120**	<1	<53
Calcrete limestone	Grab sample	07-03-20	CC05	**9.6**	**219**	**8**	**70**	<1	<54
Calcrete limestone	Grab sample	07-03-20	CC06	**9.0**	**651**	**13**	**140**	<1	<55
Lake clay	Grab sample	04-03-20	LC01	**8.5**	**389**	**76**	**360**	**3**	<56
Lake clay	Grab sample	04-03-20	LC02	**8.7**	**140**	**60**	**420**	**2**	<57
Lake clay	Grab sample	04-03-20	LC03	**8.9**	**124**	**8**	**570**	<1	<58
Lake clay	Grab sample	04-03-20	LC04	**8.7**	**97**	**8**	**790**	<1	<59
Lake clay	Grab sample	04-03-20	LC05	**8.8**	**144**	**8**	**630**	<1	<60
Lake clay	Grab sample	04-03-20	LC06	**8.6**	**232**	**12**	**460**	<1	<61
Alluvium	Grab sample	04-03-20	AL01	**8.9**	**260**	**12**	**140**	<1	<62
Alluvium	Grab sample	04-03-20	AL02	**8.8**	**518**	**9**	**170**	<1	<63
Alluvium	Grab sample	04-03-20	AL03	**9.1**	**298**	**7**	**220**	<1	<64
Alluvium	Grab sample	04-03-20	AL04	**8.9**	**444**	**14**	**220**	<1	<65
Alluvium	Grab sample	04-03-20	AL05	**9.3**	**202**	**16**	**140**	<1	<66
Alluvium	Grab sample	07-03-20	AL06	**9.4**	**202**	<5	**160**	<1	<67

Notes:

ABC values calculated from median concentrations of baseline soil data (Outback Ecology, 2010)

Exceeds the NEPM (2013) EIL for protection of areas of ecological significance

Exceeds the ANZECC ISQG-Low (Trigger value)

Exceeds the ANZECC ISQG-High (Trigger Value)

- Not analysed / not calculated

1. EIL trigger value is adopted based on average clay content (calculated from results in Table 1)
2. EIL trigger value is adopted based on average CEC and pH_{Ca} (calculated from results in Table 2)
3. EIL trigger value is adopted based on average CEC (calculated from results in Table 2)
4. EIL trigger value is adopted based on average pHCa (calculated from results in Table 2)

Table 5
Multi-element Solids Analytical Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	Elements (Total)					
			Analyte	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese
			LOR	1.0	2.0	2.0	5.0	5.0	5.0
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
			ABC	<1	24	-	9.4	5.5	-
			EIL	-	240 [1]	-	85 [2]	480	-
			ISQG - Low	1.5	80	-	65	50	-
			ISQG - High	10	370	-	270	220	-
Material Type	Sample Type	Date Sampled	Sample ID						
Calcrete limestone	Grab sample	04-03-20	CC01	<1	**21**	**69**	**35**	**9**	**1250**
Calcrete limestone	Grab sample	04-03-20	CC02	<1	**24**	**3**	**10**	**15**	**1530**
Calcrete limestone	Grab sample	04-03-20	CC03	**11**	**27**	**2**	**11**	<5	**480**
Calcrete limestone	Grab sample	07-03-20	CC04	**1**	**34**	**4**	**14**	**18**	**649**
Calcrete limestone	Grab sample	07-03-20	CC05	<1	**16**	**2**	**9**	**6**	**1290**
Calcrete limestone	Grab sample	07-03-20	CC06	<1	**30**	**5**	**12**	**13**	**1580**
Lake clay	Grab sample	04-03-20	LC01	<1	**37**	**26**	**53**	**82**	**442**
Lake clay	Grab sample	04-03-20	LC02	<1	**51**	**25**	**64**	**88**	**382**
Lake clay	Grab sample	04-03-20	LC03	**1**	**132**	**3**	**20**	**7**	**26**
Lake clay	Grab sample	04-03-20	LC04	**1**	**81**	**3**	**21**	**7**	**11**
Lake clay	Grab sample	04-03-20	LC05	<1	**67**	**5**	**29**	**8**	**87**
Lake clay	Grab sample	04-03-20	LC06	<1	**64**	**5**	**32**	**8**	**107**
Alluvium	Grab sample	04-03-20	AL01	<1	**91**	**11**	**17**	**8**	**454**
Alluvium	Grab sample	04-03-20	AL02	<1	**73**	**11**	**15**	**7**	**553**
Alluvium	Grab sample	04-03-20	AL03	<1	**85**	**13**	**16**	**6**	**540**
Alluvium	Grab sample	04-03-20	AL04	<1	**77**	**12**	**16**	**9**	**653**
Alluvium	Grab sample	04-03-20	AL05	<1	**65**	**12**	**15**	**12**	**553**
Alluvium	Grab sample	07-03-20	AL06	<1	**58**	**11**	**17**	<5	**561**

Notes:

ABC values calculated from median concentrations of baseline soil data (Outback Ecology, 201

Exceeds the NEPM (2013) EIL for protection of areas of ecological significance

Exceeds the ANZECC ISQG-Low (Trigger value)

Exceeds the ANZECC ISQG-High (Trigger Value)

- Not analysed / not calculated

1. EIL trigger value is adopted based on average clay content (calculated from results in Table 1
2. EIL trigger value is adopted based on average CEC and pH_{Ca} (calculated from results in Table
3. EIL trigger value is adopted based on average CEC (calculated from results in Table 2)
4. EIL trigger value is adopted based on average pHCa (calculated from results in Table 2)

Table 5
Multi-element Solids Analytical Results
Mt Weld Waste Materials Characterisation

			Analyte Grouping	Elements (Total)				
			Analyte	Mercury	Nickel	Selenium	Vanadium	Zinc
			LOR	0.1	2.0	5.0	5.0	5.0
			Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
			ABC	<0.1	4.6	-	-	9.1
			EIL	-	50 - 75 [3]	-	-	140 - 240 [4]
			ISQG - Low	0.15	21	-	-	200
			ISQG - High	1	52	-	-	410
Material Type	Sample Type	Date Sampled	Sample ID					
Calcrete limestone	Grab sample	04-03-20	CC01	<0.1	**26**	<5	**15**	**25**
Calcrete limestone	Grab sample	04-03-20	CC02	<0.1	**6**	<5	**31**	**46**
Calcrete limestone	Grab sample	04-03-20	CC03	<0.1	**4**	<5	**12**	**245**
Calcrete limestone	Grab sample	07-03-20	CC04	<0.1	**9**	<5	**36**	**68**
Calcrete limestone	Grab sample	07-03-20	CC05	<0.1	**5**	<5	**21**	**35**
Calcrete limestone	Grab sample	07-03-20	CC06	<0.1	**9**	<5	**32**	**45**
Lake clay	Grab sample	04-03-20	LC01	<0.1	**48**	<5	**80**	**27**
Lake clay	Grab sample	04-03-20	LC02	<0.1	**68**	<5	**106**	**27**
Lake clay	Grab sample	04-03-20	LC03	<0.1	**20**	<5	**147**	**13**
Lake clay	Grab sample	04-03-20	LC04	<0.1	**21**	<5	**164**	**11**
Lake clay	Grab sample	04-03-20	LC05	<0.1	**32**	<5	**129**	**15**
Lake clay	Grab sample	04-03-20	LC06	<0.1	**33**	<5	**117**	**19**
Alluvium	Grab sample	04-03-20	AL01	<0.1	**23**	<5	**64**	**28**
Alluvium	Grab sample	04-03-20	AL02	<0.1	**26**	<5	**50**	**21**
Alluvium	Grab sample	04-03-20	AL03	<0.1	**32**	<5	**61**	**18**
Alluvium	Grab sample	04-03-20	AL04	<0.1	**29**	<5	**55**	**29**
Alluvium	Grab sample	04-03-20	AL05	<0.1	**27**	<5	**49**	**30**
Alluvium	Grab sample	07-03-20	AL06	<0.1	**41**	<5	**53**	**13**

Notes:

ABC values calculated from median concentrations of baseline soil data (Outback Ecology, 201

Exceeds the NEPM (2013) EIL for protection of areas of ecological significance

Exceeds the ANZECC ISQG-Low (Trigger value)

Exceeds the ANZECC ISQG-High (Trigger Value)

- Not analysed / not calculated

1. EIL trigger value is adopted based on average clay content (calculated from results in Table 1
2. EIL trigger value is adopted based on average CEC and pH_{Ca} (calculated from results in Table
3. EIL trigger value is adopted based on average CEC (calculated from results in Table 2)
4. EIL trigger value is adopted based on average pHCa (calculated from results in Table 2)

Table 6
Multi-element Solution Analytical Results
Mt Weld Waste Materials Characterisation

Material Type	Sample Type	Date Sampled	Sample ID	pH	Final pH (ASLP leach)	EC	Aluminium	Arsenic [1]	Barium	Beryllium
			Analyte Grouping	Physio-chemical Parameters			Elements (Dissolved)			
			LOR	0.1	0.1	1.0	0.01	0.001	0.001	0.001
			Units	pH units	pH units	µS/cm	mg/L	mg/L	mg/L	mg/L
			GIL Marine Water	-	-	-	-	-	-	-
			ANZECC Marine Water	-	-	-	-	-	-	-
			LDW	-	-	-	5	0.5	-	-
Calcrete limestone	Grab sample	04-03-20	CC01	**9.4**	**9.5**	**312**	**0.02**	<0.001	**0.100**	<0.001
Calcrete limestone	Grab sample	04-03-20	CC02	**9.6**	**9.6**	**162**	**0.03**	<0.001	**0.038**	<0.001
Calcrete limestone	Grab sample	04-03-20	CC03	**9.8**	**9.7**	**151**	**0.03**	<0.001	**0.017**	<0.001
Calcrete limestone	Grab sample	07-03-20	CC04	**9.4**	**9.6**	**271**	**0.65**	**0.001**	**0.009**	<0.001
Calcrete limestone	Grab sample	07-03-20	CC05	**9.6**	**9.7**	**219**	**0.02**	<0.001	**0.049**	<0.001
Calcrete limestone	Grab sample	07-03-20	CC06	**9**	**9.4**	**651**	**0.01**	<0.001	**0.039**	<0.001
Lake clay	Grab sample	04-03-20	LC01	**8.5**	**8.7**	**389**	**22.6**	**0.004**	**0.236**	**0.002**
Lake clay	Grab sample	04-03-20	LC02	**8.7**	**8.4**	**140**	**30.3**	**0.005**	**0.625**	**0.002**
Lake clay	Grab sample	04-03-20	LC03	**8.9**	**8.8**	**124**	**28.5**	**0.002**	**0.582**	<0.001
Lake clay	Grab sample	04-03-20	LC04	**8.7**	**8.4**	**97**	**36.6**	**0.002**	**0.816**	<0.001
Lake clay	Grab sample	04-03-20	LC05	**8.8**	**8.8**	**144**	**88.9**	**0.003**	**3.580**	**0.002**
Lake clay	Grab sample	04-03-20	LC06	**8.6**	**8.5**	**232**	**53.6**	**0.002**	**1.210**	<0.001
Alluvium	Grab sample	04-03-20	AL01	**8.9**	**9**	**260**	**14.5**	**0.004**	**0.078**	<0.001
Alluvium	Grab sample	04-03-20	AL02	**8.8**	**9**	**518**	**3.7**	**0.002**	**0.043**	<0.001
Alluvium	Grab sample	04-03-20	AL03	**9.1**	**9.2**	**298**	**7.76**	**0.003**	**0.064**	<0.001
Alluvium	Grab sample	04-03-20	AL04	**8.9**	**9.1**	**444**	**9.33**	**0.003**	**0.060**	<0.001
Alluvium	Grab sample	04-03-20	AL05	**9.3**	**9.3**	**202**	**8.01**	**0.003**	**0.054**	<0.001
Alluvium	Grab sample	07-03-20	AL06	**9.4**	**9.3**	**202**	**7.02**	**0.001**	**0.045**	<0.001

Notes:
Exceeds the NEPM (2013) GIL for protection of slightly to moderately disturbed marine water ecosystems
Exceeds the ANZECC (2000) critera for protection of highly disturbed marine water ecosystems (80% protection of species)
Exceeds the DER (2014) Livestock Drinking Water (LDW) guidelines for recommended water quality (low risk)
- Not analysed / not calculated
1. GIL assumed all arsenic is as As(V)
2. GIL assumed all chromium is as Cr(III)
Where trigger value is less than the deterction limit, <LOR values are not highlighted

Table 6
Multi-element Solution Analytical Results
Mt Weld Waste Materials Characterisation

Material Type	Sample Type	Date Sampled	Sample ID	Boron	Cadmium	Chromium [2]	Cobalt	Copper	Iron	Lead
			Analyte Grouping	Elements (Dissolved)						
			LOR	0.05	0.0001	0.001	0.001	0.01	0.05	0.001
			Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			GIL Marine Water	-	0.0007	0.027	0.001	0.0013	-	0.0044
			ANZECC Marine Water	-	0.036	0.085	0.15	0.008	-	0.012
			LDW	5	0.01	1	1	0.5	-	0.1
Calcrete limestone	Grab sample	04-03-20	CC01	**0.10**	<0.0001	**0.002**	<0.001	<0.001	<0.05	<0.001
Calcrete limestone	Grab sample	04-03-20	CC02	<0.05	<0.0001	**0.002**	<0.001	<0.001	**0.07**	<0.001
Calcrete limestone	Grab sample	04-03-20	CC03	**0.06**	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001
Calcrete limestone	Grab sample	07-03-20	CC04	**0.10**	<0.0001	**0.006**	<0.001	<0.001	**1.21**	<0.001
Calcrete limestone	Grab sample	07-03-20	CC05	<0.05	<0.0001	<0.001	<0.001	<0.001	<0.05	<0.001
Calcrete limestone	Grab sample	07-03-20	CC06	**0.10**	<0.0001	**0.002**	<0.001	<0.001	<0.05	<0.001
Lake clay	Grab sample	04-03-20	LC01	**0.64**	<0.0001	**0.041**	**0.003**	**0.017**	**9.63**	**0.011**
Lake clay	Grab sample	04-03-20	LC02	**0.69**	<0.0001	**0.038**	**0.002**	**0.023**	**12.5**	**0.015**
Lake clay	Grab sample	04-03-20	LC03	**0.58**	<0.0001	**0.063**	<0.001	**0.008**	**11.4**	**0.002**
Lake clay	Grab sample	04-03-20	LC04	**0.64**	<0.0001	**0.065**	<0.001	**0.011**	**13.2**	**0.003**
Lake clay	Grab sample	04-03-20	LC05	**0.87**	<0.0001	**0.081**	**0.004**	**0.036**	**22.3**	**0.006**
Lake clay	Grab sample	04-03-20	LC06	**0.70**	<0.0001	**0.062**	**0.002**	**0.019**	**14.7**	**0.004**
Alluvium	Grab sample	04-03-20	AL01	**0.11**	<0.0001	**0.040**	**0.010**	**0.016**	**19.9**	**0.007**
Alluvium	Grab sample	04-03-20	AL02	**0.11**	<0.0001	**0.007**	**0.003**	**0.004**	**3.01**	**0.002**
Alluvium	Grab sample	04-03-20	AL03	**0.11**	<0.0001	**0.022**	**0.006**	**0.008**	**8.89**	**0.003**
Alluvium	Grab sample	04-03-20	AL04	**0.11**	<0.0001	**0.023**	**0.006**	**0.009**	**11.2**	**0.004**
Alluvium	Grab sample	04-03-20	AL05	**0.10**	<0.0001	**0.019**	**0.007**	**0.008**	**9.14**	**0.004**
Alluvium	Grab sample	07-03-20	AL06	**0.09**	<0.0001	**0.014**	**0.005**	**0.007**	**5.15**	**0.002**

Notes:

Exceeds the NEPM (2013) GIL for protection of slightly to moderately disturbed marine water ecosystems

Exceeds the ANZECC (2000) critera for protection of highly disturbed marine water ecosystems (80% protection of spec

Exceeds the DER (2014) Livestock Drinking Water (LDW) guidelines for recommended water quality (low risk)

- Not analysed / not calculated

1. GIL assumed all arsenic is as As(V)

2. GIL assumed all chromium is as Cr(III)

Where trigger value is less than the deterction limit, <LOR values are not highlighted

Table 6
Multi-element Solution Analytical Results
Mt Weld Waste Materials Characterisation

Material Type	Sample Type	Date Sampled	Sample ID	Manganese	Mercury	Nickel	Selenium	Vanadium	Zinc
			Analyte Grouping	Elements (Dissolved)					
			LOR	0.001	0.0001	0.001	0.01	0.01	0.01
			Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
			GIL Marine Water	-	0.0001	0.007	-	0.1	0.015
			ANZECC Marine Water	-	0.0014	0.56	-	0.28	0.043
			LDW	-	0.002	1	0.02	-	20
Calcrete limestone	Grab sample	04-03-20	CC01	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.005
Calcrete limestone	Grab sample	04-03-20	CC02	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.005
Calcrete limestone	Grab sample	04-03-20	CC03	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.005
Calcrete limestone	Grab sample	07-03-20	CC04	**0.003**	<0.0001	<0.001	<0.01	<0.01	<0.005
Calcrete limestone	Grab sample	07-03-20	CC05	<0.001	<0.0001	<0.001	<0.01	<0.01	**0.006**
Calcrete limestone	Grab sample	07-03-20	CC06	<0.001	<0.0001	<0.001	<0.01	<0.01	<0.005
Lake clay	Grab sample	04-03-20	LC01	**0.101**	<0.0001	**0.045**	<0.01	**0.01**	**0.032**
Lake clay	Grab sample	04-03-20	LC02	**0.172**	<0.0001	**0.040**	<0.01	**0.02**	**0.055**
Lake clay	Grab sample	04-03-20	LC03	**0.027**	<0.0001	**0.014**	<0.01	**0.03**	**0.036**
Lake clay	Grab sample	04-03-20	LC04	**0.034**	<0.0001	**0.022**	<0.01	**0.03**	**0.051**
Lake clay	Grab sample	04-03-20	LC05	**0.070**	<0.0001	**0.089**	<0.01	**0.04**	**0.232**
Lake clay	Grab sample	04-03-20	LC06	**0.051**	<0.0001	**0.033**	<0.01	**0.03**	**0.071**
Alluvium	Grab sample	04-03-20	AL01	**0.465**	<0.0001	**0.023**	<0.01	**0.05**	**0.022**
Alluvium	Grab sample	04-03-20	AL02	**0.126**	<0.0001	**0.007**	<0.01	**0.02**	**0.006**
Alluvium	Grab sample	04-03-20	AL03	**0.266**	<0.0001	**0.018**	<0.01	**0.04**	**0.011**
Alluvium	Grab sample	04-03-20	AL04	**0.310**	<0.0001	**0.016**	<0.01	**0.04**	**0.015**
Alluvium	Grab sample	04-03-20	AL05	**0.309**	<0.0001	**0.017**	<0.01	**0.04**	**0.013**
Alluvium	Grab sample	07-03-20	AL06	**0.244**	<0.0001	**0.019**	<0.01	**0.04**	**0.010**

Notes:
Exceeds the NEPM (2013) GIL for protection of slightly to moderately disturbed marine water ecosystems
Exceeds the ANZECC (2000) critera for protection of highly disturbed marine water ecosystems (80% protection of spec
Exceeds the DER (2014) Livestock Drinking Water (LDW) guidelines for recommended water quality (low risk)
- Not analysed / not calculated
1. GIL assumed all arsenic is as As(V)
2. GIL assumed all chromium is as Cr(III)
Where trigger value is less than the deterction limit, <LOR values are not highlighted

Appendix D Primary Laboratory Results

CERTIFICATE OF ANALYSIS

Work Order	: **EP2004365**	Page	: 1 of 18
Client	: **STANTEC AUSTRALIA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: Tracy Schwinkowski	Contact	: Lauren Biagioni
Address	: 41 BISHOP ST JOLIMONT PERTH, WESTERN AUSTRALIA 6014	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: 08 9406 1307
Project	: mwel_ss_19002	Date Samples Received	: 30-Apr-2020 16:35
Order number	: ----	Date Analysis Commenced	: 01-May-2020
C-O-C number	: ----	Issue Date	: 14-May-2020 23:13
Sampler	: Mt Weld		
Site	: ----		
Quote number	: EP/619/18		
No. of samples received	: 18		
No. of samples analysed	: 18		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Kim McCabe	Senior Inorganic Chemist	Brisbane Inorganics, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ED021, ED042T, ED047, EK080 conducted by ALS Brisbane, NATA Site No. 818.
- EA150/EA152 conducted by ALS Newcastle, NATA accreditation no. 825, site no 1656.
- EA031 (Saturated Paste pH): NATA accreditation does not cover the performance of this service.
- EA032 (Saturated Paste EC): NATA accreditation does not cover the performance of this service.
- EG005T: Poor matrix spike recovery was obtained for arsenic on sample EP2004365-011 due to possible matrix interference. Results have been confirmed by re-extraction and re-analysis.
- EG005T: Poor precision was obtained for barium on sample EP2004365-001 due to possible sample heterogeneity. Results have been confirmed by re-extraction and re-analysis.
- ASS: EA013 (ANC) Fizz Rating: 0- None; 1- Slight; 2- Moderate; 3- Strong; 4- Very Strong; 5- Lime.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

Analytical Results

Sub-Matrix: **DI WATER LEACHATE**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Stantec mwel_19002 CC01	Stantec mwel_19002 CC02	Stantec mwel_19002 CC03	Stantec mwel_19002 CC04	Stantec mwel_19002 CC05
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
				EP2004365-001	EP2004365-002	EP2004365-003	EP2004365-004	EP2004365-005
				Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.02**	**0.03**	**0.03**	**0.65**	**0.02**
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	<0.001
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	**0.100**	**0.038**	**0.017**	**0.009**	**0.049**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.002**	**0.002**	<0.001	**0.006**	<0.001
Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	<0.001	**0.003**	<0.001
Nickel	7440-02-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	**0.006**
Boron	7440-42-8	0.05	mg/L	**0.10**	<0.05	**0.06**	**0.10**	<0.05
Iron	7439-89-6	0.05	mg/L	<0.05	**0.07**	<0.05	**1.21**	<0.05
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: DI WATER LEACHATE
(Matrix: WATER)

Compound	CAS Number	LOR	Unit	Stantec mwel_19002 CC06	Stantec mwel_19002 LC01	Stantec mwel_19002 LC02	Stantec mwel_19002 LC03	Stantec mwel_19002 LC04
Client sampling date / time				30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
				EP2004365-006	EP2004365-007	EP2004365-008	EP2004365-009	EP2004365-010
				Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.01**	**22.6**	**30.3**	**28.5**	**36.6**
Arsenic	7440-38-2	0.001	mg/L	<0.001	**0.004**	**0.005**	**0.002**	**0.002**
Beryllium	7440-41-7	0.001	mg/L	<0.001	**0.002**	**0.002**	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	**0.039**	**0.236**	**0.625**	**0.582**	**0.816**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.002**	**0.041**	**0.038**	**0.063**	**0.065**
Cobalt	7440-48-4	0.001	mg/L	<0.001	**0.003**	**0.002**	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L	<0.001	**0.017**	**0.023**	**0.008**	**0.011**
Lead	7439-92-1	0.001	mg/L	<0.001	**0.011**	**0.015**	**0.002**	**0.003**
Manganese	7439-96-5	0.001	mg/L	<0.001	**0.101**	**0.172**	**0.027**	**0.034**
Nickel	7440-02-0	0.001	mg/L	<0.001	**0.045**	**0.040**	**0.014**	**0.022**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L	<0.01	**0.01**	**0.02**	**0.03**	**0.03**
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.032**	**0.055**	**0.036**	**0.051**
Boron	7440-42-8	0.05	mg/L	**0.10**	**0.64**	**0.69**	**0.58**	**0.64**
Iron	7439-89-6	0.05	mg/L	<0.05	**9.63**	**12.5**	**11.4**	**13.2**
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	Stantec mwel_19002 LC05	Stantec mwel_19002 LC06	Stantec mwel_19002 AL01	Stantec mwel_19002 AL02	Stantec mwel_19002 AL03
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-011	EP2004365-012	EP2004365-013	EP2004365-014	EP2004365-015
				Result	Result	Result	Result	Result
EG020W: Water Leachable Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**88.9**	**53.6**	**14.5**	**3.70**	**7.76**
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.002**	**0.004**	**0.002**	**0.003**
Beryllium	7440-41-7	0.001	mg/L	**0.002**	<0.001	<0.001	<0.001	<0.001
Barium	7440-39-3	0.001	mg/L	**3.58**	**1.21**	**0.078**	**0.043**	**0.064**
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Chromium	7440-47-3	0.001	mg/L	**0.081**	**0.062**	**0.040**	**0.007**	**0.022**
Cobalt	7440-48-4	0.001	mg/L	**0.004**	**0.002**	**0.010**	**0.003**	**0.006**
Copper	7440-50-8	0.001	mg/L	**0.036**	**0.019**	**0.016**	**0.004**	**0.008**
Lead	7439-92-1	0.001	mg/L	**0.006**	**0.004**	**0.007**	**0.002**	**0.003**
Manganese	7439-96-5	0.001	mg/L	**0.070**	**0.051**	**0.465**	**0.126**	**0.266**
Nickel	7440-02-0	0.001	mg/L	**0.089**	**0.033**	**0.023**	**0.007**	**0.018**
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Vanadium	7440-62-2	0.01	mg/L	**0.04**	**0.03**	**0.05**	**0.02**	**0.04**
Zinc	7440-66-6	0.005	mg/L	**0.232**	**0.071**	**0.022**	**0.006**	**0.011**
Boron	7440-42-8	0.05	mg/L	**0.87**	**0.70**	**0.11**	**0.11**	**0.11**
Iron	7439-89-6	0.05	mg/L	**22.3**	**14.7**	**19.9**	**3.01**	**8.89**
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Analytical Results

Sub-Matrix: DI WATER LEACHATE (Matrix: WATER)			Client sample ID	Stantec mwel_19002 AL04	Stantec mwel_19002 AL05	Stantec mwel_19002 AL06	----	----
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	EP2004365-016	EP2004365-017	EP2004365-018	--------	--------
				Result	Result	Result	----	----
EG020W: Water Leachable Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**9.33**	**8.01**	**7.02**	----	----
Arsenic	7440-38-2	0.001	mg/L	**0.003**	**0.003**	**0.001**	----	----
Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Barium	7440-39-3	0.001	mg/L	**0.060**	**0.054**	**0.045**	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----
Chromium	7440-47-3	0.001	mg/L	**0.023**	**0.019**	**0.014**	----	----
Cobalt	7440-48-4	0.001	mg/L	**0.006**	**0.007**	**0.005**	----	----
Copper	7440-50-8	0.001	mg/L	**0.009**	**0.008**	**0.007**	----	----
Lead	7439-92-1	0.001	mg/L	**0.004**	**0.004**	**0.002**	----	----
Manganese	7439-96-5	0.001	mg/L	**0.310**	**0.309**	**0.244**	----	----
Nickel	7440-02-0	0.001	mg/L	**0.016**	**0.017**	**0.019**	----	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	----	----
Vanadium	7440-62-2	0.01	mg/L	**0.04**	**0.04**	**0.04**	----	----
Zinc	7440-66-6	0.005	mg/L	**0.015**	**0.013**	**0.010**	----	----
Boron	7440-42-8	0.05	mg/L	**0.11**	**0.10**	**0.09**	----	----
Iron	7439-89-6	0.05	mg/L	**11.2**	**9.14**	**5.15**	----	----
EG035W: Water Leachable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 CC01	Stantec mwel_19002 CC02	Stantec mwel_19002 CC03	Stantec mwel_19002 CC04	Stantec mwel_19002 CC05
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-001	EP2004365-002	EP2004365-003	EP2004365-004	EP2004365-005
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.4	7.6	8.1	8.0	8.2
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	9.4	9.6	9.8	9.4	9.6
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-820	-851	-878	-637	-668
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	312	162	151	271	219
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	9.0	9.0	9.6	9.1	9.2
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	820	851	878	637	668
ANC as CaCO3	----	0.1	% CaCO3	83.7	86.8	89.6	65.0	68.1
Fizz Rating	----	0	Fizz Unit	5	5	5	5	5
EA031: pH (saturated paste)								
pH (Saturated Paste)	----	0.1	pH Unit	8.6	8.6	8.9	8.7	8.3
EA032: Electrical Conductivity (saturated paste)								
Electrical Conductivity (Saturated Paste)	----	1	µS/cm	719	604	332	795	835
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	1.5	<1.0	<1.0	1.4	<1.0
EA150: Soil Classification - National Committee on Soil and Terrain (2009)								
Clay (<2 µm)	----	1	%	16	28	16	51	24
Silt (2-20 µm)	----	1	%	45	40	14	35	33
Fine Sand (0.02-0.2 mm)	----	1	%	6	10	8	11	5
Coarse Sand (0.2-2.0 mm)	----	1	%	33	22	62	3	38
Gravel (>2mm)	----	1	%	<1	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.45	2.81	2.74	2.86	2.80
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	6.4	6.9	8.4	5.9
Exchangeable Magnesium	----	0.1	meq/100g	----	7.1	7.2	10.3	6.0

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 CC01	Stantec mwel_19002 CC02	Stantec mwel_19002 CC03	Stantec mwel_19002 CC04	Stantec mwel_19002 CC05
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-001	EP2004365-002	EP2004365-003	EP2004365-004	EP2004365-005
				Result	Result	Result	Result	Result
ED007: Exchangeable Cations - Continued								
Exchangeable Potassium	----	0.1	meq/100g	----	**0.3**	**0.3**	**0.6**	**0.1**
Exchangeable Sodium	----	0.1	meq/100g	----	**1.1**	**1.1**	**2.6**	**1.0**
Cation Exchange Capacity	----	0.1	meq/100g	----	**14.8**	**15.5**	**22.0**	**13.0**
Exchangeable Sodium Percent	----	0.1	%	----	**7.6**	**7.0**	**11.8**	**8.0**
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**5.2**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**6.0**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**0.3**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**0.6**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**12.2**	----	----	----	----
ED021: Bicarbonate Extractable Potassium (Colwell)								
Bicarbonate Extractable K (Colwell)	----	10	mg/kg	**329**	**313**	**273**	**481**	**172**
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**440**	**220**	**290**	**260**	**290**
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.01**	<0.01	<0.01	**0.01**	<0.01
ED047: Potassium Chloride Extractable Sulfur (KCl-40)								
ø **KCl-40 Extractable Sulfur**	----	10	mg/kg	**71**	**21**	<10	**42**	**37**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**10**	**12**	**8**	**24**	**8**
Barium	7440-39-3	10	mg/kg	**430**	**150**	**70**	**120**	**70**
Beryllium	7440-41-7	1	mg/kg	**1**	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	**11**	**1**	<1
Chromium	7440-47-3	2	mg/kg	**21**	**24**	**27**	**34**	**16**
Cobalt	7440-48-4	2	mg/kg	**69**	**3**	**2**	**4**	**2**
Copper	7440-50-8	5	mg/kg	**35**	**10**	**11**	**14**	**9**
Lead	7439-92-1	5	mg/kg	**9**	**15**	<5	**18**	**6**
Manganese	7439-96-5	5	mg/kg	**1250**	**1530**	**480**	**649**	**1290**
Nickel	7440-02-0	2	mg/kg	**26**	**6**	**4**	**9**	**5**
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	**15**	**31**	**12**	**36**	**21**
Zinc	7440-66-6	5	mg/kg	**25**	**46**	**245**	**68**	**35**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 CC01	Stantec mwel_19002 CC02	Stantec mwel_19002 CC03	Stantec mwel_19002 CC04	Stantec mwel_19002 CC05
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-001	EP2004365-002	EP2004365-003	EP2004365-004	EP2004365-005
				Result	Result	Result	Result	Result
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	<5	<5	<5
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**9.5**	**9.6**	**9.7**	**9.6**	**9.7**
EP004: Organic Matter								
Organic Matter	----	0.5	%	**0.6**	**1.0**	**0.8**	**0.5**	**0.8**
Total Organic Carbon	----	0.5	%	<0.5	**0.6**	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Stantec mwel_19002 CC06	Stantec mwel_19002 LC01	Stantec mwel_19002 LC02	Stantec mwel_19002 LC03	Stantec mwel_19002 LC04
Client sampling date / time				30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
				EP2004365-006	EP2004365-007	EP2004365-008	EP2004365-009	EP2004365-010
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	8.1	7.9	7.8	7.7	7.6
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	9.0	8.5	8.7	8.9	8.7
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-732	-131	-64.5	-16.0	-10.0
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	651	389	140	124	97
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	9.3	8.7	8.5	7.6	6.9
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	2.8
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	733	132	65.4	16.6	10.6
ANC as CaCO3	----	0.1	% CaCO3	74.8	13.5	6.7	1.7	1.1
Fizz Rating	----	0	Fizz Unit	5	2	2	2	1
EA031: pH (saturated paste)								
pH (Saturated Paste)	----	0.1	pH Unit	8.0	8.3	8.1	8.2	7.8
EA032: Electrical Conductivity (saturated paste)								
Electrical Conductivity (Saturated Paste)	----	1	µS/cm	1810	1040	1050	590	744
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	1.2	6.6	7.8	6.0	7.3
EA150: Soil Classification - National Committee on Soil and Terrain (2009)								
Clay (<2 µm)	----	1	%	39	87	85	65	83
Silt (2-20 µm)	----	1	%	27	7	5	13	9
Fine Sand (0.02-0.2 mm)	----	1	%	6	4	8	4	4
Coarse Sand (0.2-2.0 mm)	----	1	%	28	2	2	18	4
Gravel (>2mm)	----	1	%	<1	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.89	2.47	2.52	2.77	2.47
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	14.3	12.6	13.7
Exchangeable Magnesium	----	0.1	meq/100g	----	----	20.4	17.2	19.6

Analytical Results

Sub-Matrix: SOIL
(Matrix: SOIL)

Compound	CAS Number	LOR	Unit	Stantec mwel_19002 CC06	Stantec mwel_19002 LC01	Stantec mwel_19002 LC02	Stantec mwel_19002 LC03	Stantec mwel_19002 LC04
Client sampling date / time				30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
				EP2004365-006	EP2004365-007	EP2004365-008	EP2004365-009	EP2004365-010
				Result	Result	Result	Result	Result
ED007: Exchangeable Cations - Continued								
Exchangeable Potassium	----	0.1	meq/100g	----	----	1.3	1.0	1.1
Exchangeable Sodium	----	0.1	meq/100g	----	----	6.2	5.8	6.2
Cation Exchange Capacity	----	0.1	meq/100g	----	----	42.1	36.6	40.6
Exchangeable Sodium Percent	----	0.1	%	----	----	14.7	15.9	15.3
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	5.5	9.8	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	5.8	13.1	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.3	0.9	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.3	3.2	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	11.9	27.0	----	----	----
ED021: Bicarbonate Extractable Potassium (Colwell)								
Bicarbonate Extractable K (Colwell)	----	10	mg/kg	341	1010	900	742	801
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	580	370	420	450	500
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.02	0.03	0.02	0.02
ED047: Potassium Chloride Extractable Sulfur (KCl-40)								
ø KCl-40 Extractable Sulfur	----	10	mg/kg	142	97	77	65	70
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	13	76	60	8	8
Barium	7440-39-3	10	mg/kg	140	360	420	570	790
Beryllium	7440-41-7	1	mg/kg	<1	3	2	<1	<1
Boron	7440-42-8	50	mg/kg	<50	<50	50	60	60
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	1	1
Chromium	7440-47-3	2	mg/kg	30	37	51	132	81
Cobalt	7440-48-4	2	mg/kg	5	26	25	3	3
Copper	7440-50-8	5	mg/kg	12	53	64	20	21
Lead	7439-92-1	5	mg/kg	13	82	88	7	7
Manganese	7439-96-5	5	mg/kg	1580	442	382	26	11
Nickel	7440-02-0	2	mg/kg	9	48	68	20	21
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	32	80	106	147	164
Zinc	7440-66-6	5	mg/kg	45	27	27	13	11

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 CC06	Stantec mwel_19002 LC01	Stantec mwel_19002 LC02	Stantec mwel_19002 LC03	Stantec mwel_19002 LC04
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-006	EP2004365-007	EP2004365-008	EP2004365-009	EP2004365-010
				Result	Result	Result	Result	Result
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	<5	<5	<5
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**9.4**	**8.7**	**8.4**	**8.8**	**8.4**
EP004: Organic Matter								
Organic Matter	----	0.5	%	**1.1**	**0.8**	**0.5**	**0.8**	**1.0**
Total Organic Carbon	----	0.5	%	**0.7**	<0.5	<0.5	<0.5	**0.6**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 LC05	Stantec mwel_19002 LC06	Stantec mwel_19002 AL01	Stantec mwel_19002 AL02	Stantec mwel_19002 AL03
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-011	EP2004365-012	EP2004365-013	EP2004365-014	EP2004365-015
				Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.6	7.5	7.5	7.8	7.8
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.8	8.6	8.9	8.8	9.1
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-10.5	-13.5	-15.3	-19.6	-14.1
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	144	232	260	518	298
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	6.7	6.9	8.2	8.6	8.3
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	<0.1	<0.1
NAG (pH 7.0)	----	0.1	kg H2SO4/t	4.6	3.8	<0.1	<0.1	<0.1
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	11.1	14.1	15.3	19.6	14.1
ANC as CaCO3	----	0.1	% CaCO3	1.1	1.4	1.6	2.0	1.4
Fizz Rating	----	0	Fizz Unit	1	2	2	2	2
EA031: pH (saturated paste)								
pH (Saturated Paste)	----	0.1	pH Unit	8.0	7.9	7.9	7.8	8.0
EA032: Electrical Conductivity (saturated paste)								
Electrical Conductivity (Saturated Paste)	----	1	µS/cm	1110	1060	1110	1310	935
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	8.3	5.3	1.9	2.2	3.0
EA150: Soil Classification - National Committee on Soil and Terrain (2009)								
Clay (<2 µm)	----	1	%	81	88	17	11	10
Silt (2-20 µm)	----	1	%	4	5	6	7	3
Fine Sand (0.02-0.2 mm)	----	1	%	10	5	8	9	10
Coarse Sand (0.2-2.0 mm)	----	1	%	4	2	69	73	77
Gravel (>2mm)	----	1	%	<1	<1	<1	<1	<1
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.64	2.55	2.55	2.51	2.49
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	12.5	11.5	6.8	----	8.2
Exchangeable Magnesium	----	0.1	meq/100g	16.7	16.0	3.6	----	4.9

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 LC05	Stantec mwel_19002 LC06	Stantec mwel_19002 AL01	Stantec mwel_19002 AL02	Stantec mwel_19002 AL03
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-011	EP2004365-012	EP2004365-013	EP2004365-014	EP2004365-015
				Result	Result	Result	Result	Result
ED007: Exchangeable Cations - Continued								
Exchangeable Potassium	----	0.1	meq/100g	1.0	1.0	1.7	----	1.9
Exchangeable Sodium	----	0.1	meq/100g	5.9	5.6	2.3	----	2.9
Cation Exchange Capacity	----	0.1	meq/100g	36.1	34.2	14.4	----	17.8
Exchangeable Sodium Percent	----	0.1	%	16.3	16.5	15.9	----	16.1
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	9.4	----
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	3.9	----
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	1.6	----
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	1.3	----
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	16.1	----
ED021: Bicarbonate Extractable Potassium (Colwell)								
Bicarbonate Extractable K (Colwell)	----	10	mg/kg	760	764	1330	1230	1320
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	500	500	240	330	250
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	0.02	0.02	<0.01	<0.01	<0.01
ED047: Potassium Chloride Extractable Sulfur (KCl-40)								
ø KCl-40 Extractable Sulfur	----	10	mg/kg	76	70	46	81	48
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	8	12	12	9	7
Barium	7440-39-3	10	mg/kg	630	460	140	170	220
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg	50	50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	67	64	91	73	85
Cobalt	7440-48-4	2	mg/kg	5	5	11	11	13
Copper	7440-50-8	5	mg/kg	29	32	17	15	16
Lead	7439-92-1	5	mg/kg	8	8	8	7	6
Manganese	7439-96-5	5	mg/kg	87	107	454	553	540
Nickel	7440-02-0	2	mg/kg	32	33	23	26	32
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg	129	117	64	50	61
Zinc	7440-66-6	5	mg/kg	15	19	28	21	18

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 LC05	Stantec mwel_19002 LC06	Stantec mwel_19002 AL01	Stantec mwel_19002 AL02	Stantec mwel_19002 AL03
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00
Compound	CAS Number	LOR	Unit	EP2004365-011	EP2004365-012	EP2004365-013	EP2004365-014	EP2004365-015
				Result	Result	Result	Result	Result
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	<5	<5	<5
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**8.8**	**8.5**	**9.0**	**9.0**	**9.2**
EP004: Organic Matter								
Organic Matter	----	0.5	%	**1.1**	<0.5	<0.5	<0.5	**0.5**
Total Organic Carbon	----	0.5	%	**0.6**	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 AL04	Stantec mwel_19002 AL05	Stantec mwel_19002 AL06	----	----
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	EP2004365-016	EP2004365-017	EP2004365-018	--------	--------
				Result	Result	Result	----	----
EA001: pH in soil using 0.01M CaCl extract								
pH (CaCl2)	----	0.1	pH Unit	7.2	7.5	7.6	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.9	9.3	9.4	----	----
EA009: Net Acid Production Potential								
Net Acid Production Potential	----	0.5	kg H2SO4/t	-20.9	-18.0	-16.3	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	444	202	202	----	----
EA011: Net Acid Generation								
pH (OX)	----	0.1	pH Unit	8.8	8.6	8.3	----	----
NAG (pH 4.5)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	----	----
NAG (pH 7.0)	----	0.1	kg H2SO4/t	<0.1	<0.1	<0.1	----	----
EA013: Acid Neutralising Capacity								
ANC as H2SO4	----	0.5	kg H2SO4 equiv./t	21.2	18.0	16.3	----	----
ANC as CaCO3	----	0.1	% CaCO3	2.2	1.8	1.6	----	----
Fizz Rating	----	0	Fizz Unit	1	1	1	----	----
EA031: pH (saturated paste)								
pH (Saturated Paste)	----	0.1	pH Unit	7.9	8.3	8.2	----	----
EA032: Electrical Conductivity (saturated paste)								
Electrical Conductivity (Saturated Paste)	----	1	µS/cm	1460	284	670	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	2.0	2.5	3.6	----	----
EA150: Soil Classification - National Committee on Soil and Terrain (2009)								
Clay (<2 µm)	----	1	%	13	9	4	----	----
Silt (2-20 µm)	----	1	%	4	3	4	----	----
Fine Sand (0.02-0.2 mm)	----	1	%	10	6	3	----	----
Coarse Sand (0.2-2.0 mm)	----	1	%	73	82	89	----	----
Gravel (>2mm)	----	1	%	<1	<1	<1	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	2.47	2.55	2.66	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	7.0	10.5	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	4.3	5.6	----	----

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 AL04	Stantec mwel_19002 AL05	Stantec mwel_19002 AL06	----	----
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	EP2004365-016	EP2004365-017	EP2004365-018	--------	--------
				Result	Result	Result	----	----
ED007: Exchangeable Cations - Continued								
Exchangeable Potassium	----	0.1	meq/100g	----	**2.0**	**2.4**	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	**2.8**	**4.3**	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	**16.2**	**22.8**	----	----
Exchangeable Sodium Percent	----	0.1	%	----	**17.5**	**18.8**	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	**9.9**	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	**4.2**	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	**1.7**	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	**1.4**	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	**17.3**	----	----	----	----
ED021: Bicarbonate Extractable Potassium (Colwell)								
Bicarbonate Extractable K (Colwell)	----	10	mg/kg	**1300**	**1570**	**1820**	----	----
ED040: Sulfur as SO4 2-								
Sulfate as SO4 2-	14808-79-8	100	mg/kg	**360**	**170**	**120**	----	----
ED042T: Total Sulfur by LECO								
Sulfur - Total as S (LECO)	----	0.01	%	**0.01**	<0.01	<0.01	----	----
ED047: Potassium Chloride Extractable Sulfur (KCl-40)								
ø KCl-40 Extractable Sulfur	----	10	mg/kg	**97**	**20**	**11**	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**14**	**16**	<5	----	----
Barium	7440-39-3	10	mg/kg	**220**	**140**	**160**	----	----
Beryllium	7440-41-7	1	mg/kg	<1	<1	<1	----	----
Boron	7440-42-8	50	mg/kg	<50	<50	<50	----	----
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	----	----
Chromium	7440-47-3	2	mg/kg	**77**	**65**	**58**	----	----
Cobalt	7440-48-4	2	mg/kg	**12**	**12**	**11**	----	----
Copper	7440-50-8	5	mg/kg	**16**	**15**	**17**	----	----
Lead	7439-92-1	5	mg/kg	**9**	**12**	<5	----	----
Manganese	7439-96-5	5	mg/kg	**653**	**553**	**561**	----	----
Nickel	7440-02-0	2	mg/kg	**29**	**27**	**41**	----	----
Selenium	7782-49-2	5	mg/kg	<5	<5	<5	----	----
Vanadium	7440-62-2	5	mg/kg	**55**	**49**	**53**	----	----
Zinc	7440-66-6	5	mg/kg	**29**	**30**	**13**	----	----
EG035T: Total Recoverable Mercury by FIMS								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Client sample ID	Stantec mwel_19002 AL04	Stantec mwel_19002 AL05	Stantec mwel_19002 AL06	----	----
			Client sampling date / time	30-Apr-2020 00:00	30-Apr-2020 00:00	30-Apr-2020 00:00	----	----
Compound	CAS Number	LOR	Unit	EP2004365-016	EP2004365-017	EP2004365-018	--------	--------
				Result	Result	Result	----	----
EG035T: Total Recoverable Mercury by FIMS - Continued								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	----	----
EK080: Bicarbonate Extractable Phosphorus (Colwell)								
Bicarbonate Ext. P (Colwell)	----	5	mg/kg	<5	<5	<5	----	----
EN60: Bottle Leaching Procedure								
Final pH	----	0.1	pH Unit	**9.1**	**9.3**	**9.3**	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	<0.5	<0.5	**0.6**	----	----
Total Organic Carbon	----	0.5	%	<0.5	<0.5	<0.5	----	----

CERTIFICATE OF ANALYSIS

Batch: EP2004365

CONTACT: Tracy Schwinkowski
CLIENT: Stantec Australia PTY LTD

ADDRESS: 41 Bishop St
Jolimont Perth, Western Australia 6014

LABORATORY: ALSE Perth
DATE RECEIVED: 30/04/2020

DATE COMPLETED: 14/05/2020
SAMPLE TYPE: Soil
No. of SAMPLES: 18

COMMENTS

1. Samples extracted using 2M KCl fluid at ratio 1:10 for 1 hour.
2. Nitrate as Nitrate and Ammonium as Ammonium results in this report is not covered by NATA accreditation.

NOTES

This is the Final Report and supersedes any preliminary reports with this batch number.
Results apply to sample(s) as submitted. All pages to this report have been checked and approved for release.

ISSUING LABORATORY: ALS Perth

Address: 26 Rigali Way
Wangara WA 6065 Australia

Telephone: 08 9406 1314
E-mail: canhuang.ke@alsglobal.com

Sample ID	EP2004365-001	EP2004365-001 DUP	% RPD	EP2004365-001 MS	% Recovery
Sample Name	Stantec mwel_19002 CC01	Stantec mwel_19002 CC01		Stantec mwel_19002 CC01	
Sample Date	30/04/2020 0:00	30/04/2020 0:00		30/04/2020 0:00	
NO3_NO3 mg/kg	15.4	16.2	5	33.4	81
NH4_NH4 mg/kg	0.21	0.29	32	11.9	90

Sample ID	EP2004365-002	EP2004365-003	EP2004365-004	EP2004365-005	EP2004365-006
Sample Name	Stantec mwel_19002 CC02	Stantec mwel_19002 CC03	Stantec mwel_19002 CC04	Stantec mwel_19002 CC05	Stantec mwel_19002 CC06
Sample Date	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00
NO3_NO3 mg/kg	9.57	5.41	21.1	31.6	35.0
NH4_NH4 mg/kg	2.77	5.16	4.52	3.83	2.62

Sample ID	EP2004365-007	EP2004365-008	EP2004365-009	EP2004365-010
Sample Name	Stantec mwel_19002 LC01	Stantec mwel_19002 LC02	Stantec mwel_19002 LC03	Stantec mwel_19002 LC04
Sample Date	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00
NO3_NO3 mg/kg	15.5	15.5	14.1	15.2
NH4_NH4 mg/kg	1.94	1.41	1.38	1.53

Sample ID	EP2004365-011	EP2004365-011 DUP	% RPD	EP2004365-012	EP2004365-013
Sample Name	Stantec mwel_19002 LC05	Stantec mwel_19002 LC05		Stantec mwel_19002 LC06	Stantec mwel_19002 AL01
Sample Date	30/04/2020 0:00	30/04/2020 0:00		30/04/2020 0:00	30/04/2020 0:00
NO3_NO3 mg/kg	16.6	16.2	2	16.9	17.2
NH4_NH4 mg/kg	1.26	1.10	14	1.71	0.95

Sample ID	EP2004365-014	EP2004365-015	EP2004365-016	EP2004365-017	EP2004365-018
Sample Name	Stantec mwel_19002 AL02	Stantec mwel_19002 AL03	Stantec mwel_19002 AL04	Stantec mwel_19002 AL05	Stantec mwel_19002 AL06
Sample Date	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00	30/04/2020 0:00
NO3_NO3 mg/kg	69.9	26.1	43.1	11.8	45.4
NH4_NH4mg/kg	2.25	10.2	2.27	1.27	3.73

Sample ID	MB	LCS	% Recovery
NO3_NO3 mg/kg	<1	17.3	78
NH4_NH4 mg/kg	<0.1	11.4	89

Canhuang Ke (Inorganic Supervisor)

Certificate of Analysis

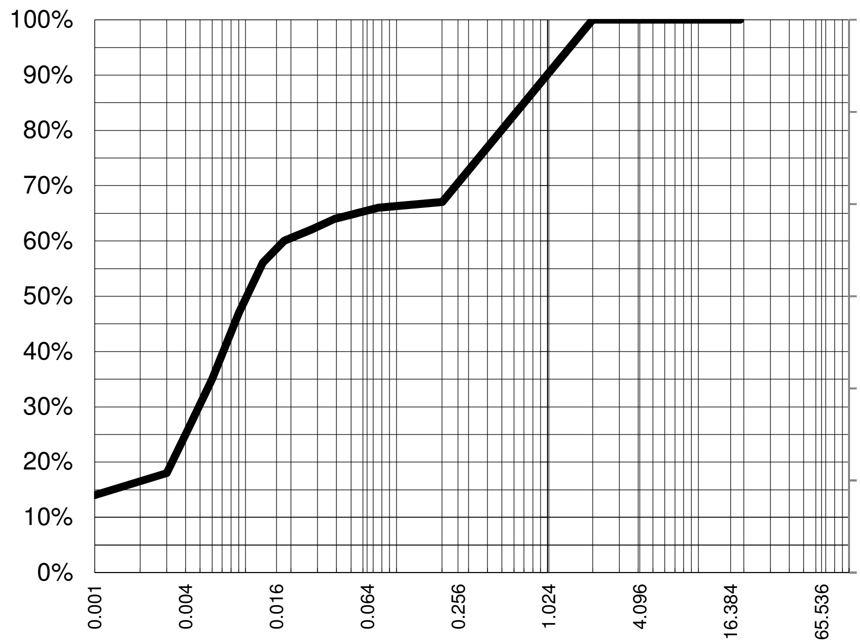
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-001 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 CC01

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	67%
0.200	67%
0.200	67%
0.200	67%
0.200	67%
0.075	#N/A
Particle Size (microns)	
54	65%
39	64%
27	62%
18	60%
13	56%
9	47%
6	35%
4	25%
1	14%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.45

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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

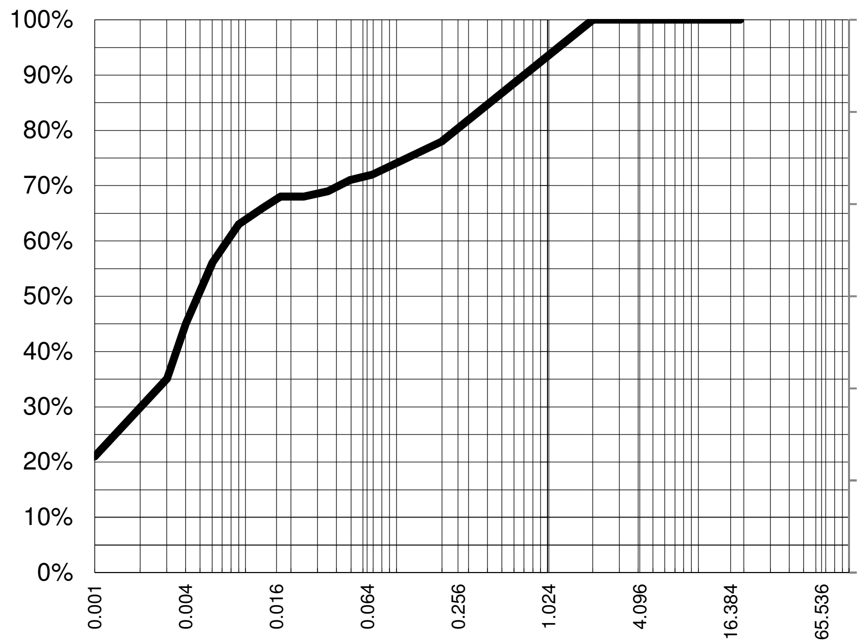
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-002 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 CC02

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	78%
0.200	78%
0.200	78%
0.200	78%
0.200	78%
0.075	#N/A
Particle Size (microns)	
49	71%
35	69%
24	68%
17	68%
13	66%
9	63%
6	56%
4	45%
1	21%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.81

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Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

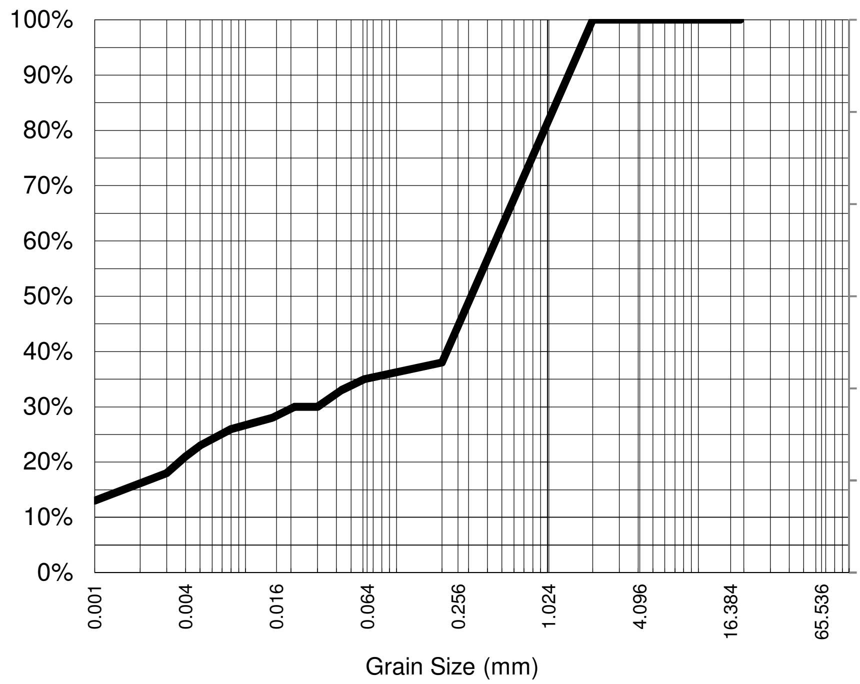
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-003 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 CC03

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	38%
0.200	38%
0.200	38%
0.200	38%
0.200	38%
0.075	#N/A
Particle Size (microns)	
43	33%
30	30%
21	30%
15	28%
11	27%
8	26%
5	23%
4	21%
1	13%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.74

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Laboratory Supervisor
Authorised Signatory

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ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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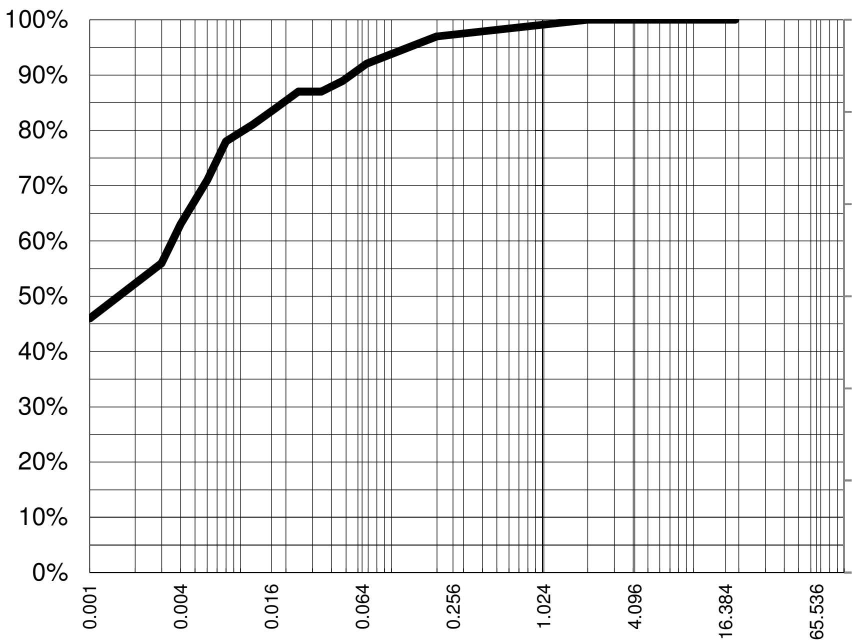
Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-004 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 CC04

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	97%
0.200	97%
0.200	97%
0.200	97%
0.200	97%
0.075	#N/A
Particle Size (microns)	
48	89%
34	87%
24	87%
17	84%
12	81%
8	78%
6	71%
4	63%
1	46%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.86 (2.85)*

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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

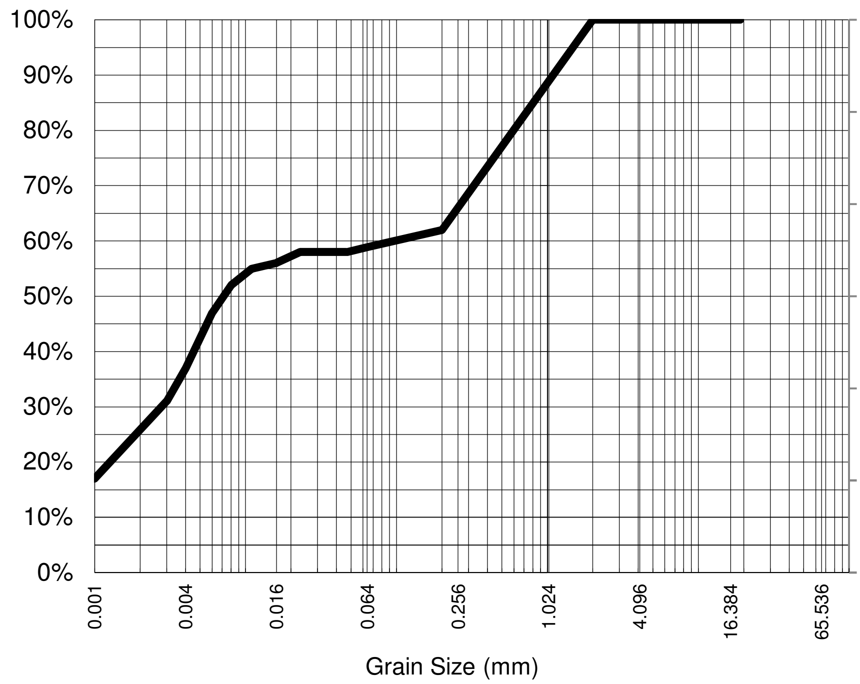
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-005 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 CC05

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	62%
0.200	62%
0.200	62%
0.200	62%
0.200	62%
0.075	#N/A
Particle Size (microns)	
47	58%
33	58%
23	58%
16	56%
11	55%
8	52%
6	47%
4	37%
1	17%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.8

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Laboratory Supervisor
Authorised Signatory

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ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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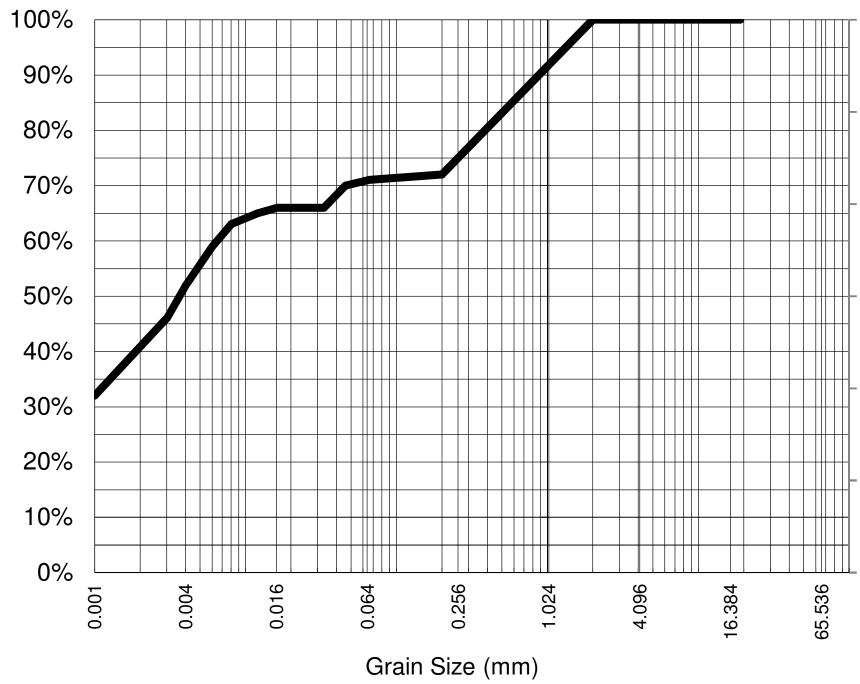
CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-006 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 CC06

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	72%
0.200	72%
0.200	72%
0.200	72%
0.200	72%
0.075	#N/A
Particle Size (microns)	
46	70%
33	66%
23	66%
16	66%
12	65%
8	63%
6	59%
4	52%
1	32%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.89 (2.85)*

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5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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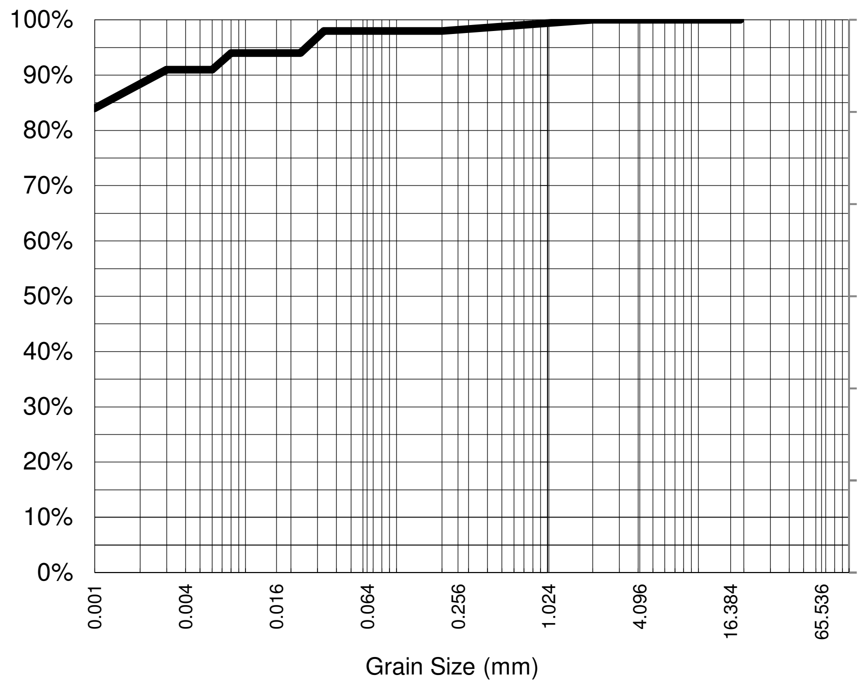
CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-007 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 LC01

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	98%
0.200	98%
0.200	98%
0.200	98%
0.200	98%
0.075	#N/A
Particle Size (microns)	
46	98%
33	98%
23	94%
16	94%
12	94%
8	94%
6	91%
4	91%
1	84%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.47

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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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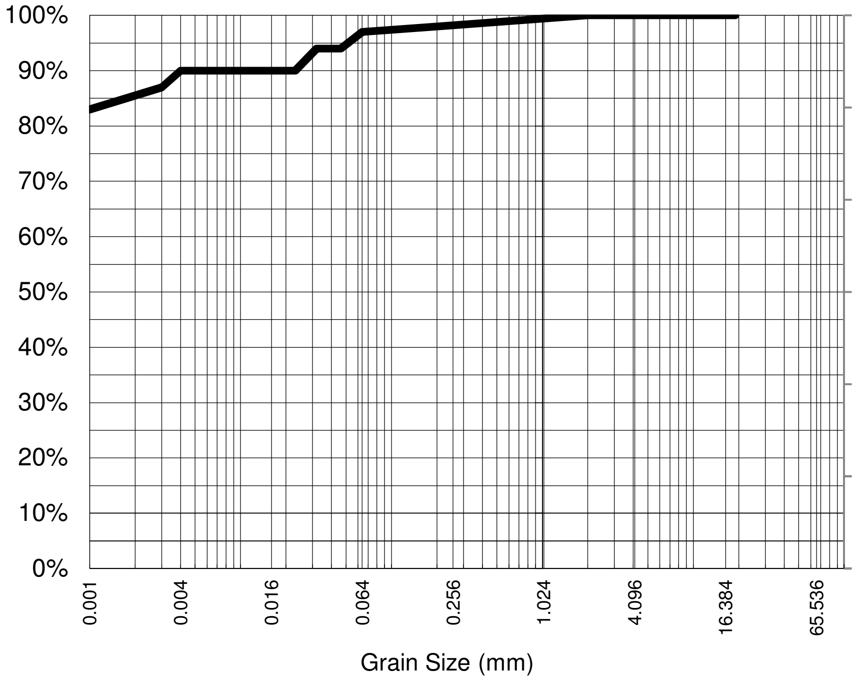
Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-008 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 LC02

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	98%
0.200	98%
0.200	98%
0.200	98%
0.200	98%
0.075	#N/A
Particle Size (microns)	
46	94%
32	94%
23	90%
16	90%
12	90%
8	90%
6	90%
4	90%
1	83%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.52

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Laboratory Supervisor
Authorised Signatory

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ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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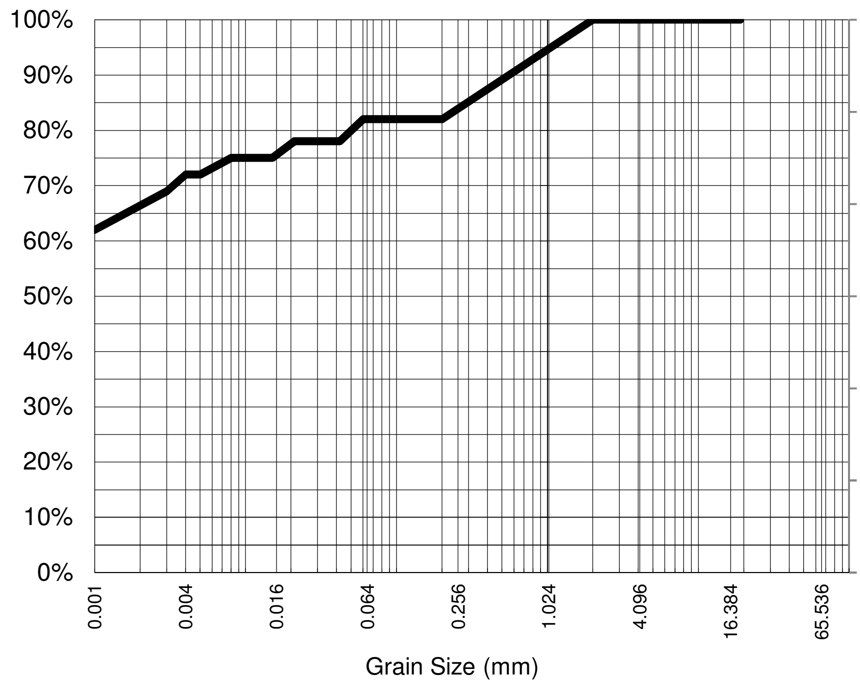
Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-009 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 LC03

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	82%
0.200	82%
0.200	82%
0.200	82%
0.200	82%
0.075	#N/A
Particle Size (microns)	
42	78%
30	78%
21	78%
15	75%
11	75%
8	75%
5	72%
4	72%
1	62%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.77

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Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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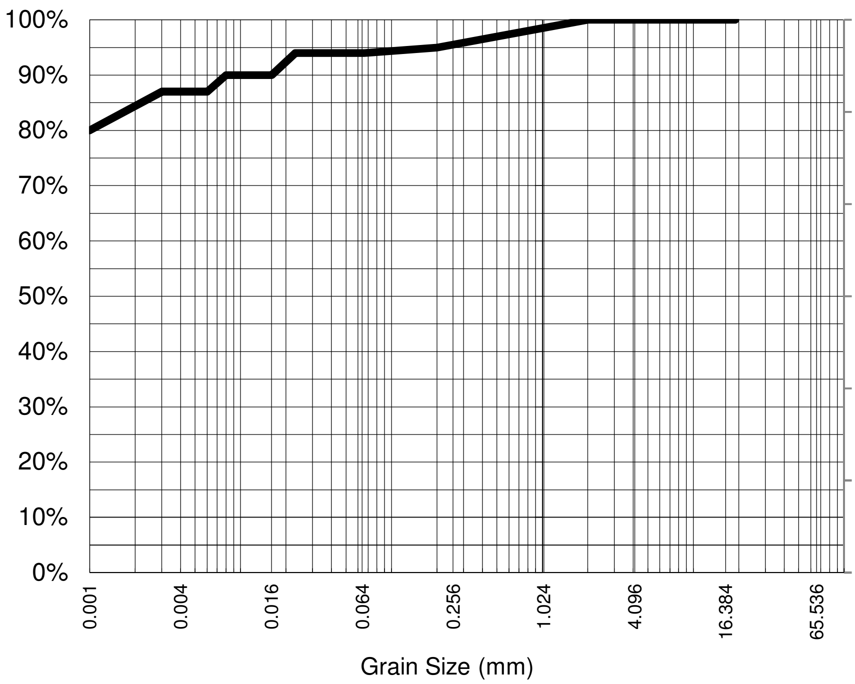
Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-010 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 LC04

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	95%
0.200	95%
0.200	95%
0.200	95%
0.200	95%
0.075	#N/A
Particle Size (microns)	
46	94%
33	94%
23	94%
16	90%
12	90%
8	90%
6	87%
4	87%
1	80%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.47

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Laboratory Supervisor
Authorised Signatory

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ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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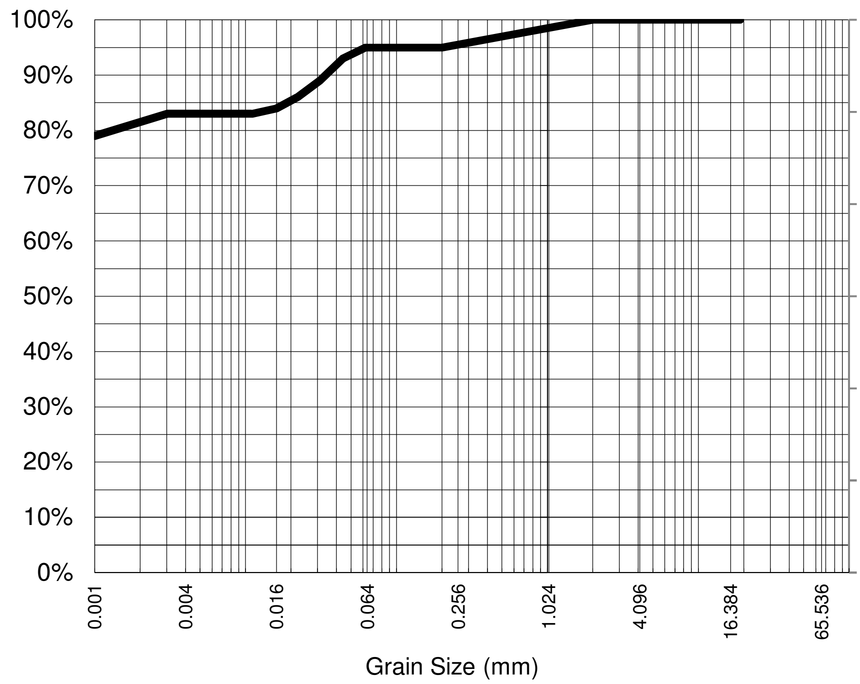
Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-011 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 LC05

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	95%
0.200	95%
0.200	95%
0.200	95%
0.200	95%
0.075	#N/A
Particle Size (microns)	
44	93%
31	89%
22	86%
16	84%
11	83%
8	83%
6	83%
4	83%
1	79%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.64

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Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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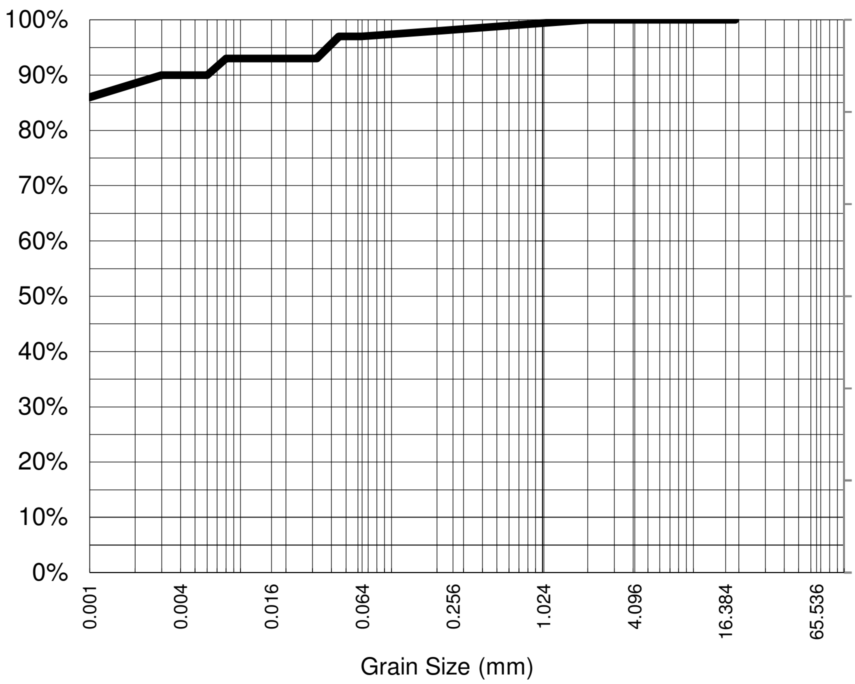
Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-012 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 LC06

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	98%
0.200	98%
0.200	98%
0.200	98%
0.200	98%
0.075	#N/A
Particle Size (microns)	
45	97%
32	93%
22	93%
16	93%
12	93%
8	93%
6	90%
4	90%
1	86%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.55

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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

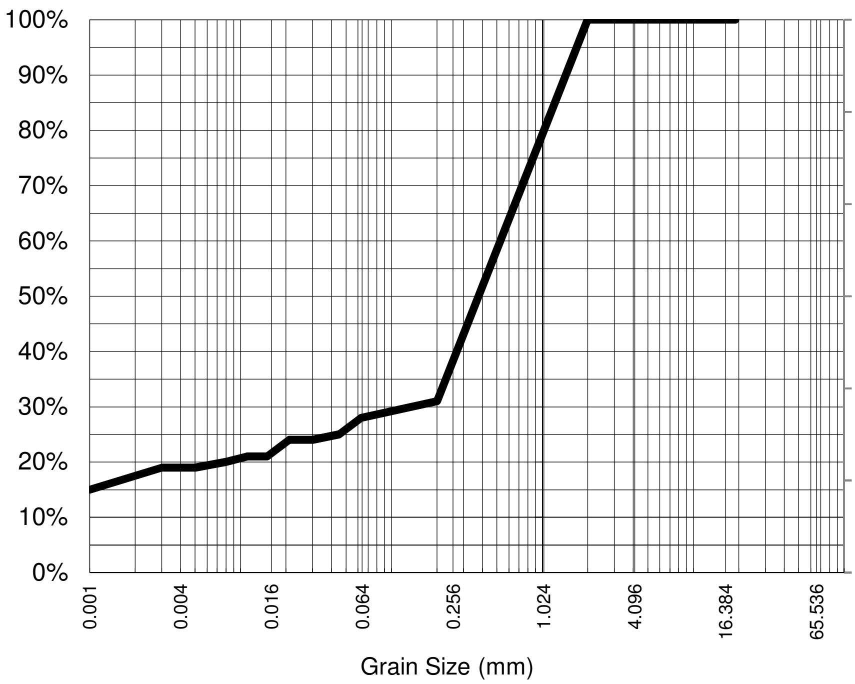
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-013 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 AL01

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	31%
0.200	31%
0.200	31%
0.200	31%
0.200	31%
0.075	#N/A
Particle Size (microns)	
45	25%
30	24%
21	24%
15	21%
11	21%
8	20%
5	19%
4	19%
1	15%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.55

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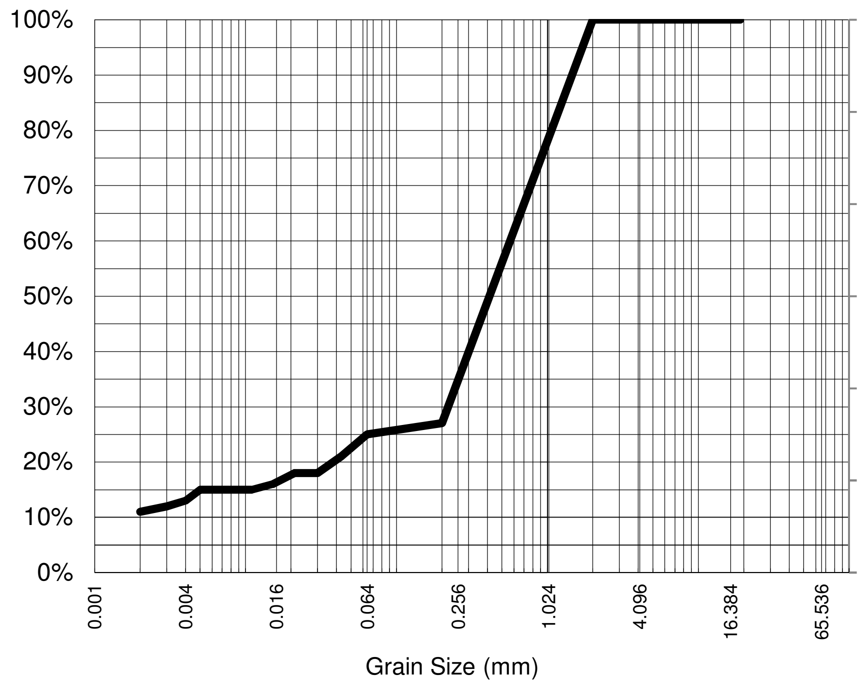
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-014 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 AL02

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	27%
0.200	27%
0.200	27%
0.200	27%
0.200	27%
0.075	#N/A
Particle Size (microns)	
43	21%
30	18%
21	18%
15	16%
11	15%
8	15%
5	15%
4	13%
2	11%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	

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Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.51

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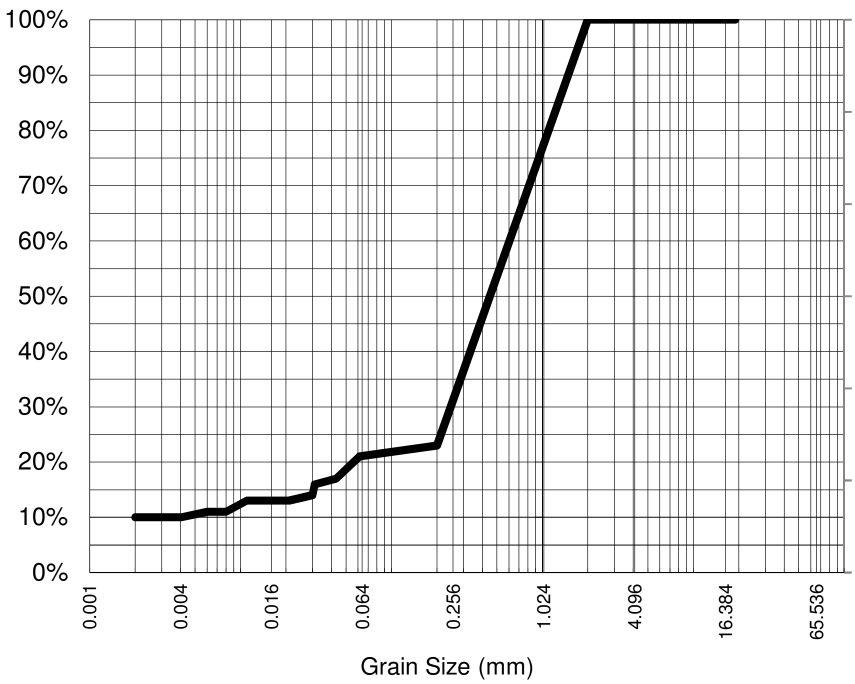
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-015 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 AL03

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	23%
0.200	23%
0.200	23%
0.200	23%
0.200	23%
0.075	#N/A
Particle Size (microns)	
43	17%
31	16%
30	14%
21	13%
16	13%
11	13%
8	11%
6	11%
2	10%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.49

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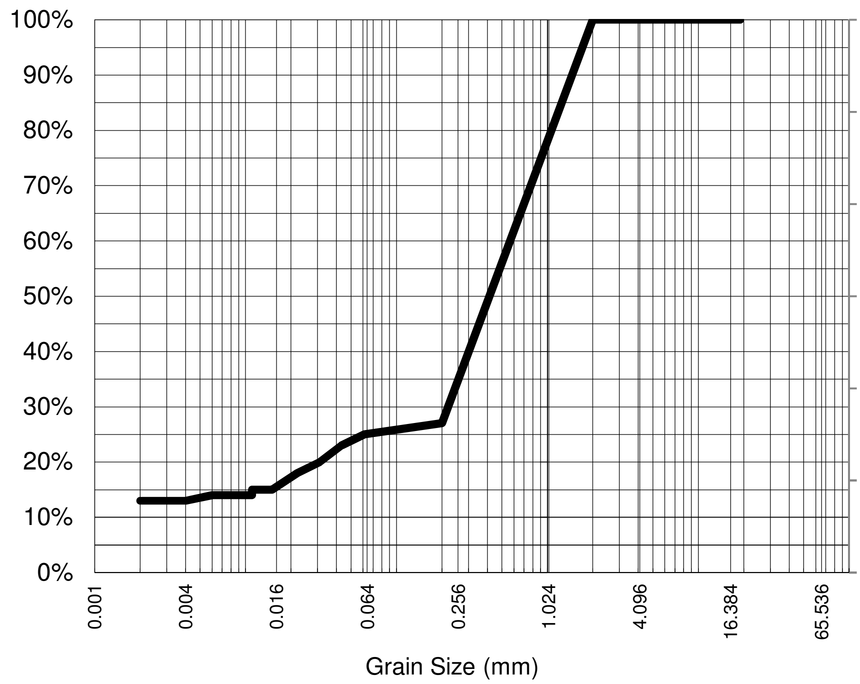
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-016 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 AL04

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	27%
0.200	27%
0.200	27%
0.200	27%
0.200	27%
0.075	#N/A
Particle Size (microns)	
43	23%
31	20%
22	18%
15	15%
11	15%
11	14%
8	14%
6	14%
2	13%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.47

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Aleksandar Vujkovic
Laboratory Supervisor
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Certificate of Analysis

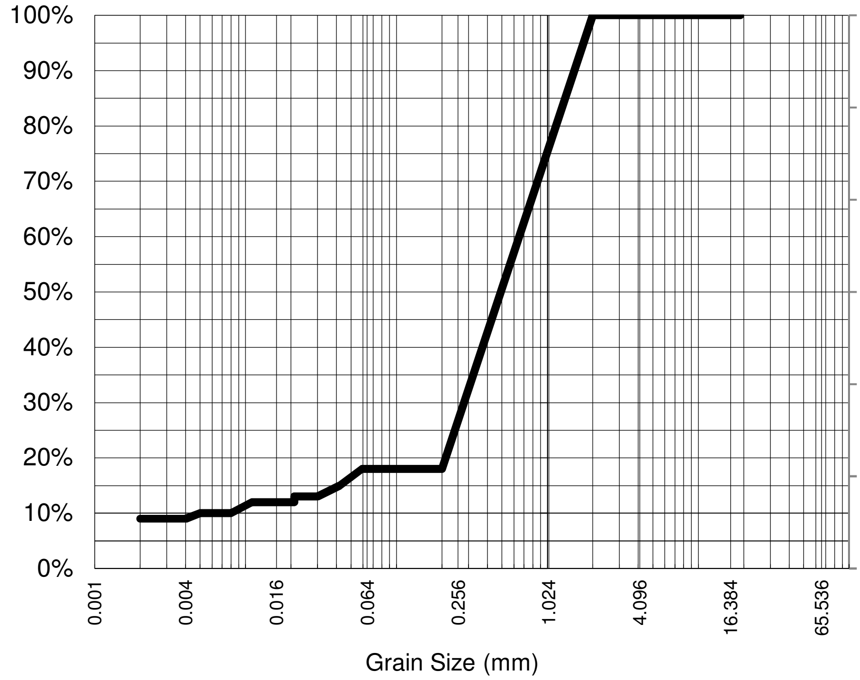
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-017 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 AL05

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	18%
0.200	18%
0.200	18%
0.200	18%
0.200	18%
0.075	#N/A
Particle Size (microns)	
42	15%
30	13%
21	13%
21	12%
15	12%
11	12%
8	10%
5	10%
2	9%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.55

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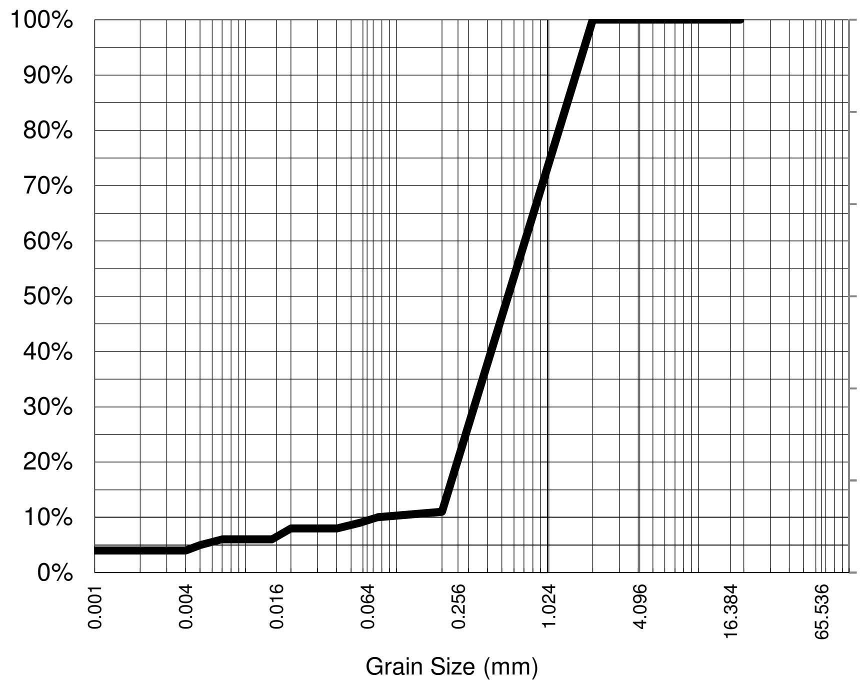
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental

Newcastle, NSW

CLIENT:	Tracy Schwinkowski	**DATE REPORTED:**	12-May-2020
COMPANY:	STANTEC AUSTRALIA PTY LTD	**DATE RECEIVED:**	30-Apr-2020
ADDRESS:	41 Bishop St Jolimont Perth, Western Australia	**REPORT NO:**	EP2004365-018 / PSD
PROJECT:	mwel_ss_19002	**SAMPLE ID:**	Stantec mwel_19002 AL06

Particle Size Distribution



Particle Size (mm)	% Passing
19	100%
19	100%
19.0	100%
19.0	100%
2.00	100%
2.00	100%
2.00	100%
0.20	11%
0.200	11%
0.200	11%
0.200	11%
0.200	11%
0.075	#N/A
Particle Size (microns)	
57	9%
40	8%
28	8%
20	8%
15	6%
10	6%
7	6%
5	5%
1	4%

Median Particle Size (mm)*	

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 6-May-20

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: FINES, SAND

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.00mm) 2.66

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Appendix E Laboratory and Analytical Method Descriptions

E.1 Soil Physical Characteristics

The soil physical properties were determined using a combination of testwork procedures including:

- soil texture and particle size distribution;
- soil structure and structural stability;
- soil strength;
- hydraulic conductivity; and
- water retention.

Soil texture was determined through a combination of particle size distribution and field texture measurements. Particle size distribution is a measurement of the proportions of sand (0.02 to 2.00 mm), silt (0.002 to 0.02 mm) and clay (<0.002 mm) particles in a sample. The measured proportions are compared to the Australian texture triangle (McDonald *et al.,* 1998). Field texture is determined by working the soil size fraction of the material by hand using the method described in McDonald *et al.* (1998). The soil coarse material fraction (particles greater than 2 mm) was determined gravimetrically. The soil texture class influences most physical and many chemical and biological processes. Soil structure, water holding capacity, hydraulic conductivity, soil strength, fertility, erodibility and susceptibility to compaction are some of the factors closely linked to soil texture. The percentage of coarse material can provide information on the ability of the material to withstand mechanical breakdown and erosion.

Soil structure describes the arrangement of solid particles and void space in a soil. The structure of a soil influences the ability of soil to support plant growth, store and transmit water and resist erosional processes. Soil structure is described through physical examination of the soil. It can be influenced by the particle size distribution, chemical composition and organic matter content, and is often affected by root growth, vehicle compaction, and with respect to reconstructed soil profiles, the methods of soil handling and deposition. A well-structured soil is one with a range of different sized aggregates; with component particles bound together to give a range of pore sizes facilitating root growth and the transfer of air and water. When a soil material is disturbed, the breakdown of aggregates into primary particles can lead to structural decline (Needham *et al.,* 1998). This can result in hardsetting and crusting at the soil surface and a 'massive' soil structure at depth, which potentially reduces the ability of seeds to germinate, roots to penetrate the soil matrix, and water to infiltrate to the root zone.

The structural stability of a soil and its susceptibility to structural decline can be complex and the tendency for a soil to remain stable, or to become structurally unstable depends on the net effect of a number of properties, including the amount and type of clay present, organic matter content, soil chemistry and the nature of disturbance. Soil aggregates that are unstable and will readily slake and disperse indicate a weak soil structure that is easily degraded. These soils are regarded as potentially problematic from an erosion perspective and unsuitable for use in the reconstruction of soil profiles for rehabilitation, particularly if left exposed at the surface. Structural stability of a soil is measured using the Emerson Aggregate Test which identifies the potential slaking and dispersive properties of soil aggregates under a worst-case scenario. Severe stress is applied to the soil material through wetting and saturation. The soils are rated into classes using the method described Soil Guide: A Handbook for understanding and managing agricultural soils (Moore, 1998). Generally, samples allocated into Emerson Classes 1 and 2 are those most likely to exhibit dispersive properties and therefore be the most problematic with respect of soil erosion.

Soil strength is determined using the modulus of rupture (MOR) test which identifies the tendency for the soil fraction (<2 mm) of material to hardset as a direct result of soil slaking and dispersion. An average MOR of >60 kPa has been described as the critical value for distinguishing potentially problematic soils in agricultural scenarios (Cochrane and Aylmore, 1997). If placed in near surface soil profiles, materials with high MOR may restrict root penetration and impact germination and emergence of some vegetation. As the MOR test is conducted on reconstructed soil blocks composed of the <2 mm soil fraction, it does not take into account the effect of coarse material content or soil structure on soil strength, nor any degree of compaction that may naturally occur under field conditions. It does, however, provide insight into the potential for soil layers to hardset and compact with repeated wetting and drying cycles, and the ability of roots to fracture the soil and penetrate crack faces.

The saturated hydraulic conductivity (K_{sat}) refers to the permeability of soil, or the ability of water to infiltrate and drain through the soil matrix and is dependent on soil properties such as texture and structure (Hunt and Gilkes, 1992; Hazelton and Murphy, 2007; Moore, 1998). Freely draining soils with high K_{sat} values (62.5 to >250.0 mm/hr) promote infiltration and are generally less susceptible to surface runoff and erosion. Slow draining soils with low K_{sat} values (0 to 5.0 mm/hr), are more likely to experience waterlogging, increased surface runoff and erosion. To determine saturated hydraulic conductivity, selected samples were collected in bulk in the field, and re-packed to approximate field bulk density. Drainage classes were determined for each sample according to their K_{sat} (Hunt and Gilkes, 1992).

The water retention properties of soil materials are important for determining the amount of water available for plant growth when soil materials are intended for use in rehabilitation. It can also give an indication of the potential for soil to hold water and release it through evaporation. In low-nutrient environments, common to most of arid zone Australia, the amount of water available to plants is often the most limiting factor to vegetation establishment and growth. The water retention or water holding capacity of a soil is influenced by a number of factors, with the particle size (and pore space) distribution, soil structure and organic matter content being the most influential. Soil water retention is measured through pressurising samples. As the pressure increases the amount of water that is held within the pores of the soil is reduced. The soil water (% volume) at 10 kPa is considered to represent water holding potential at field capacity of the soil (upper storage capacity [USL]) and the soil water at 1500 kPa is considered to represent water holding potential at wilting point (lower storage limit [LSL]) of the soil. Field capacity is representative of the percentage of water remaining in a soil two or three days after it has been saturated and free drainage has practically ceased. Wilting point is the percentage of water in the soil at which plants wilt and fail to recover. The difference between the USL and LSL is referred to as the plant-available water (PAW) and is measured as percent of soil volume.

E.2 Soil Chemical Characteristics

The soil chemical properties were determined using a combination of testwork procedures including:

- soil pH in water and calcium chloride;
- soil salinity;
- exchangeable cations;
- exchangeable sodium percentage (ESP); and
- plant-available nutrients.

The soil pH provides a measure of the activity of hydrogen ions in a soil solution made from a 1:5 soil to liquid suspension. Ratings are assigned from very strongly acidic to strongly alkaline based on the recorded pH measured in deionised water (pHW) and other solutions (Van Gool, Tille, and Moore, 2005). Soil pH is often measured in 0.01 M calcium chloride (CaCl2, pHCa), which is considered to be a more accurate measurement of hydrogen ion concentration present in a natural soil solution under similar conditions to soil solution taken up by plants (Hunt and Gilkes, 1992). The soil pH measured in CaCl2 is usually lower than pH measured in water; and both measurements are taken for a complete assessment. The ideal pH range for plant growth of most agricultural species is considered to be between 5.0 and 7.5 (Moore, 1998). Outside this range, the plant-availability of some nutrients can be affected, while various metal toxicities (e.g. aluminium and manganese) can become limiting to plant growth at low pH. For native species, which are known to be tolerant of wider ranges in soil pH, preferred pH ranges are best inferred from the natural, undisturbed soil in which they are observed to occur.

Soil salinity, or electrical conductivity (EC) is a measure of the amount of readily soluble salts in soil and soil pore water (Moore, 1998). The salinity is measured from a soil solution made from a 1:5 soil to deionised water suspension. Soil salinity classes are rated from non-saline to extremely saline based on the measured EC (recorded in dS/m) and the soil texture. The classes used for rating are equivalent to those commonly used by the United States Department of Agriculture (USDA) and Commonwealth Scientific and Industrial Research Organisation (CSIRO). Soil salinity can limit plant growth and impact soil structural stability. The measured salinity of a soil is influenced by natural processes of landscape evolution, hydrological processes and rainfall (Hunt and Gilkes, 1992), and may also be affected by anthropogenic processes such as water application for dust suppression, leaching and seepage from water bodies and infrastructure.

Exchangeable cations held on clay particle surfaces and within organic matter are an important source of soil fertility and can influence the physical properties of soil. Generally, if cations such as calcium (Ca^{2+}), magnesium (Mg^{2+}) and potassium (K^{+}) are the dominant ions on the exchange surfaces, the soil will typically display increased physical structure and stability, which aids aeration, drainage and root growth (Moore, 1998). If sodium cations (Na^+) are dominant on exchange surfaces and the exchangeable sodium percentage (ESP) exceeds more than 6% of the total exchangeable cations, then the soil is considered to be sodic, which can lead to poor physical properties such as increased dispersion upon wetting, hardsetting at the soil surface and increased erosion in soils, particularly when placed on sloped surfaces of constructed landforms. If ESP exceeds 15%, then the soil is considered to be highly sodic (Moore, 1998). The effective cation exchange capacity (eCEC), or the sum of total cations that can be held for exchange on the soil surfaces is used to determine the exchange capacity of the soil (which is typically related to clay and organic matter content).

Soil nutrients are important for plant growth and health. The most important macronutrients are nitrogen (N), phosphorus (P), potassium (K) and sulphur (S). Nitrogen is an integral component of essential plant compounds, and is important for root growth and development, and enhancing the uptake of other nutrients (Brady and Weil, 2002). A significant proportion of soil nitrogen is held in organic matter and is not readily available to for plant uptake (Hazelton and Murphy, 2007). Phosphorus is essential for the growth of plants and animals as it plays a key role in the formulation of energy producing organic compounds. Adequate phosphorus nutrition enhances many aspects of plant physiology, including the fundamental processes of photosynthesis, nitrogen fixation, flowering, fruiting (including seed production), and maturation (Brady and Weil, 2002). Potassium plays a critical role in a number of plant physiological processes. Adequate amounts of potassium have been linked to improved drought tolerance, improved winter hardiness, better resistance to certain fungal diseases, and greater tolerance to insect pests. Potassium can also improve the structural stability of plants (Brady and Weil, 2002). Sulphur is a constituent of many protein enzymes that regulate activities such as photosynthesis and nitrogen fixation (Brady and Weil, 2002). A large proportion of soil sulphur is held in organic matter and must be converted to inorganic sulphate sulphur to become available for plant-uptake. The conversion of organic to inorganic sulphur is usually catalysed by micro-organisms.

To measure the nutrient content of soil, the macronutrients are extracted using methods that approximate root-zone extraction from the soil. The resulting measurement is representative of plant-available nutrient content. Plant-available nitrogen is generally measured in the separate nitrate and ammonium forms. Both ammonium and nitrate are available forms of nitrogen for plant uptake. Potassium and phosphorus are typically measured using the Colwell method, and sulphur is extracted and measured as plant-available sulphate sulphur (Rayment and Lyons, 2011).

Australian soils are typically nutrient-poor. The majority of Australian native plant species have a number of physiological adaptations that enable them to be productive in areas where the supply of macronutrients is limited. There is limited information available which details the specific nutritional requirements for native plant species in the semi-arid zones of Australia.

E.3 Geochemical Characteristics

E.3.1 Acid Generation Assessment

Acid generation assessment for mine waste materials is generally carried out using a combination of two static testing methods:

- Acid Base Accounting (ABA); and/or
- Net Acid Generation (NAG)

The ABA methodology calculates the acid generation capacity through separate testing of the acid generating and acid neutralising properties of the sample material. The acid potential (AP) is a measurement of the acid that can be generated from the oxidation of sulfide minerals. The neutralisation potential (NP) is a measurement of the neutralisation properties of the material which is related to the presence of carbonate minerals and, to a lesser extent, silicate minerals. The net acid production potential (NAPP) is then calculated from the difference between the AP and NP values using the following formula.

$$NAPP = AP - NP$$

The NAG methodology calculates the resulting acid generation capacity of a material during a single test, during which rapid oxidation of the sample allows acid generation and acid neutralisation reactions to occur simultaneously.

For the purposes of this assessment, a combination of total sulfur and sulfate sulfur (SO_4 mg/kg) concentration has been used to calculate the sulfide sulfur percentage (%S). This value is then used to calculate AP on the basis that all sulfur present is in the mineral form of the sulfide mineral pyrite. It is noted that this represents a conservative approach to the estimation of AP and in cases where sulfide minerals other than pyrite are present may overestimate AP produced from rock containing other sulfide minerals. The use of a conservative approach enables the assessment to be undertaken as a reasonable worst case scenario for the management of any PAF materials.

The NP value is usually determined from the measured ANC of the samples. This method can cause an overestimation of the actual neutralisation capacity as it does not distinguish the readily available acid buffering from carbonate minerals, from less available sources of acid buffering (e.g. silicate minerals). An alternative method involves calculation of NP using the assumption that that all inorganic carbon present in the sample is in the form of calcium carbonate.

Where calculations were required, a conservative approach was used in the treatment of values less than the limit of reporting (<LOR). Values reported as <LOR were either converted to zero or used as a whole number to calculate AP or NP.

Using the ABA and NAG results, samples were classified in accordance with the criteria outlined in **Table E-7-1**. Samples classified as PAF are given arbitrary classifications of low capacity (LC) to high capacity (HC) to further delineate the amount of acid that may form during oxidation. The purpose of arbitrary classification is to aid in recommendation of management strategies. The arbitrary classifications are denoted by a suffix (e.g. PAF-LC or PAF-HC).

Table E-7-1: Classification scheme for identification of potential AMD risk

Classification	NAPP	NAG_{pH}	NP/AP	%S [1]	Notes
AC [2]	<-20 kg H2SO4/t	pH >4.5	≥2	<0.1	Must meet all criteria
NAF-barren	<0 kg H2SO4/t	pH >4.5	≥2	<0.1	-
NAF	<0 kg H2SO4/t	pH >4.5	>1	<0.3	UNC if %S is >1.0
UNC	<0 kg H2SO4/t	pH >4.5	>1 and <2	>1.0	May be related to insufficient sulfide oxidation
	<0 kg H2SO4/t	pH ≤4.5	>1	>0.1	Conflicting results
	>0 kg H2SO4/t	pH ≤4.5	<1	<0.1	May be related to presence of other acids [3]
	>0 kg H2SO4/t	pH >4.5	>1 and <2	>0.1	Conflicting results
PAF	>0 kg H2SO4/t	pH ≤4.5	<1	>0.3	Further classification of PAF material may be required for high %S

Notes:
Criteria developed with reference to the GARD Guide (INAP, 2009) and the AMIRA International ARD Test Handbook (AMIRA, 2002).
[1] The use of %S values for classification represents a guideline only as sulfide content can be in different mineralogical forms and content may be highly variable in a sample. This classification criterion is less important than other criteria and is generally only related to classification of samples as NAF or PAF.
[2] AC classification takes into account a safety factor related to Total S% and ANC.
[3] Generally related to samples with high organic carbon (TOC generally >5%).

E.4 Multi-elemental Composition

E.4.1 Multi-elements in Solids

The availability of metals (micronutrients) in soils play a significant role in many biological functions. The majority of metals occur in inert forms in soils and rocks, and only become available to plants and animals if they are chemically altered during oxidation reactions, or if severe weathering events occur (Hazelton and Murphy, 2007). Although some metals are essential to support plant growth, high concentrations can be toxic to flora and fauna. The exact sensitivity of different plant types and animal species in the semi-arid region of Australia has not been studied extensively. Assessment of potential toxicology is made through comparison of metal concentrations to site-specific soil and rock elemental concentrations (where available), as well as published guideline criteria. It is noted that this represents a conservative estimate as local soil and groundwater in mineralised areas is likely to contain more naturally elevated concentrations of metals and salts compared to guideline criteria.

To assess the potential for elemental enrichment, soil and mine waste materials are generally tested for total elemental concentrations. For the purposes of this assessment, total elemental concentrations were determined via acid-digest. As a conservative approach, the surface soil and mine waste samples were assessed as 'soil' material, which may enter the ecosystem via dust or bulk movement of material, and as sediment material which may enter the ecosystem via water-driven erosion and transport. The latter is considered to represent the more bioavailable form of the metal. Where available, site-specific screening criteria have been developed for assessment of potential impacts using the National Environment Protection Measure (NEPM) (NEPM 2013) Environmental Investigation Levels (EIL) for aged contaminants that apply to 99% protection of areas of ecological significance. It is noted that this represents a conservative approach to screening. Criteria for assessment of potential impacts as sediment in surface waters has been developed using Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC) (ANZECC, 2000) ISQG low and highly probable effects values. It is noted that for the purposes of this study, background soil samples that exceed a trigger value under the guideline does not necessarily indicate a concentration of environment significance, but rather an indication that the natural surface soils are enriched with respect to that element.

The EIL values are determined by the sum of the ambient background concentration (ABC) and added contaminant limits (ACL) for each element. For this study the ABC values (**Table E-5-1**) for specific elements was derived from mean concentrations of the samples in this baseline investigation. A summary of assessment criteria for total elements in solids assessed as part of this study is provided in **Table E-5-1.**

Table E-5-1: Assessment criteria for multi-elements in solids

Total Element (mg/kg)	ABC-MGO Topsoil	ABC-MGO Gravel Subsoil	ABC-MGO Clay Subsoil	MGO EIL Topsoil[1]	MGO EIL Gravel Subsoil[1]	MGO EIL Clay Subsoil[1]	ISQG-Low	ISQG-High
Aluminium	-	-	-	ND	ND	ND	ND	ND
Arsenic [3]	5	5.1	5.6	45	45	45	20	70
Barium	-	-	-	ND	ND	ND	ND	ND
Beryllium	-	-	-	ND	ND	ND	ND	ND
Boron	-	-	-	ND	ND	ND	ND	ND
Cadmium	-	-	-	ND	ND	ND	1.5	10
Chromium [2]	224.4	219.7	230	360	360	360	80	370
Cobalt	-	-	-	ND	ND	ND	ND	ND
Copper [4]	19.5	20.6	18.7	85	91	50	65	270
Iron	-	-	-	ND	ND	ND	ND	ND
Lead	5.3	<5	<5	480	480	480	50	220
Manganese	-	-	-	ND	ND	ND	ND	ND
Mercury	-	-	-	ND	ND	ND	0.15	1
Nickel [5]	103.3	105.1	110.2	130	170	120	21	52
Selenium	-	-	-	ND	ND	ND	ND	ND
Vanadium	-	-	-	ND	ND	ND	ND	ND
Zinc [3]	16.4	14.7	11.4	100	230	65	200	410

Notes: ND = No trigger value data is published

[1] MGO EIL for 99% protection of areas of ecological significance NEPM (2013), based on average values determined through this baseline assessment

[2] Assumed all Chromium is present as Cr III (conservative approach based on mineralogy). EIL value adopted based on average CEC and % clay content for each Resource Material

[3] EIL value adopted based on average CEC and pH_{Ca} for each Resource Material

[4] EIL value adopted based on average CEC for each Resource Material

[5] EIL value adopted based on average CEC and %clay content for each Resource Material

E.4.2 Soluble elements

For the assessment of elemental concentrations in solution (deionised water leachate), the laboratory results were compared to published guideline criteria for the protection of aquatic ecosystems (surface water and groundwater), based on the methodology set out in NEPM and ANZECC guidelines.

In the absence of site-specific data, the adopted trigger values for potential impact to surface water receptors from runoff have been determined conservatively based on previous knowledge related to the local hydrology of the Project Area (**Section 2.4**) and assumes 80% protection of species due to the nature of land clearing and mining operation in the surrounding area. For assessment of impact to groundwater receptors from seepage and infiltration, results have been compared to NEPM groundwater investigation levels (GIL) trigger values for moderately to slightly disturbed fresh and marine water ecosystems based on the salinity of regional groundwater (i.e. fresh to hyper-saline). This approach for assessment of potential impact is considered to be a conservative assessment of elevated levels of elements in seepage and runoff. A summary of assessment criteria for the elements assessed as part of this study is provided in **Table E-5-2**.

Table E-5-2: Assessment criteria with trigger values for elemental concentrations in solution

Soluble Elements (mg/L)	Groundwater	Surface Water
	GIL Marine Water[1]	ANZECC Marine Water [2]
Arsenic [3]	ND	ND
Barium	ND	ND
Beryllium	ND	ND
Boron	ND	ND
Cadmium	0.0007	0.036
Chromium[4]	0.0274	0.085
Cobalt	0.001	0.15
Copper	0.0013	0.008
Lead	0.0044	0.012
Manganese	ND	ND
Mercury	0.0001	0.0014
Nickel	0.007	0.56
Selenium	ND	ND
Vanadium	0.1	0.28
Zinc	0.015	0.043

Notes: ND = no trigger value data is published.
[1] Trigger value from NEPM (2013) GIL for protection of slightly to moderately disturbed marine water ecosystems
[2] Trigger value from ANZECC (2000) criteria for protection of highly disturbed marine water ecosystems (80% protection of species)
[3] GIL screening criteria assumes all arsenic as As (V)
[4] GIL screening criteria assumes all chromium as Cr (III)

Perth

Ground Floor, 226 Adelaide Terrace,
PERTH, WA 6000
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Appendix D Mt Weld – Mine Closure Risk Matrix

Risk Criteria Tables

The Risk Criteria Tables set out the Consequence Scale (Table 1) and the Likelihood Scale (Table 2) that are used by Lynas in risk analysis. Tables 3 and 4 assist the evaluation of which risks need treatment and the priorities for treatment implementation.

The tables contain definitions that enable risk to be expressed from the combination of both consequences and likelihood. These tables represent a qualitative risk analysis and use description rather than numerical means to define a level of risk

Table 1 – Consequence Scale – Consider the Worst Credible Outcome (Actual or Potential)

Consequence Rating						
Descriptor	People Health/ Safety (includes off-site)	Environment	Reputation / Community	Operational Impact / Customer Service / Marketing	Compliance	Financial/ Asset Loss
Catastrophic	Multiple Fatalities (AC1)	Large scale irreversible environmental harm	Serious public or media outcry (international coverage)	Interruption to a material part of operations >6 months Extreme loss of production and service to customers. Key customers lost to alternative supply	Significant prosecution and fine Very serious litigation including class actions	> $100 million
Major	Fatality (AC1)	Significant, long term environmental harm Major release of pollutants or release of pollutants to an extremely sensitive area	Significant adverse national media / public / NGO attention	Interruption to a material part of operations >1 month Major loss of production and service to customers Some customers lost to alternative supply	Major breach of regulation Major litigation	$10 million to $100 million
Moderate	Permanent disabling injury (AC1)	Immediate offsite contamination which is beyond the normal combatant resources available at site. Release of pollutants to sensitive areas	Attention from media and / or heightened concern by local community. Criticism by NGOs	Interruption to a material part of operations >1 week Moderate loss of production and service to customers Some customers seek alternative supply for short term	Serious breach of litigation with investigation or report to authority with prosecution and/or moderate fine possible	$1 million to $10 million
Minor	Medically treated injury with no permanent impact (alternative duties required - AC2)	Minor effects on biological or physical environment.	Minor, adverse local public or media attention or complaints	Interruption to a material part of operations <1 week Minor loss of production and service to customers.	Minor legal issues, non-compliance and breaches of regulation	$100,000 to $1 million
Negligible	Medically treated injury with no permanent impact (no alternative duties required - AC3)	Limited damage to minimal area of low significance	Public concern restricted to local complaints	Interruption to a material part of operations <2 hours Minimal loss of production or service to customers	Technical breach without penalties or damages	< $100,000

Table 2 – Likelihood Scale

Likelihood Rating			
Descriptor	Description	Probability	Frequency
Almost Certain	The event is expected to occur in most circumstances	80% - 100%	At least once per year
Likely	The event will probably occur in most circumstances	60% - 79%	At least once in 2 years
Possible	The event may occur at some time	40% - 59%	At least once in 10 years
Unlikely	The event may occur only in exceptional circumstances	20% - 39%	At least once in 25 years
Rare	The event is not expected	0% - 19%	Less than once in 25 years

Table 3 – Risk Level Matrix

		Consequences				
		Negligible	**Minor**	**Moderate**	**Major**	**Catastrophic**
Likelihood	**Almost Certain**	Medium	High	Extreme	Extreme	Extreme
	Likely	Medium	Medium	High	Extreme	Extreme
	Possible	Low	Medium	Medium	High	High
	Unlikely	Low	Low	Medium	Medium	High
	Rare	Low	Low	Low	Medium	Medium

Table 4 – Risk Tolerability and Response Guidelines

The level at which a risk is managed is determined by the severity of the projected risk and the extent to which the risk is being effectively managed by existing strategies. The majority of risks tend to be of medium severity or can be easily mitigated by local management and should be managed through existing strategies in accordance with this Framework. However, risks with a projected risk (i.e. after mitigations have been implemented) of Extreme or High Risks where controls are not consistently implemented or effective must be escalated to the attention of senior management in accordance with the table below.

The following table sets out the appropriate roles to manage risks of varying projected severity where risks are/ are not being effectively controlled.

Projected Risk Rating	Strategic	Tactical
Extreme	Escalate risk to attention of Board, LLT and Risk Management Committee. Accountable LLT member to oversee revised / strengthened mitigation strategies to reduce projected risk.	Escalate risk to attention of Board, LLT and Risk Management Committee. Accountable LLT member to oversee revised / strengthened mitigation strategies to reduce projected risk.
High	Escalate risk to attention of Board, LLT and Risk Management Committee. Accountable LLT member to oversee revised / strengthened mitigation strategies to reduce projected risk.	Local General Manager to implement detailed mitigation strategies to reduce projected risk to an acceptable level (i.e. Moderate or below). If mitigations strategies are not implemented or effective, risk must be escalated to the attention of the LLT.
Medium	Nominated risk owner to undertake active monitoring and assurance activities. If existing mitigations not implemented and/or effective additional mitigations must be developed and implemented.	Local General Manager to undertake active monitoring and assurance activities. If existing mitigations not implemented and/or effective: (a) additional mitigations must be developed and implemented (b) the risk must be escalated to the attention of the LLT.
Low	Accept the Risk. LLT to review risk annually.	Accept the Risk. Local management to manage through routine business procedures and contingencies.

Table 5 – Effectiveness of Control Measures

Control Effectiveness	
Strong	Significant attention to the risk. Have undertaken all feasible economic controls. Are maintaining an ongoing monitoring system.
Moderate	Controls in place provide a reasonable certainty of control, although will not allow management of all potential risk events.
Weak	Controls in place are insufficient to prevent or mitigate this risk.
Uncontrollable	Outside the control of the organisation in respect of likelihood.

Risk Control

Once hazards and aspects are identified and risk assessed, action must be taken to control them. When developing risk control strategies, those items having the highest level of risk will be addressed first. It is the responsibility of management to develop a written action plan to ensure that recorded risks are controlled.

When determining the best method of eliminating or reducing risk, the hierarchy of control must be followed.

Hierarchy of Control

- Elimination - can the risk be eliminated altogether?
- Substitution - can the plant/substance/hazard be substituted by one that presents a lower risk?
- Engineering - can the risk be enclosed, isolated, guarded or modified to reduce the risk?
- Administration - Safe Work procedures, signs, training be used to reduce the risk?
- PPE - Personal Protective Equipment and/or clothing?

Elimination of risk is always the preferred control measures and should be the first choice. If this cannot be achieved then move through the Hierarchy of Controls until suitable controls are found. Generally the best option requires a combination of controls may be considered appropriate for minimising the risk or lower order controls may be considered as an interim control measure.

The choice of options adopted are considered in the light of the most cost-effective risk reduction measure to preferably eliminate, or alternatively reduce the risk to an acceptable level of risk by following the hierarchical approach. Consideration is also given to the immediate and long-term actions, including time frames and accountability.

NOTE: Environment Aspects and Impacts will be managed through the site Environmental Aspects and Impacts Register.

Risk Review

For some risk controls, control measures may need to be tested before they are permanently implemented. Some risk controls will be immediate actions and others will take time to implement.

After an appropriate control is implemented it is the responsibility of management to monitor and review the effectiveness of the implemented risk controls. The review period is to be decided by consultation of the HSE improvement team. Dates and results of the review are to be included in the Risk Register.

Appendix E Mt Weld – Closure Implementation Schedule

Mt Weld Rare Earths Project - Schedule of Works

Baseline - Research, Investigation and Trials

Baseline Category	Knowledge Gap	Associated Risk	Closure Implementation Tasks	Timeframe	Responsible Department
Soil and Waste Characterisation	Adequacy of the 'blocky alluvium' as a source of armouring material that can be utilised on the upper slopes of the WRL, or on features that will remain post closure.	•slope erosion is not mitigated •narrow berms fill with sediment, overtop and fail Inadequate volumes of competent material for: •abandonment bund construction; •permanent water diversion structures; •successful armouring of slopes preventing erosion.	Undertake durability testing on the blocky alluvium to determine the hardness and abrasion characteristic i.e. ability to resist degradation due to imposed wheel load.	2021 - 2023	Environment Department
Soil and Waste Characterisation	The quantity of alluvium required for the construction of the TSF 4 embankment, and If all the alluvium material (~ 2,406,000 m3 after Stage 4) proposed to be stockpiled in the ROM Pad expansion area will be utilised (sandy and blocky).	•remaining material (potentially containing a higher percentage of sandy alluvium) is applied as a source of rehabilitation material on the final landform embankments. •Erosion of slopes due to inadequate armouring material •inadequate closure provisioning; •increase cost	•Determine volume of material needed for construction of the TSF 4 embankments. •Discontinue stockpiling of the sandy alluvium and blocky alluvium together in the same stockpile once the required volume for TSF 4 construction is attained.	2020 - 2026	Environment Department
Hydrology	Impact of 1 in 100 AEP storm event under current site conditions.	•the Flood inundation modelling identified likely process plant site inundation in the event of a 1 in 100 AEP storm under current conditions. •increased costs as a result of potential bund design changes.	•undertake a detailed survey within the project area of the proposed infrastructure to confirm modelling outcomes and confirm changes to bund design.	2020 - 2026	Environment Department
Hydrology	Post closure features (e.g. roads) which may impede surface water flows have not yet been defined, in addition to if these features have been designed and/ or constructed with post closure in mind.	Given the flat topography, roads and other post-mining features will act as surface water diversion or containment structures, impacting surface water flow patterns, and drainage lines discharging surface water flows to Lake Lefroy.	Develop surface water management measures that can be progressively implemented during operations to minimise impacts on landforms, hydrological regime and receiving environment, including Lake Carey post closure; and The surface water assessment should be revisited when an agreement is reached on features remaining post-closure. Including an assessment on extent of work required (e.g. further stripping back of roads, further armouring, maintenance of permanent features).	2020 - 2026	Environment Department
Hydrogeology	The rate of return of groundwater back into the open pit and the pit lake hydrological system that will develop post closure is not understood.	The proposed development of the open pit, infiltration volumes and monitoring data are not captured in a groundwater model; hence an understanding of the system response is limited. Groundwater flow directions in a post-mining landscape are not understood.	Development and regular recalibration of a regional scale numerical model and sub-regional groundwater flow model, with current data is required, in order to understand the groundwater system response to dewatering and to groundwater rebound once dewatering ceases.	2020 - 2023	Environment Department
	No current closure related knowledge gaps were identified in relationship to Local and Regional Ecological Information				
Indigenous and European Heritage	No current closure related knowledge gaps were identified in relationship to Indigenous and European Heritage				

Mt Weld Rare Earths Project - Schedule of Works

Baseline - Research, Investigation and Trials

Baseline Category	Knowledge Gap	Associated Risk	Closure Implementation Tasks	Timeframe	Responsible Department
Rehabilitation	The variances in the seed mixes proposed for specific areas is undefined.	Inadequate closure provisioning; and Rehabilitation failure.	ascertain the average height of emergent species in the topsoil stockpiles; develop a register of species and their average height, as shallow rotted species are proposed for the TSF; Determine the seed species suitable for different features, and an appropriate seed ratio / mix; Ascertain the required volume of the specific seed species; and Ascertain the recommended treatment / cleaning and storage of specific seed species to ensure sufficient time for seed collection and management is allocated.	2020 - 2023	Environment Department
Rehabilitation	Incomplete data for 2008 rehabilitation prescriptions	Inability to replicate successful rehabilitation	Commence monitoring to ascertain vegetation species in rehabilitated areas, and incorporate data into rehabilitation prescriptions.	2020 onwards	Environment Department
Rehabilitation	Closure criteria regarding rehabilitation outcomes not determined (qualitative not quantitative).	Inadequate closure provisioning; and Rehabilitation failure.	Commence monitoring against analogue sites, and incorporate data into rehabilitation criteria.	2020 - 2023	Environment Department
Contaminated Sites	Contaminated sites data is incomplete	Inadequate closure provisioning; and Potential risk posed to ecological receptors.	In consultation with DWER, complete site-wide PSI (as required).	2020 - 2023	Environment Department

Mt Weld Rare Earths Project - Knowledge Gap Register

Overarching - Research, Investigation and Trials

Domain	Knowledge Gap	Associated Risk	Closure Implementation Tasks	Investigative Task Status Update	Timeframe	Responsible Department
Site Wide	Stakeholder interest in infrastructure, and liability handover, in particular site roads and bores.	Residual liability for remnant infrastructure due to lack of clarity regarding ownership and responsibility for removal of infrastructure;	Obtain signed agreements for the responsibility for any infrastructure or features such as roads to remain post closure. Written acceptance from all applicable parties to take responsibility for any remaining infrastructure or features will have to be provided in the MCP prior to closure	Not yet commenced - planned for 5 years prior to closure	5 Years from Closure	Corporate
Site Wide	Environmental legacies and compliance with the CS Act 2003	Potential risk posed to ecological receptors via uptake of potential contaminants in soil/groundwater (vegetation used for rehabilitation) limiting rehabilitation success, and potential migration of contaminants to groundwater and surrounding vegetation.	Develop a register of point source contaminants, including their location; Develop a sampling analysis and quality plan (SAQP) in accordance with the CS Act, CS Regulations and the DER Assessment and Management of Contaminated Sites Guidelines 2014 and remediate areas where required; and Continue to update the contaminated soils inventory.	Not yet commenced - planned for 2020 - 2023	2020 - 2023	Environment Department
Site Wide	Species to be utilised in rehabilitation	Post mining landscape not returning to a functioning ecosystem. Failure to relinquish site due to inability to achieve completion criteria.	Continue analogue and rehabilitation monitoring to finalise seed mixes.		2 to 3 years	Environment Department
Site Wide	The viability of seed within the topsoil stockpiles is unknown due to stockpiling for extended periods	Inability to rely on the topsoil stockpiles as a seed resource	Collect local provenance seed, clean and store appropriately, or identify a source for a suitable locally-provenance seed mix. Determine quantity of seed or plants required, and sources of these, for revegetation of entire project site.	Not yet commenced - planned for 5 years prior to closure	5 years from closure	Environment Department
Site Wide	Management of material hazardous to human health during closure works	Contaminated / hazardous materials that could be deemed hazardous during closure works are not identified.	Develop a comprehensive hazardous material register for the mine. This includes (but not limited to): Naturally Occurring Radioactive Materials (NORM), Synthetic Mineral Fibre's (insulation) hydrocarbons (including quantities), polychlorinated biphenyls (PCB's) (including quantities), asbestos and any other identifiable contaminated/hazardous material that could be deemed hazardous during closure works.	Not yet commenced - planned for 2020 - 2026	2020 - 2026	Environment Department/ Safety Department
Site Wide	Final Surface Water Management strategy	Incorrect drainage across the project area leading to erosion scour and water ponding causing a decline in vegetation health from shadowing and/ or ponding.	Develop a site Mine Closure Surface Water Management Plan, focused on re-establishing the natural drainage lines and sheet flow	Not yet commenced - planned for 2020 - 2023	2020 - 2023	Environment Department

Mt Weld Rare Earths Project - Schedule of Works

Overarching - Progressive and Premature Closure

Domain	Closure Implementation Tasks	Responsible Department	Timeframe
Progressive Closure			
Site Wide	All buildings and structures, no longer required, are to be dismantled and removed from site or buried.	Site Services	Life of Mine
Site Wide	Plug all bore holes no longer required.	Site Services	Life of Mine
Site Wide	Remove all mining dewatering discharge pipelines and associated infrastructure no longer required.	Site Services	Life of Mine
Site Wide	Remove all turkeys nest infrastructure, including associated infrastructure, no longer required.	Mining Department	Life of Mine
Site Wide	Remove loose debris, litter and other non-hazardous substances to landfill or off-site recycling.	All Departments	Life of Mine
Site Wide	If required, take validation samples below where impacted soils have been removed to prove no residual impact.	Environment Department	Life of Mine
Site Wide	If required, undertake additional contaminated sites investigations in accordance with the CS Act and Regulations.	Environment Department	Life of Mine
Site Wide	If required, remove all potentially contaminated soils (hydrocarbons) and dispose of appropriately in a designated active bioremediation facility.	Environment Department	Life of Mine
Site Wide	Identify areas where contaminated material can be disposed of for treatment (on or off-site depending on status of on-site bioremediation areas and other designated disposal facilities).	Environment Department	Life of Mine
Site Wide	Identify and maintain all active bioremediation facilities on site that have the capacity and / or requirement to receive the contaminated material from the Project areas.	Environment Department / Mining Department	Life of Mine
Site Wide	Source local provenance seed (for the areas identified), clean and store appropriately.	Environment Department	Life of Mine
Site Wide	Verify placement and construct abandonment bunding as required, (in accordance with recommendations in the latest MCP.	Mining Department	Life of Mine
Site Wide	Define the full extent of the road network and responsibility for rehabilitation.	Environment Department	Life of Mine
Site Wide	Develop a Care and Maintenance (C&M) Plan	Environment Department	Life of Mine
Premature Closure			
Site Wide	Implement the site-specific Care and Maintenance (C&M) Plan	Environment, Mining and Processing Departments	Within two months of going into C&M.
Site Wide	Remove stored reagents (including excess fuel) and other chemicals	Processing Department	Within two months of going into C&M
Site Wide	All services: Isolate and purge all service lines (air / water / gas etc.); Physically disconnect the service as close to the proposed demolition site boundary as possible; Provide temporary service connection points at the proposed demolition site boundary if possible; Ensure that there are no services running through the site that feed other areas that need to remain live; and Attain written signoff for all disconnected services.	Site Services	Within three months of going into C&M

Mt Weld Rare Earths Project - Schedule of Works

Overarching - Progressive and Premature Closure

Domain	Closure Implementation Tasks	Responsible Department	Timeframe
Site Wide	All Vessels / Pumps / Motors (where applicable): Ensure all fuels and oils are removed from all storage vessels; Ensure all fuels and oils are purged from any service lines that run within the sites; Ensure all fuels and oils are purged from any pumps, motors or the like; As the site will remain operational, before demolition commences in the relevant areas, all storage vessels will need to be cleaned and a gas free certificate provided; and Attain written signoff for all purged vessels, motors and pumps from the various services trades.	Site Services	Within three months of going into C&M
Site Wide	Miscellaneous: Dispose of any drums, containers or the like containing any remnant chemicals or hazardous substances.	All Departments	Within two months of going into C&M
Landforms	Install bund across the WRL ramp.	Mining Department	Within three months of going into C&M
Landforms	Install sediment bunds around the TSFs and WRL, as required.	Mining Department	Within three months of going into C&M
Mining Infrastructure	Install abandonment bunds around the non-operational open pit void in the required location.	Mining Department	Within three months of going into C&M
Mining Infrastructure	Install a bund across all the open pit ramps and minimise, where possible, the risk of inadvertent (vehicular) public access to the site.	Mining Department	Within three months of going into C&M
Exploration	Seal any open drill holes.	Mining Department	Within one month of going into C&M

Mt Weld Rare Earths Project - Schedule of Works

Landforms

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
TSF 1, 2 and 3	63.37	Volume of tailings liquor that can be recovered from the underdrainage, and when the underdrainage can be decommissioned.	TSF remaining uncapped for extended periods exposing NORM and delaying closure of the landform.	Once the recoverable supernatant waters have been removed from the tailings surface, investigate if seepage water can be recovered from the underdrainage. Monitor any volumes recovered from the underdrainage. Determine how long after ceasing deposition that the underdrainage will be decommissioned.	NA	At closure	Environment Department	•Remove tailings delivery and distribution pipework and remove the top sections of the decant tower.remove and seal the decant tower; •Reshape and prepare batters to average 15°; •Reshape and prepare top surface (doze perimeter bench and decant access roads) for cover works; •cover with appropriate cover material sufficient to blanket radiation (as determined by trials); •develop final store and release cover profile; •install coarse waste rock protection layer (as required); •apply topsoil to the upper surface, embankment crests and downstream slopes; •install appropriate drainage control to prevent water ponding against the toe of the TSF embankments; •re-establish natural surface water flows, where feasible; •where appropriate, rip and install erosion control measures; •apply local provenance seed; and •decommission underdrainage when deemed appropriate.	At closure	Mine Closure team
		Time required for consolidation.	TSF remaining uncapped for extended periods exposing NORM and delaying closure of the landform.	Cone Penetration Test to determine tailings consolidation.	NA	Following cessation of deposition into TSF 1, 2 and 3	Mine Closure Team			
		Final Closure Design including the findings of the tailings profile assessment and subsequent depth of material required to cap the TSF to blanket radiation, requirement for a capillary break, and required cover profile to support vegetation.	Inappropriate landform design leading to: - slope erosion; - exposure of radioactive materials; - sedimentation of adjacent areas; - failure to achieve relinquishment; - upward migration of salts inhibiting vegetation establishment; - unplanned closure costs; and - rehabilitation failure / significant rework.	Undertake rehabilitation trials during the life of the project to determine the most efficient methodology to provide an effective radiation capping layer, prevent upward migration of salts and rehabilitate the surface of the facility.	NA	2021 onwards	Environment Department			
				Cone Penetration Test to determine tailings consolidation. Develop a final closure design including cover profile, surface preparations and geotechnical design of engineered spillways (if required).	NA	Following cessation of deposition into TSF 1, 2 and 3	Mine Closure Team			
		Volume and type of material that will be available for closure of the TSF, including drainage channels.	Adequate volumes of rehabilitation materials not available at closure	Further materials testing of waste streams to verify adequacy for specific closure tasks (e.g. Slope armouring, NORM capping material and drainage channels).	NA	2021-2026	Environment Department			
		Requirement for storm drainage around the TSFs to prevent water locally ponding against the TSF walls.	The integrity of the TSF embankments are compromised	Integrate storm drainage around TSF into site-wide drainage plan	NA	2020-2023	Environment Department			
WRL	96.93	Final landform design including surface water management of the WRL upon closure.	Inappropriate landform design leading to: - slope erosion; - potential for back-sloping berms to fill with sediment (topsoil) and fail; -exposure of dispersive, sodic and potentially mineralised waste (radioactive material); -sedimentation of adjacent areas; -failure to achieve relinquishment; - unplanned closure costs; and - rehabilitation failure / significant rework	Develop a final Landform design to minimise erosion (based on soil characteristics, and lessons learnt from the current rehabilitation trials) with consideration to Probable Maximum Precipitation. Evaluate necessary ratio of growth medium to armour rock to achieve desired slope stability.	NA	2021 onwards	Environment Department	The slopes will be battered to a maximum angle of 18°. Reshape the top surface of the WRL. Install a crest bund and drainage control cells on the top surface of the WRL. Re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features. Apply topsoil/ subsoil, where required. Deep rip all rehabilitated areas along the contour. Spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats. Apply local provenance seed.	At closure	Mine Closure Team
		Total waste material types and volumes	Adequate volumes of rehabilitation materials	maintain a rehabilitation materials inventory		Updated annually	Environment Department			

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
			not available at closure	Further materials testing of waste streams to verify adequacy for specific closure tasks (e.g. Slope armouring, NORM capping material) Evaluate surface artea and cover volument requirements		2020 - 2023	Environment Department			
				Cover trials and radiological testing determining adequate depth of cover to attenuate radiation.		2020-2023	Environment/ Safety Departments			
		Areas suitable for progressive rehabilitation	Large remaining liability at time of site closure	Annual review of disturbance areas to identify potential progressive rehabilitation targets.		Annually	Environment Department			
Blended Ore Stockpile	1.62	Extent of radioactive nuclides movement into the soil beneath the BOS. Depth to which the soil beneath the BOS needs to be excavated to remove contaminated soil.	Inappropriate closure planning. Inappropriate closure provision. Human or environmental exposure to radioactive material.	Determine the depth to which the soil beneath the BOS needs to be excavated to remove contaminated soil.		At closure	Environment Department/ Safety Department	•remove underlying base layer for processing (approximately 0.5 m of material); •re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; •spread topsoil where required; •deep rip all rehabilitated areas along the contour; •spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and •apply local provenance seed.	At closure	Mine Closure team
Lake Clay Stockpile	2.9	No key closure knowledge gaps were identified for this feature.	NA					•remove material and encapsulate within the WRL •re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features; •spread topsoil where required; •deep rip all rehabilitated areas along the contour; •spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; and apply local provenance seed.	At Closure	Mine Closure Team
Mineralised Waste Stockpiles	2.1	Whether the mineralised waste will be processed or backfilled into the open pit, or if encapsulation of the mineralised waste on the surface will be considered as alternative. If backfilled, the depth at which this will occur, and cost associated with haulage	Inappropriate closure provision. Inappropriate closure planning. Adequate volumes of capping material not being available at closure.	Development of a decommissioning plan for mineralised waste.	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure	Environment Department/ Mining Department	•If the mineralised waste will be processed; •And if not if it will be pushed back into the open pit and covered with 1 m of oxide material, or buried within the WRL; •remove underlying base layer for encapsulation (approximately 0.5 m of material); •re-establish natural surface water flows and drainage lines; •spread topsoil where required; •deep rip all rehabilitated areas along the contour; •spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats; •apply local provenance seed; and •rock armour where required.	At Closure	Mine Closure Team
		Total volume of mineralised waste at closure		Regular survey of quantities of mineralised waste and location throughout mine life.	NA	Annually	Mining / Survey Department			

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Landforms

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
		Unknown depth of pit lake post closure - whether the mineralised waste will be covered by the pit lake	Exposure of NORM material.	Post closure pit lake modelling study	Not yet commenced	2020 -2026	Environment Department			
ROM Pad	39.44	Extent of radioactive nuclides movement into the soil beneath the ROM Pad. Depth to which the soil beneath the ROM Pad needs to be excavated to remove contaminated soil At what point in time the temporary stockpiles will be removed from the ROM Pad Expansion area	Inappropriate closure planning. Inappropriate closure provision. Human or environmental exposure to radioactive material	Determine the depth to which the soil beneath the ROM needs to be excavated to remove contaminated soil.	NA	At closure	Environment Department/ Safety Department	Utilise remaining ore within the plant including underlying base layer (approximately 0.5 m of material). Undertake radiation monitoring and scrape any radioactive material from the surface. Remove material and encapsulate within the WRL Re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features. Spread topsoil where required. Deep rip all rehabilitated areas along the contour. Spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats. Apply local provenance seed.	At Closure	Mine Closure Team
Topsoil Stockpiles	28.68	No key closure knowledge gaps were identified for this feature.	NA					Remove topsoil and spread at the defined depth in the required location. Re-establish natural drainage contours. Deep rip the stockpile footprint. Spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats. Apply local provenance seed.	At Closure	Mine Closure Team

Mt Weld Rare Earths Project - Schedule of Works

Industrial Infrastructure

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
Industrial Infrastructure	30.02	Extent of dust generated from drying and bagging of concentrate. Level of radioactive dust in surrounding areas. Length of time that concentrate is left in bags in the Concentrate Handling and Storage Area.	Inappropriate closure planning. Inappropriate closure provision. Human or environmental exposure to radioactive material.	Radiation monitoring as per requirements of RMP.	Ongoing	Ongoing as per RMP	Safety Department	Develop a detailed decommissioning demolition plan with scheduled removal of related infrastructure including the plant, septic tank infrastructure, pipelines, concrete pads and bunding. Remove plant infrastructure including crushing, milling and flotation circuits, as detailed in the demolition and decommissioning plan. Remove all infrastructure including concrete pads, laboratory equipment, bunding, tanks and buildings. Remove all rubbish and place within the landfill. Cap landfill with a minimum of 2 m inert waste rock. All pipelines and pumps flushed and removed from site. Remove tailings pipeline infrastructure. Ensure septic tanks are safely buried and remove infrastructure (pipelines to septics) from site. Remove of all soils contaminated by saline water or hydrocarbons. Remove all potentially contaminated soils (radiation) and dispose of in one of the TSFs or encapsulate in WRL. Remove all potentially contaminated soils (hydrocarbons) and place in the bioremediation facility. Apply a 1 m cover of suitable material to the area to blanket radiation where applicable. Re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features. Spread topsoil where required. Deep rip all rehabilitated areas along the contour. Spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna	At closure	Mine Closure Team
		Vertical and lateral extent of hydrocarbon and/or processing chemical contamination to underlying soils.	Potential risk posed to ecological receptors via uptake of potential contaminants in soil/surface water / groundwater (vegetation used for rehabilitation) limiting rehabilitation success, and potential migration of contaminants to groundwater and surrounding vegetation. Inappropriate closure planning. Inappropriate closure provision.	Site audit for potentially contaminated sites Continue to maintain / update the contaminated soils inventory and prepare a sampling and analysis plan and remediate areas where required. Review all previously recorded potential contaminations and treatments to ensure compliance with the Contaminated Sites Act 2003 Review groundwater monitoring to include potential sources of contamination from hydrocarbons and from sewage.	Ongoing	At time of incident/ contamination	Environment Department			
				Develop both a sub-regional groundwater flow model and a surface water hydraulic model. These models would encompass the entire operational footprint of Mt Weld Mining's current and future operations, both on-land and in-lake.	Not yet commenced - planned for 2020-2023	2020 - 2026				

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
		Whether any infrastructure is required by a third party.	Inappropriate closure planning. Inappropriate closure provision.	Stakeholder consultation with underlying land holders. Ascertain infrastructure to be retained or removed in accordance with agreed post mining land use. Determine the requirements for transferring responsibility to a third party. Seek approval, if required, from the Pastoral Lands Board (PLB) for retention of infrastructure. Develop an asset transfer agreement prior to closure.	Not yet commenced - planned for 2020-2023	2020-2023	Environment Department	habitats. Apply local provenance seed.		
		Lack of a comprehensive inventory on the type and quantity of metals on site.	The potential cost savings on scrap credit are not captured.	Develop an inventory on type and quantity of metals on site to more accurately assess potential cost savings on scrap credit (built into the tendering document).	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure	Environment Department			
		Closure strategy for landfill facility.	Inappropriate closure planning. Inappropriate closure provision.	Determine timeframe for rehabilitation and closure of the current landfill facility; and Identify an appropriate landfill facility to enable placement of rubbish during decommissioning.	Not yet commenced - planned for 2020-2023 Not yet commenced - planned for 3 years prior to closure	2020 - 2023 3 year prior to closure	Environment Department			

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Mining Infrastructure

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
Mt Weld Open Pit	52.4	The rate of return of groundwater back into the open pits.	Limited understanding of the cumulative effect of pit dewatering effects and water quality.	Hydrogeological study modelling post closure pit lake formation.	Not yet commenced - planned for 2020-2026	2020 - 2026	Environment Department	Apply a 1 m layer of oxide material to the floor of the open pit to minimise the levels of radiation exposure. Establish fencing, lockable gates, signage and alternative bunding where required. Block access to open pit ramp. Establish abandonment bunding as per DMIRS guidelines.	Decommissioning Phase	Mine Closure Team
		Final hydrogeological function of pit lake.	Limited understanding of the: Movement of potential contaminants into groundwater; and Concentration of contaminants in the pit lake.							
		Predicted post closure pit lake water level.	Hazardous materials (potentially located in foot wall or mineralised waste backfill) inadequately covered by pit lake rebound.							
		Predicted post closure pit lake water quality.	Potential risk posed to ecological receptors. Altered groundwater quality.	Incorporate all monitoring and production bore water quality data into the groundwater flow model, in order to predict the water quality trends, post closure in the open pit.			Environment Department			
		Required depth of capping layer to the open pit floor.	Release of hazardous substances (radiation and, geochemical) into the pit lake.	Sampling, analyses and modelling of geochemical and radioactive properties within the open pit footwall. Analysis of propensity of hazardous substances to transfer to pit lake and required mitigation techniques (e.g. capping within benign waste).	Not yet commenced - planned for 2020-2026	2020 - 2026				
		Requirement for post closure management of the pit lake.	Inappropriate closure planning. Inappropriate closure provision.				Environment Department			
		Requirement for fencing of the open pit post closure to prevent stock access.		Stakeholder consultation with underlying pastoral lease holder regarding fencing of the open pit post closure	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure				
		Source of competent abandonment material if required.	Inappropriate closure provision associated with haulage of material from Granny Smith, distance will be dependent on available sources of material.	Stakeholder consultation with GSGM regarding availability of n		2020-2026	Environment Department			

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Water Containment Infrastructure

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
Water Containment infrastructure	80.38	Quality of the water within the water containment facilities at closure.	Inappropriate closure planning. Inappropriate closure provision.	Monitoring of sediments in RWP post closure. Stakeholder consultation.	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure	Corporate	Determine water quality contained with water containment facilities and dispose of appropriately or allow to evaporate. Remove any liners and dispose of in one of the TSFs or WRL as appropriate. Bury any contaminated material in the base of the facilities. Remove all infrastructure. All pipelines and pumps flushed and removed from site. Appropriately dispose of or utilise the embankment material. Install a 1 m oxide store and release cover over the facilities. Appropriately armour any structures to remain post-closure (i.e. Flood Control Bund and / or Stormwater Diversion Channel) with competent waste rock material. Re-establish natural surface water flows and drainage lines, without compromising the integrity of the landform features. Spread topsoil where required. Deep rip all rehabilitated areas along the contour. Spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats. Apply local provenance seed.	At Closure	Mine Closure Team
		If current surface water management structures have been designed to remain post closure.	Inappropriate closure provision. Inappropriate closure planning.	Site wide surface water management plan with consideration to PMF. Audit of existing water management structures to determine construction specifications. Update MCP to include additional armouring of permanent diversion features as required.	Not yet commenced - planned for 2020-2023	2020-2023	Environment Department			
		Will any water containment infrastructure be required by the pastoralist post closure.	Inappropriate closure provision. Inappropriate closure planning.	Stakeholder consultation. Formal transfer of infrastructure in consultation with DPLH, Pastoral Land Board.	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure	Corporate			

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Groundwater Containment Infrastructure

Feature	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
Ground Water Infrastructure	Responsibility for rehabilitation of B12.	Inappropriate closure provision. Inappropriate closure planning.	Stakeholder consultation with GSGM regarding the closure liability of B12.	Not yet commenced - planned for 2020 - 2023	2020 - 2023	Corporate	Remove groundwater infrastructure including bores and pipelines to be detailed in the demolition and decommissioning plan. Securely plug all bores and infiltration drain holes at minimum 400 m below ground surface. Remove all infrastructure including concrete pads. Re-landscape infiltration pond to blend in with surrounding landscape (if not retained by pastoralist). Remove infiltration baffles to WRL or utilise rock material to armour Flood Control Bund (if remaining). All pipelines and pumps flushed and removed from site. Remove of all soils contaminated by saline water or hydrocarbons. Spread topsoil where required. Deep rip all rehabilitated areas along the contour. Spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats. Aapply local provenance seed.	At Closure	Mine Closure Team
	Will any groundwater infrastructure be required by the pastoralist post closure, including, but not limited to the MAR.	Inappropriate closure provision. Inappropriate closure planning.	Stakeholder consultation with pastoralist. Formal transfer of infrastructure in consultation with DPLH, Pastoral Land Board.	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure	Corporate			
	The number of bores that will be retained post closure for ongoing monitoring, and the extent of the affiliated pipeline.	Potential increase in financial liability.	Undertake consultation with regulators to ascertain specific groundwater infrastructure that will be retained post closure. Develop a register of what bores will be required post closure for monitoring Progressively rehabilitate bores / pipeline footprint not required, or when they become unserviceable	Not yet commenced - planned for 3 years prior to closure	Progressively where feasible or 3 year prior to closure	Environment Department & Corporate			

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Roads

Feature	Area (ha)	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsibility	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
Roads Domain	31.33		Inappropriate closure provision. Inappropriate closure planning.	Undertake consultation to ascertain if any roads will be retained post closure. Undertake formal transfer of infrastructure or obtain legal agreements outlining responsibilities, in consultation with DPLH, Pastoral Land Board.	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure.	Corporate	Sample and assess levels of salt build up in the road profile; Remove material that may inhibit rehabilitation growth, if required; Windrows graded in. Strip down where required and re-contour to re-establish natural drainage lines and sheet flow. Spread topsoil where required. Deep rip all rehabilitated areas along the contour. Spread available vegetative material to improve resistance to erosion, act as a source of seeds and organic matter and provide fauna habitats. Apply local provenance seed.	At Closure	Mine Closure Team
		Will any road infrastructure be required to protect permanent features (e.g. TSFs) post closure.	Inappropriate closure provision. Inappropriate closure planning.	Surface water assessment to determine level of protection required for post-closure landforms.	Not yet commenced	2020-2023	Environment Department			
		Cumulative impact to Haul Roads of the application of dust suppression water (> 17,000 mg/L TDS)	Cumulation of salts within the road profile Adverse impacts to the health and survival of vegetation Inappropriate closure provision. Inappropriate closure planning	Identify volume of material that may be characterised by high salt levels and require removal/ encapsulation at closure. Identify a location where the material that is potentially high in salts can be encapsulated.	Not yet commenced - planned for 3 years prior to closure	3 years prior to closure.	Environment Department			

Mt Weld Rare Earths Project - Schedule of Works

Exploration Disturbance

Feature	Knowledge Gap	Associated Risk	Investigative Tasks	Investigative Task Status Update	Investigative Task Timeframe	Responsible	Decommissioning Tasks	Decommissioning Task Timeframe	Responsibility
Exploration Domain	Unknown total area of exploration disturbance requiring additional rehabilitation.	Lack of vegetation establishment on some exploration tracks Impacts to surface water flow (disruption of sheet flow and channelling of flow down creating erosion).	Project wide assessment to identify which tracks would benefit from additional rehabilitation works and priority be given to those which pose an erosion risk. Investigate alternative measures to slow water flow including cross bunding with competent material and spreading of vegetation.	Not yet commenced - planned for 2020 - 2023	2020 - 2023	Environment Department	Re-spread stockpiled topsoil and/or vegetation mulch along the exploration tracks. Lightly rip compacted areas. Seed with local provenance seed where required. Establish a photo monitoring and rehabilitation record for the database. Maintain a process of progressive closure and reduction of liability, with regular reporting to regulators and stakeholders informing and supporting that process.	2023-2026	Mine Closure Team

Appendix F Mt Weld – Closure Cost Assumptions Report

MT WELD RARE EARTHS PROJECT
CLOSURE COST ESTIMATE ASSUMPTIONS REPORT

Prepared for: Lynas Corporation

Prepared by: M Slight & Associates

December 2020

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QUALITY STATEMENT

PROJECT MANAGER

Tracy Schwinkowski

PROJECT TECHNICAL LEAD

PREPARED BY

Mike Slight ..../....../......

CHECKED BY

Kim Bennett ..../....../......

REVIEWED BY

Kim Bennett ..../....../......

APPROVED FOR ISSUE BY

Kim Bennett ..../....../......

PERTH
Ground Floor, 226 Adelaide Terrace, PERTH, WA 6000
TEL +61 (08) 6222 7000

REVISION SCHEDULE

Rev No.	Date	Description	Signature or Typed Name (documentation on file)			
			Prepared by	Checked by	Reviewed by	Approved by
1	18/12/2020	Draft Report	MS	KB	KB	KB
2	15/2/2021	Final Report	MS	KB	KB	KB

Executive Summary

In 2020, Lynas Corporation (Lynas) requested Stantec to undertake an update of their mine closure plan (MCP) to include their proposed Stage 4 mining campaign. An update of the site's closure provision cost estimate was also undertaken during 2020 for Lynas's financial reporting obligations and which was based on the current disturbance footprint, as reported within Lynas's Mining Rehabilitation Fund (MRF) annual report for 2020. The cost estimate update excluded the proposed Stage 4 mining campaign as it has yet to be approved. The provision estimate was undertaken using a purpose-built Microsoft Excel workbook costing model. Once the Stage 4 mining campaign and new mine closure plan are approved then the cost model will be updated and used to provide a closure provision estimate based on the new 2020 MCP and as the mining campaign progresses and the mining footprint expands. This report provides the basis for, and the assumptions made within the Excel workbook cost model and will provide the detail required by the regulators to be confident that Lynas are ensuring appropriate closure provisions are being and will continue to be estimated for the project as it expands.

The cost model includes costs for all relevant rehabilitation earthworks, and site decommissioning and demolition activities as well as for all proposed post closure monitoring and maintenance activities. The Excel workbook costing model template has been adapted from similar sized projects within Western Australia and costs, productivities and closure prescriptions are based on an extensive data base of actual mine closure across WA, Qld, and the NT as well as details provided within the current MCP.

The mine closure assumptions include:

- Mine closure works commence in 2042.
- Closure earthworks are undertaken over 2 years (completed by 2044).
- Closure monitoring period is assumed to take up to 10 years with relinquishment occurring in 2052.
- Sufficient rehabilitation materials including tailings storage facility covers and topsoil are located and available on the site.

The closure provision estimate has considered all likely rehabilitation and closure requirements (as per legal obligations and standards within WA) and as specified within the MCP, including rehabilitation of all aspects of the operations including waste rock landforms (WRL), mineralised waste stockpile, run of mine and ore pads, tailings storage facilities, the open pit, heavy ore processing and support infrastructure, ground water infrastructure, water containment infrastructure, exploration activities, closure monitoring and owner's management costs required to manage and support the closure activities.

The cost estimate model has provided for all cost inputs for the closure, decommissioning, demolition and rehabilitation works including the costing of likely earthmoving equipment considered appropriate for the proposed closure works based on Caterpillar mining equipment and other relevant and typical equipment used in mine closure and rehabilitation activities by earthmoving and civil contractors. Unit costs and production schedules have been developed based on a "bottom-up first principles" approach and have been calibrated against actual rehabilitation and mining activities, to ensure currency and consistency with expected contractor rates for the type of closure activities likely to be undertaken. Where site contractor equipment unit costs are available these have also been included and applied within the estimate.

The following are the key assumptions for the closure provision cost estimate:

- All decommissioning and rehabilitation works are assumed to be undertaken over an estimated two (2) year period including mobilisation and demobilisation of equipment from the North Eastern Goldfields region of Western Australia. Post-closure monitoring and maintenance, likely required, commences at the end of the closure works and is assumed to run over a ten (10) year period or as prescribed within the current MCP or future mine closure plans.

- Decommissioning and demolition costs are based on benchmarked industry averages factored for similar infrastructure within WA.
- All rehabilitation earthworks and revegetation costs have been estimated on a bottom-up, first principle approach, task and activity focused and where detailed aligned with the works prescribed within the MCP and/or likely to be prescribed in any future closure plans.
- Disturbance footprints are as per Lynas's 2020 Mining Rehabilitation Fund (MRF) reporting requirements and supplied in June 2020 by Lynas. (Note that this disturbance data excludes any proposed footprint disturbance for the Stage 4 mining campaign).
- Any demolition rubble and infrastructure scrap and rubbish collected during the decommissioning and demolition of all infrastructure is assumed to be disposed of, by burial, within a suitable location on site, assumed to be the process water storage pond located at the processing plant.
- Topsoil materials are assumed to be stockpiled during construction and operation of the project and sufficient stocks will be available to complete all rehabilitation required. It is also assumed that stocks can be salvaged, adjacent to site tracks and other low impact disturbance footprint areas when required.
- Haulage distances for transport of rehabilitation materials are assumed to not exceed 6.0 km as measured from plans for the site.
- All rehabilitation works are assumed to be undertaken on a single (day) shift, twelve-hour, seven days per week basis, with equipment efficiencies (availability and utilisation of available hours) based on the estimators operational and mine closure experience.
- Project owner's management of the closure works including administration and supervision, accommodation, fly in fly out (FIFO) costs and post-closure management, maintenance and monitoring have been included in the estimate. These costs will be required to satisfy company and regulatory requirements.
- Pre-closure works including technical studies required to inform the closure plans and gain approvals, have been included within the closure cost model; and
- The current fuel price of $0.60 per litre delivered to site, ex the diesel fuel excise rebate, has been used as well as current accommodation and FIFO costs.

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1. Introduction

In 2020, Lynas Corporation (Lynas) requested Stantec to undertake an update of their mine closure plan (MCP) to include their proposed Stage 4 mining campaign. An update of the site's closure provision cost estimate was also undertaken during 2020 for Lynas's financial reporting obligations and which was based on the current disturbance footprint, as reported within Lynas's Mining Rehabilitation Fund (MRF) annual report for 2020.

The cost estimate update excluded the proposed Stage 4 mining campaign as it has yet to be approved. The provision estimate was undertaken using a purpose-built Microsoft Excel workbook costing model and once the Stage 4 mining campaign and new mine closure plan are approved then the cost model will be updated and used to provide a closure provision estimate based on the new MCP and as the mining campaign progresses and the mining footprint expands.

This report provides the basis for, and the assumptions made within the Excel workbook cost model and will provide the detail required by the regulators to be confident that Lynas are ensuring appropriate closure provisions are being and will continue to be estimated for the project as it expands.

The Excel workbook cost model provides details of the project's current disturbance footprint, current and future closure, demolition, and rehabilitation activities, estimated rehabilitation quantities, unit cost rates used in the estimate, estimated cash flows, and summary tables for the closure cost estimate. These features of the cost model will also be applied to the proposed Stage 4 mining campaign once the campaign is approved and the works commence.

The closure cost estimate model was developed in 2011 and has been updated over the last eight years to reflect the operational development of the project. The cost estimate has considered all likely rehabilitation and closure requirements (as per legal requirements in WA) and as specified within the MCP including rehabilitation of all aspects of the operations including waste rock landforms (WRL), tailings storage facilities, mineralised waste stockpiles, run of mine and ore pads, the open pit, ore processing and support infrastructure, ground water infrastructure, water containment infrastructure, exploration activities, closure monitoring and owner's management costs required to manage and support the closure activities. Once the proposed Stage 4 mining campaign is approved any additional features and disturbance footprints will also be included within the workbook cost model.

The closure provision cost estimate has considered and allowed for the entire closure planning, execution, and post closure monitoring periods, and include:

- During operations (pre-closure) - development of relevant decommissioning and rehabilitation plans required to inform and update all future mine closure plans (MCP) as required by the regulators every three years of operations.
- Active closure and rehabilitation (closure) – assumed to commence once all exploration, operations and production activities cease, and decommissioning, demolition and rehabilitation works can commence; and
- Passive closure (post-closure) – usually considered as the closure monitoring period leading up to final relinquishment of the mineral tenements back to the State.

The closure cost estimate has been based on all likely compliance requirements for the Project as required under WA regulations, and represents a 2020 "todays" dollars estimation for the full closure and rehabilitation costs of all disturbance footprints, decommissioning, demolition and removal offsite of all infrastructure, plant and equipment.

Generally, the closure cost estimate allows for all direct pre-closure, closure execution and post closure costs as they relate to the disturbance footprint and the following components have been considered and allowed for within the estimate:

- All regulator and stakeholder obligations and commitments made, or likely to be made, to gain approval of the Project and any additional and new obligations and commitments established with any Mining Proposals, Ministerial Approvals, MCP's, agreements etc.
- All likely company obligations required to maintain management, ownership, and control of the site during the closure periods (pre-closure, active or execution of closure, and post-closure periods) including safety, environmental, community, corporate closure support and site costs including closure planning, compliance, site admin and support, Fly in Fly out (FIFO) and camp costs.
- All likely consultant and other technical expert resources required to assist with and support the closure of the site during the active and post closure periods.
- All likely earthworks costs associated with all disturbance footprints including rehabilitation of all infrastructure and support facility footprints including the concentrator plant, power and water supply, administration and workshop facilities, all laydown areas, water containment facilities, bore field infrastructure, and site roads and tracks.
- All likely costs associated with any contamination investigation, removal, and reporting.
- All likely mobilisation and demobilisation of necessary closure and rehabilitation equipment (assumed to be sourced from Kalgoorlie) and personnel required during the closure period.
- All likely project owner's management costs including health and safety, planning, engineering, design, procurement, contractor management and supervision, QA/QC support, travel (FIFO), and camp accommodation costs associated with the closure period.
- All likely environmental compliance, monitoring and reporting obligations during the active and passive (post) closure periods including any tenement holding costs for the closure and post closure periods and any likely MRF levy payments required post operations.
- Any stakeholder engagement and local community obligations during the closure and post closure periods; and
- An estimation contingency to reflect the class of estimate undertaken and applied to all costs.

The closure cost estimate has excluded the following:

- Any likely company-employee entitlements that are accounted for in Lynas's legal obligations and other balance sheet provisions such as annual and long service leave entitlements, and other costs associated with retrenchment and/or retraining and redeployment of employees. Note that the cost model estimate has been based on the use of third-party contractors and these contractor employee entitlement costs have been included within the contractor rates used to estimate the closure cost.
- Any likely stocks, stores and inventory, and asset disposal costs and associated "write downs".
- Any likely salvage value returns for the sale and disposal of any plant, equipment, and buildings etc.
- All likely Lynas corporate costs including support staff, insurances, levies, equipment leasing payments, and overhead costs; and
- Any likely care and maintenance costs and/or any other costs associated with delaying or deferring the active or post-closure activities which are considered as an operating expense, (note that an estimate of three years of care and maintenance has been included in the cost model, but not the closure provision estimate, though).

The closure provision estimate has been based on the most recent (2020) Mining Rehabilitation Fund reporting disturbance footprints supplied in June 2020 by Lynas. The following table summarises the disturbance:

Table 1: 2020 MRF Disturbance Summary

Disturbance Classification	Area (ha)
Landforms	192.84
Industrial Infrastructure	23.34
Mining Infrastructure	23.92
Water Containment Facilities	78.43
Groundwater Infrastructure	-
Roads	47.71
Exploration	-
TOTAL: ALL AREAS	**366.24**

2. Cost Assumptions

The closure costs have been estimated based on typical requirements for financial reporting obligations under Australian Accounting Standards and WA mine closure planning guidelines and are assumed to reflect third party contractor costs to undertake the works based on a "bottom up first principles" approach.

The closure cost model has included a review of all cost inputs for the likely closure works including the costing of earthmoving equipment considered appropriate for the proposed closure works and based on Caterpillar mining equipment and other relevant and typical equipment used in mine closure and rehabilitation activities by earthmoving and civil contractors. Unit costs and production schedules have been developed based on earthmoving "bottom-up first principles" approach and have been benchmarked against actual rehabilitation and mining activities, to ensure currency and consistency with expected contractor rates for the type of closure activities likely to be undertaken. Where site contractor equipment unit costs were available these were also considered within the estimate.

3. Remediation Fleet Options

Due to the relatively scale of the site facilities, a combination of a small and medium earthworks fleet has been considered for costing within the model and based on the equipment likely to be supplied out of the Kalgoorlie region. The fleets are matched to ensure the required rehabilitation works can be constructed safely and efficiently and as per the design requirements likely to be established and agreed with the regulators. The following table summarises the likely fleet arrangements.

Table 2: Summary of Equipment Combinations for Remediation Activities

Closure Earthworks Activity	Fleet Combinations
SMALL Fleet: load, haul and dump stockpiled material including demolition rubble, topsoil, contaminated soils, silts, and sediments etc.	CAT 330 Excavator, CAT 980 Front End Loader, CAT 740 Articulated Truck, water truck, CAT 14M grader, service truck and light vehicles.
MEDIUM Fleet: load, haul and dump stockpiled material including rock cover, growth media, contaminated soils, silts, and sediments etc.	Komatsu PC1250 excavator, CAT 777 haul trucks, CAT 773 water truck, as well as support equipment as for the small fleet
Dozing, pushing materials and ripping	CAT D7, D8, and D10 dozers
Topsoil spread, road de-compaction, ripping and general shaping and grading to establish natural drainage.	CAT D10 dozers, CAT 14M grader

The assumed hourly cost for each piece of equipment is based on third party contractor ownership, maintenance, and repair, and operating costs, and includes an allowance for contractor profit and administration overheads and is listed in the following table.

Table 3: 2020 Equipment Cost Summary Table

Equipment Type	Monthly Rental Rate	Month Rental Plus Profit and Admin	Equipment Hourly Rate	Fuel	Lube/PM/Wear	Operator	Total Rate
	$/Month	$/Month	$/hr	$/hr	$/hr	$/hr	$/hr
Bulldozers							
D7R	$13,647	$15,831	$51.03	$17.37	$54.74	$90.59	$213.73
D8R	$21,993	$25,512	$82.23	$22.58	$62.06	$90.59	$257.46
CAT D10TR	$47,083	$54,616	$176.04	$47.78	$99.33	$90.59	$413.73
Graders							
CAT 14M	$14,386	$16,687	$53.79	$15.30	$49.13	$90.59	$208.80
Tracked Excavators							
CAT 330F	$16,858	$19,555	$63.03	$13.22	$64.25	$90.59	$231.09
PC 1250	$40,701	$47,214	$152.18	$73.43	$110.20	$90.59	$426.40
Wheeled Loaders							
CAT 980M	$18,433	$21,382	$68.92	$17.37	$85.30	$90.59	$262.18
Trucks							
CAT 777G	$32,118	$37,257	$120.09	$44.36	$82.82	$90.59	$337.87
CAT 773G	$20,726	$24,042	$77.49	$24.19	$64.46	$90.59	$256.73
Water Truck (Standard)	$9,289	$10,775	$34.73	$24.90	$48.61	$90.59	$198.83
CAT 740C (ADT)	$15,981	$18,538	$59.75	$17.44	$65.91	$90.59	$233.69

4. Hours of Work

Mine closure and rehabilitation earthworks are generally undertaken on a single shift basis unless there is a requirement for bulk earthworks movement of waste rock material that can be safely and efficiently undertaken during a night shift arrangement (not the case for this project). The cost model and estimate has been based on the following hours of work arrangements:

- Single shift, 12-hour days (day shift only).
- Seven (7) days per week.
- Two crew staffing rosters based on a 14-days-on-7-days-off FIFO work arrangement, typically used by rehabilitation and mining contractors and mine owners.
- Effective use of available dayshift time (efficiency rate) has been set based on a general rate of 85%. The "efficiency" rate is to allow for equipment availability (maintenance, servicing, and repair) and utilisation (prestart safety checks, meal breaks, on-job instruction etc.). Note that other operational factors such as wet weather, job safety, operator efficiency etc. have been allowed for within the various equipment productivities used to estimate the activity costs; and
- Total equivalent monthly equipment operating hours has been set at 310 hours.

It is assumed that the works would be undertaken continuously throughout the estimated two (2) year program of works.

5. Contractor Profit and Administration Overheads

The "bottom-up, first principle" modelled equipment cost estimates are developed to reflect a typical earthmoving contractor schedule of rates (often called "day works" rates) which include an allowance for the contractor's administration or overhead costs and a typical contractor profit or margin. There will be significant variation in the overhead and profit allowances depending on the contractor's scale of operations and support infrastructure, supply, and demand for the contractor services across the mining industry and even on the location of the job being quoted on. The estimator has opted for a typical rehabilitation earthworks contractor service that would be provided in WA.

The contractor's administration and overheads allowance cover the contractor's costs to support the contract, including management, and administration and associated overhead costs; it doesn't include any mine owner costs associated with undertaking the works on the site such as mobilisation-demobilisation of the contractor's equipment and workforce (site establishment), and any travel and accommodation costs etc. These costs form a part of the owner's project management and overhead costs associated with the closure and rehabilitation of the site. A conservative contractor approach has been assumed for this cost estimate and the following contractor financials for the cost estimates have been used:

- Contractor administration and overheads 6%; and
- Contractor profit margin 10%.

6. Contractor Ownership Cost of the Equipment

The modelled equipment costs are developed based on the capital (ownership) cost of the equipment and include:

- A purchase price in country of origin currency ($US).
- An allowance for typical mine site specifications (signage, GPS control, safety requirements, training etc.).
- Exchange rate ($US0.65 as at date of estimation); and
- Initial tyres, spare tray, buckets etc. and first (initial) fills and tooling (ground engaging tools) as required.

Allowances have also been included for ownership financing (4.50% interest rate) costs and insurances (3.50%). Depreciation of the equipment is based on an assumed equipment life typical of mining and rehabilitation earthworks fleets.

7. Equipment Operating Costs

The operating cost assumptions for the equipment have been based on typical costs associated with operating and maintaining the nominated equipment in mining, closure, and rehabilitation activities. Allowances for maintenance (including maintenance labour and servicing), ground engaging tooling and tyres, fuel and lubes, and operating labour are all included in the rates.

8. Maintenance Operating Costs

The equipment hourly costs are made up of the following:

- Allowances for preventative maintenance including labour and parts as per the original equipment manufacturers (OEM) recommended maintenance and service schedules.
- Maintenance schedules based on service meter units (SMU), and at OEM recommended intervals including 250, 500, 1,000, 2,000 etc. hour servicing and component change out etc.
- Maintenance labour costs based on a combination of the earthmoving contractor maintenance personnel including supervision (50%), OEM specialist support labour allowances (25%), and an allowance for additional ad hoc contract labour (25%); and
- Component replacement costs are estimated for each piece of equipment and based on data sourced and supplied for the equipment.

9. Ground Engaging Tools and Tyres

Ground engaging tools (GET) includes such items as excavator and loader bucket teeth, wear plates, and dozer and grader blade cutting edges and ripper tips (boots). Allowance is made for average wear rates typically seen in mining applications and historical data and costed per service meter units (SMU) or equipment operating hour.

Tyre costs are based on the replacement cost of the specific tyre for each piece of equipment and an average tyre life based on typical mining application. The assumed tyre lives costed within the estimated cost data is as follows:

- CAT haul trucks and water trucks – 6,000 hours; and
- CAT graders – 4,000 to 5,000 hours.

10. Fuel and Lubes

Fuel is based on the estimated diesel price delivered on site less the tax rebate allowance and an average fuel consumption (including a lube allowance of 0.5% of fuel consumption) for each piece of equipment. The fuel price has been set at the current site price of $0.60/litre ex rebate delivered to site.

11. Operating Labour Costs

Operating labour costs are based on typical labour rates within the earthworks contractor industry and includes all relevant on-costs. Breakdown of the equipment operating labour rate is as follows:

Base rate $51.28 per hour:

- Annual leave provision 11%.
- Long service leave provision 5%.
- Paid notice of termination allowance 1%.
- Severance and retrenchment allowance 1%.
- Payroll tax 5.5%.
- Workers compensation insurance allowance 3.5%.
- Statutory Guarantee Superannuation payment 9.5%; and
- Contractor profit 10%

Total operating labour rate equates to $77.00 per hour. This rate is then grossed up to reflect the availability and utilisation of the equipment (85%) to arrive at the equipment operator rate of $90.59 per machine operating hour or service meter unit (SMU).

12. Other Cost Assumptions

The closure provision cost estimate has allowed for all likely rehabilitation activities for sourcing rehabilitation materials including topsoil materials in stockpiles and adjacent to the disturbance footprints as required, reshaping footprint surfaces, re-establishing natural drainage across the footprints, road decompaction, water storage pond and dam backfill, contour ripping, and revegetation as required. One-way haulage distance for all rehabilitation activities has been assumed to be less than 3.0 km unless specified otherwise within the cost model.

Other key cost assumptions are:

- Rehabilitation covers (rock and topsoil) thicknesses are based on those proposed within the current mine closure plan.
- Revegetation costs are based on typical (benchmarked) seeding costs for the NE Goldfields regions of WA.
- No salvage value has been ascribed to any infrastructure within the closure estimate that may be sold at closure.
- Fly in Fly out and camp accommodation costs are based on current site rates; and
- Tenement holding costs, based on current costs for the site and represent both regulator tenement rents and local Shire rates as well as budgeted tenement management fees and charges.

13. Cost Details

Landform Assumptions

Waste Rock Landforms

The site currently has a single waste rock landform (WRL) with a current footprint of 61.3 Ha. Progressive rehabilitation has been undertaken on the slopes of the WRL (3.0 Ha) and this activity has been accounted for within the costs estimate. It has been assumed that the waste rock material within the WRL's is non-acid forming and that all radioactivity waste material mined from the open pit has been fully encapsulated with in the landform. The following activities have been allowed for in the cost estimate:

- Reprofiling and shaping of the WRL slopes to less than 18 degrees (15 degrees on average) using CAT D10 dozers.
- Reshaping for drainage away from the crests of the upper and flat surfaces of the WRL using CAT D10 Dozers.
- It has been assumed that a store and release engineered cap on the WRL is not required and the waste material is suitable as a growth media.
- Construction of a 1.0m high crest bund around the top of the WRL perimeter as well as the construction of water harvesting cells (4 cells per hectare) over the top of the WRL to control surface water flow on the top of the facility.
- Dozing and shaping of all access ramps up onto the WRL to blend into the landform slopes were required.
- Placement of 100 mm topsoil over the landform slopes and top surfaces, contour ripping and seeding using providence seed mixtures.
- Construction of a toe drain and bund to 1.0 m in height around the outer perimeter of the WRL to contain any erosional spillage and to divert any natural surface water flows away from the toe of the facility. The toe bund is to be compartmentalised using bunding to limit the surface flow around the toe of the facility.

14. Tailings Storage Facility

There are currently three tailings storage (TSF) facilities at the site, and all will require rehabilitation at closure. The original facility was constructed as a fully lined facility using 1.5mm HDPE plastic, TSF2 was constructed using a geosynthetic clay liner (GCL) in place of the HDPE plastic liner, and TSF3 was constructed using an insitu compacted clayey/sand liner that also extended up to the TSF embankment face. The cost estimate model has allowed for these three facilities to be closed and rehabilitate using water shedding covers to avoid any water ponding and storage on the top of the facilities. Currently trials and studies are being undertaken to evaluate alternative closure strategies and the new MCP will provide an updated TSF closure strategy based on the trials and studies which will then be incorporated into the cost model once the MCP has been approved.

The following activities have been allowed for within the cost estimate:

- A lump sum estimate for removal and sealing of the decant and underdrainage tower structures has been applied and based on industry experience.
- The tailings surfaces are assumed to be dry sufficiently for cover works to be undertaken. This will be dependent on the operational strategy for tailings deposition adopted during the last few years of operations.

- It has also been assumed that there is sufficient time for drying and consolidation to occur after final tails deposition to allow for the mechanical placement of the cover materials over the tailings surface.
- All tailings storage facilities are assumed to be integrated into a single facility once the tails in each facility reach a similar height. The closure strategy for the combined facilities for the installation of a water shed cover that includes a drainage (capillary break) layer placed on top of the shaped tailings surface, a HDPE layer, and a rock protection layer covering the plastic, and topsoil, as well as constructed drains down slope.
- Prior to the installation of the drainage layer the tails are to be shaped to a maximum 15 degrees down slope (away from the crests of the facilities) and 1% cross slope (to the drainage channel centre lines) using CAT D7 and CAT D8 low ground pressure dozers. Once shaped the tails surface is to be rolled using a flat drum roller in preparation of the drainage material placement.
- The drainage layer is to be constructed using competent rock screened to a +25mm, -250 mm lump size, and is to be spread in a 500 mm layer using the D7 and D8 dozers. It has been assumed that suitable competent rock materials will be available at the site and costs have allowed for sourcing, screening, and haulage of the drainage rock material to the top of the TSF's as well as for the spreading over the tailings surface.
- The HDPE plastic layer construction includes for a 500 mm sand/clay layer over the top of the capillary break, grading and shaping the clay/sand layer, placement of a 1.5 mm HDPE plastic layer, 100 mm sand layer on top of the plastic and 1,000 mm rock cover. Topsoil is to be placed on the over lying rock cover.
- Suitable fill material is assumed to be sourced from the waste landform or other waste stockpiles and borrow pits adjacent to the TSFs and a haulage distance of 2km has been assumed.
- The water shedding covers include the construction of suitably lined (6m wide) drains to direct surface water runoff from the top of the landform down the rehabilitated slopes and to natural ground surface. The cost for this drainage has also included for the construction of flow dissipation drop structures every 25 metres down each drain. The drop structures are assumed to be a maximum 500 mm deep, 6.0-metre-wide, and 6.0-metre-long, within the cover material and include riprap lining of the drop structure cells and the installation of rock filled gabion baskets to control flow into and out of the cells. Suitable riprap screening of waste rock is assumed to be within 3 km haulage distance to the TSF's.
- The final cover surface is to have topsoil placed (100 mm) contour ripping and seeding.
- All TSF embankment slopes are to be reshaped to a maximum 15 degrees and a 1,000 mm competent material layer is to be placed over the slopes followed by 100 mm of topsoil.
- The water shed cover drains are to be extended down the embankment slopes in a similar construction method as for the tails cover sections of the drains.
- The cost estimate has included for contour rip and revegetation over the entire landforms.
- All access ramps onto the top of the embankments of the tailing's facilities are to be rehabilitated to blend into the embankment slopes were required.
- The cost estimate has also included for the construction of a toe drain and bund to 1.0 m in height and up to 20 metres away from the toe, around 75% of each facility to contain any erosional spillage and to divert any natural surface water flows away from the toe of the facilities. The toe bund is to be constructed with collection cells to limit the surface flow around the toe of the facility and should allow for the flow of water off the covers via the rock lined drains. Any undercover flow through the drainage layer is to be captured within the cells around the facilities.

15. Mineralised Waste Stockpiles

The low-grade mineralised waste stockpiles have been assumed to not be processed prior to mine closure and the cost model has currently assumed that all stocks will be dozed back into the open pit using D10's. This strategy is under review and will be addressed in the new MCP and if required any changes will be incorporated into the cost estimate model. It is assumed that the material, if dozed into the open pit, will be available for potential future rehandle from the open pit and processing through the plant if they become economic in the future. Rehabilitation of the stockpile footprint includes reshaping to re-establish natural drainage, deep ripping and seeding as required.

16. Run of Mine (ROM) and Blended Ore Pads

It has been assumed that all ROM Pad ore and the underlying pad basement layer has all been processed prior to mine closure. The cost estimate has allowed for the final ROM footprint to be reshaped to re-establish natural drainage across the footprint, using the D10 dozer. Costs have also been included for 100 mm of topsoil to be placed over footprint, deep ripped, and seeded for revegetation.

It is assumed that for the blended ore pad that all ore stocks and the stockpile base material is processed through the plant prior to closure. As for the ROM the rehabilitation of the footprint includes reshaping for drainage control, deep ripping and seeding for revegetation as required.

17. Topsoil Stockpiles

It is assumed that all stockpiles of topsoil will be used for rehabilitation purposes across the site. Rehabilitation of the footprints includes reshaping for natural drainage control, deep ripping and revegetation as required.

18. Landform Weed Management and Maintenance and Repair

The cost estimate has allowed for weed eradication and maintenance to be undertaken during the closure and post closure monitoring period and is based on industry experience in the Goldfields. The cost estimate has also allowed for an annual landform maintenance program to repair any erosion damage, or revegetation failure during the post closure monitoring period.

19. Industrial Infrastructure

The cost estimate has been based on the following assumptions:

- Demolition and removal of the concentrator plant and equipment, and all associated buildings including infrastructure support related components (power, water, buildings etc.).
- Closure and rehabilitation of all structures and building foundations, including concrete slab break-up, removal, and burial in the TSF.
- Closure and rehabilitation of all footprints where storage areas were located, including lay downs, landfills, magazines etc.
- General site clean-up including placing collected rubbish in the landfill prior to reclamation of the landfill and removal from site any recyclables.

The estimated costs for demolition of all infrastructure has been based on industry experience with a number of demolition projects and estimates across Western Australia. The demolition cost estimate has been based on the average costs for the breakup, demolition and removal of the concrete and steel used in the construction of the facilities and the infrastructure footprint and benchmarked against similar size and type of plants in WA. No salvage value has been included in the cost estimate. The decommissioning and demolition costs of the processing plant and support facilities (concentrator, power plant, steam generation plant, microfiltration plant, offices, workshops, ancillary facilities, fuel storage, sewage treatment facilities, reagent storage areas, Reverse Osmosis Plant, concentrate drying and bagging and laydown areas, telecommunications) have been based on benchmarked factored costs and averaged for the following assumed schedule of quantities required to construct the plant and associated facilities:

- Concrete footings, foundations, and slabs – 4,000 m^3.
- Steel work structure and platforms – 2,000 tonnes; and
- Plant footprint – 22,800 m^2.

A 25% premium on the demolition costs has been applied to the estimate to allow for any decontamination/clean-up of items of plant/equipment prior to and during the demolition due to potential radiation contamination safety issues associated with the infrastructure.
The key infrastructure closure provision cost estimate assumptions include and allow for:

- All services including power, compressed air, gas, steam, and water to all buildings, plant and equipment and associated infrastructure is assumed to be isolated and disconnected prior to any demolition works being undertaken.
- All processing plant and equipment, all power and steam generating equipment, fuel and gas storage, sewage treatment facility, communication infrastructure and all support buildings including buildings and workshop facilities and equipment to be decommissioned, demolished, decontaminated and cleaned down before removal offsite for disposal.
- Demolition and removal of all structures and removal of concrete slabs, foundations, footings, and plinths, and any other materials associated with the demolition and removal works as well as the removal of all concrete footings to 1.0 m below ground level.
- Removal of any services below 1.5 m are assumed to be left in situ.
- Recovery and removal (if any) of all hazardous materials (including asbestos building materials) for disposal off site.
- It has also been assumed that contamination surveys, investigations and reporting will be required to be undertaken across the infrastructure footprints.
- An allowance has been assumed for the removal and disposal within the TSF of any contaminated soils (estimated at 59,255 m3) across all industrial footprint areas. This material is assumed to be used to prepare the HDPE liner basement on top of tails surface, prior to the placement of the liner.
- The concentrator and associated plant footprint area is to be covered with suitable NAF waste rock to 1.0m cover thickness to ensure full cover of any remnant radiation contamination.
- All industrial infrastructure footprint areas are to be dozed and shaped to re-establish natural drainage, contour ripped and seeded.
- All tails and water pumps and pipelines are to be removed during demolition, cleaned, and disposed of offsite.
- All pipeline corridors are to be rehabilitated including clean-up and removal of any spillage to the TSF for disposal (prior to the TSF cover works), topsoiled and revegetated as required.
- All landfill and bioremediation areas to be assessed for contamination prior to rehabilitation and the estimate has include placement of a 1m cover over the facilities, topsoil, deep contour ripping and revegetation.
- The concentrate storage concrete pad is to be broken up and removed for burial within the TSF (below the plastic lined cover). In addition, 0.5m of soil material below the slab has been

assumed to be removed for burial within the TSF. The rehabilitation costs for this area include placement of a 1.0m cover over the footprint, topsoil, deep contour ripping and revegetation.

- A stock proof fence (5 strand barbed) is assumed to be erected around the various infrastructure areas and landforms across the site to protect revegetation from feral and grazing animals (20km fence length). An annual allowance has been included for feral animal control across the site for the closure and post closure periods to protect the revegetation.

20. Mining Infrastructure

The open is required to have an abandonment bund placed around the pit due to is depth (greater than 5.0m deep). The abandonment bund is assumed to be constructed as per the DMIRS guidelines as detailed in Figure 1 below.
The following assumptions have been made regarding the construction of the bund:

- The abandonment bund is assumed to be located at least 10m outside the area of influence of the potentially unstable rock mass associated with each open pit wall.
- The bund dimensions are assumed as; height 2m, base 4m.
- The volume bund rock material required is assumed at 10cum per linear metre of pit abandonment bund (total volume required 23,500m3). The bund is to be constructed from suitable free draining rock.
- Haulage of suitable rock is assumed to be 6km utilising rehabilitation fleet. This higher haulage distance has been applied to the costs to allow for suitable material to be selectively recovered from across the site. Although not costed it may be necessary to drill and blast suitable cap-rock material within a borrow area on the site. It may also be necessary to import suitable material from the nearby Sunrise Dam mine, however this option has not been included in the costs.

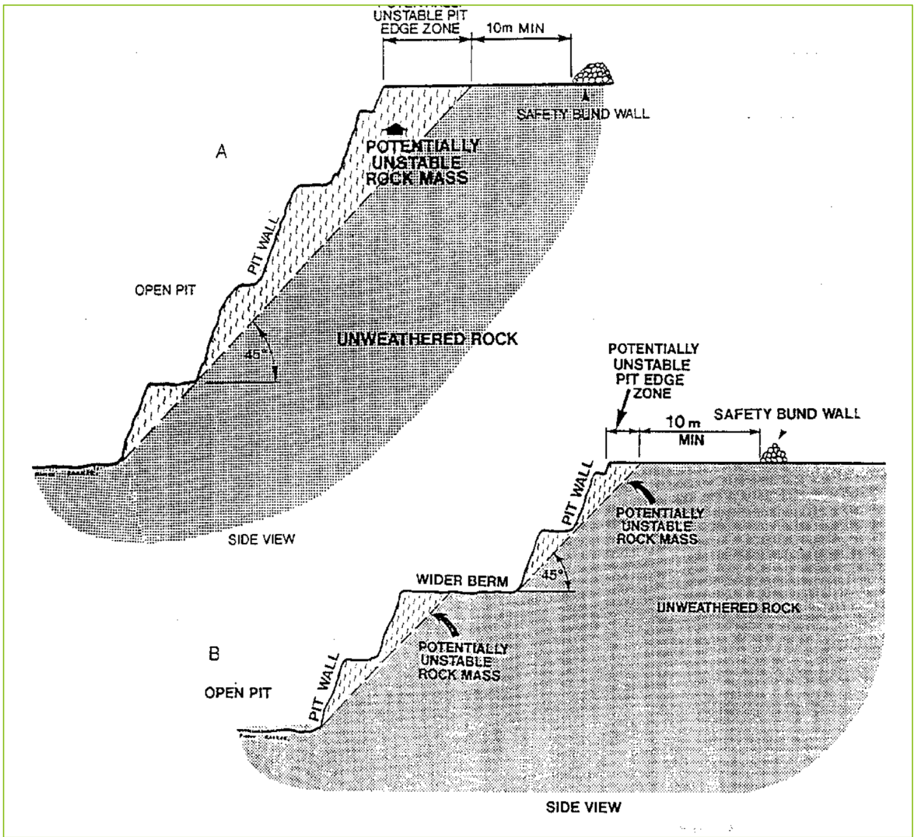

Figure 1 DMIRS Guideline for open pit abandonment

21. Water Containment Facilities

The model cost estimate has allowed for rehabilitation of all water storage facilities including the plant dams, evaporation and storm water ponds, turkey's nest dams, and all surface water diversion bunds and drains.

The model cost estimate has allowed for the following assumptions:

- It has been assumed that all ponds and dams are dry and will not require pumping and disposal of water prior to their remediation.
- Costs have been allowed for removal of evaporate (brine) within the evaporation pond, and sediment and silt from all other water storage facilities and hauled to the TSF for disposal and burial beneath the HDPE plastic liner.
- Any plastic liners within the ponds and dams is assumed to be cut, folded, and buried insitu within the base of the facility when the embankments are dozed in to backfill the ponds and dams.
- No allowances have been included within the remediation estimate for any maintenance and repair and/or construction of new of diversion drains and bunds that may be required.

22. Groundwater Infrastructure

This cost estimate has allowed for the closure and rehabilitation of all dewatering bores and monitoring wells as well as removal of any water delivery pipeline infrastructure. The cost estimates for pipe removal and bore closure are based on industry experience and based on dismantle/cutting into transportable sections, removing exposed bore hole casings, and providing suitable plugs into the hole.

The Mt Weld water supply borefield is managed and operated by the neighbouring mine (Goldfields Granny Smith) who have responsibility for decommissioning and rehabilitation of the field. A nominal amount has been included in the estimate to rehabilitate bores only if required.

The bore field pipeline is assumed to be 20km long, with 450mm diameter HDPE pipe placed above ground delivering water to the site. The pipeline is to be decommissioned and removed offsite for disposal. The pipeline corridor is to be rehabilitated utilising a grader to salvage topsoil along the route, graded the footprint to re-establish natural surface drainage, and ripping. Costs for seeding of the corridor is assumed not required due to the existing seed bank within the soils salvaged and graded across the corridor.

23. Roads

This cost category covers the closure and remediation of all site haul roads, access roads and tracks. Earthworks are assumed to include de-compaction, re-contouring, culvert, and other road furnishings removal if any, topsoil haulage and placement were required, and revegetation of road footprints.

The main assumptions are as follows:

- The site haul roads are assumed to be 30 m wide for a total length of 3.0 km. The site access roads are assumed to be 20-30 m wide for a total length of 7.4 km.
- It has been assumed that all roads will be reduced in width (50%) to maintain site access for the post closure monitoring period (10 years) and for possible pastoral lease holder use.
- Activities costed include removal of any culverts (as required) and road furnishings, decompaction ripping, reshaping of footprints to re-establish drainage across the roads and

tracks, topsoiling (100 mm), dozing to re-establish natural drainage, spillways stabilisation, and revegetation as required.

24. Exploration

The cost estimate has allowed for final closure and rehabilitation of any remaining exploration disturbance. The costs have allowed for the following activities:

- An allowance has been included to undertake an in-field audit of the site tenements to determine the extent (if any) of unrehabilitated exploration and historical workings activity requiring rehab works.
- The costs have allowed for the rehabilitation of up to 200 holes and sumps minor reclamation of exploration tracks and gridlines as required using a grader.
- A lump sum allowance has been included to cover, fence, and make safe any historical shafts within mineral tenements.

25. Water Treatment Post Closure

This cost centre allows for any seepage management during the closure and post closure period. Costs usually include power, labour, equipment (purchase or rental costs), maintenance and spare parts and infrastructural removal at the end of the pumping period. It has been assumed that this activity will not be required due to the lining system beneath the tailings storage facilities.

26. Post Closure Monitoring and Maintenance

The cost estimate has allowed for rehabilitation monitoring during the post closure period. This monitoring will be required to provide evidence of satisfactory performance with agreed (with the regulators) closure objectives and criteria for the site prior to relinquishment back to the State. The costs include for any likely maintenance activities required to undertake repairs due to erosion, and revegetation failure etc.

The assumed monitoring activities allowed for within the estimate include:

- Annual vegetation and remediation monitoring for 10 years to assess the development of and success against stable landforms and self-sustaining ecosystem targets.
- Quarterly radiation dust monitoring for the first 5 years and then annual monitoring for the last 5 years.
- Annual groundwater monitoring assumed annual sampling using two personnel for sampling and lab analysis of 30 samples each year for 10 years, (analysis for Ra-228 and Ra-226 to be included).
- Satellite imagery (every 2 years).

The site monitoring is to be undertaken in accordance with the mine closure and performance monitoring plans developed for the closure of the site and will include environmental radiation surveys that allow for surveys at the boundary of the mining pit, surveys at the site boundary and radiation dust monitoring with samples collected from identified location around the site. The post closure monitoring costs have also allowed for mobilisation and demobilisation of monitoring crews each year as required and it has been assumed that the monitoring is to be undertaken in accordance with the mine closure and performance monitoring plans and current tenement conditions and commitments.

As previously indicated in Section 3.1.6 (page 11) allowances have been assumed and included in the estimate to undertake repairs and maintenance to the rehabilitated waste dump and TSF, undertake weed eradication programs and repairs to any fencing installed to protect the remediation.

27. Owners project management costs

The cost estimate has allowed for a team of Lynas personnel to project manage the two (2) year program closure works and ten (10) year post closure period and has included management and supervision, engineering, contractor management and environmental support as well as maintenance personnel. It has also included costs associated with FIFO and camp accommodation for all personnel involved in the remediation works including the Lynas personnel, and the earthworks and demolition contractors. It is assumed up to a maximum of 42 personnel and contractors will be required over the closure works program. The costs have been developed using a bottom up approach and have allowed for the following resources:

- Regional corporate support.
- Project managers/coordinators for the closure earthworks activities and the decommissioning and demolition works and clean-up activities.
- Site engineering, survey, and environmental staff to support the closure.
- Support staff including contract management and supply chain requirements, administration, and maintenance.
- Costs for workshops and administration building power, water, and sewerage requirements.
- Health and safety support.
- FIFO costs allowing for one flight per week.
- Camp accommodation costs for employees and contractors.
- Light vehicle allowances.

The cost estimate has allowed for costs associated with any socio-economic requirements including for:

- Assumed costs associated with Lynas staff career outplacement services.
- Employee retraining allowance for up to 38 Lynas employees.
- Lump sum allowances ($50,000 per year) for community consultation during the two-year closure period and the site relinquishment period assumed to be 2052.
- Ongoing community engagement allowance ($10,000pa) has been included during the ten-year post closure monitoring period.

The estimate has allowed for investigations, studies and consultant requirements during the closure activity and post closure monitoring periods including for the following:

- Annual environmental reporting requirements.
- Preparation of as-builts and engineering sign-off of the final rehabilitated landforms and relinquishment reporting requirements.
- Radiation monitoring reports.
- TSF cover performance reporting.
- Legal cost allowance.
- Monitoring data set up, storage and management costs.

The estimate has also assumed an allowance for a closure contractor mobilisation and demobilisation of earthmoving equipment as per fleet requirements with the equipment assumed to be sourced from Kalgoorlie.

The estimate has also included for the costs associated with keeping the mineral tenements in good standing during the closure and post closure periods including payments of all regulator and shire mineral lease rents and rates based on current Lynas tenement holding costs and for the any Mining rehabilitation fund (MRF) levies payable once mine operations are complete.

28. Contingency

The cost estimate has included and allowed for an estimation contingency to be applied across each closure cost element to allow for any potential and/or unforeseen events or risks that may exist in each of the closure activities, due to limited availability or accuracy of data, the lack of detailed engineering designs for the specific closure elements, or any unforeseen circumstances that may occur during the mine life that could impact on closure costs. The estimate has assumed a 15% contingency for all activities except the industrial infrastructure cost element. The industrial infrastructure is assumed at 20% due to the nature and unknown risks and issues associated with a Rare Earths processing facility.

29. Sudden Closure Care and Maintenance

As required under the DMIRS guidelines for mine closure planning submission an estimate has be undertaken for sudden closure and costs associated with care and maintenance activities during this period. The cost estimate has including a care and maintenance cost estimate that has allowed any labour costs, compliance monitoring costs, camp and FIFO costs and maintenance and support costs as follows:

- Care and maintenance staffing requirements include:
- Caretaker/supervisor responsible as site contact and statutory mine manager.
- Maintenance/security personnel (3 required) responsible for maintaining support infrastructure including plant run-ups and security and safety of the Lynas assets.
- It has been assumed that the staffing will work a day shift arrangement only, working a 14/7 roster (12 hr days). Security night patrols have not been included in the costs.
- It has been assumed that the concentrator plant and ancillary equipment will require monthly start-up of motors, drives, pumps, crushers, mills etc to ensure protection of the assets. Other support requirements included in the care and maintenance costs include for water, sewage and power supply during the care and maintenance period.

30. Pre-Closure Costs

The cost estimate model has also included estimates for those costs expected to prepare the site for closure including costs for technical, engineering, and social studies and rehabilitation trials (currently underway) that should be undertaken during the operations period to assist in informing and updating the closure plan and cost estimates. Much of this requirement can be considered for Research and Development tax treatment.

The following technical studies have been allowed for and to be undertaken during operations to inform and provide update to the closure planning process include:

- Hydrogeological/Ground Water Modelling
- Contamination/Ecotox/Radiation Hazard studies
- Pit Lake Recharge/Water Quality Studies
- Landform Erosion modelling studies
- Landform design and engineering
- Development of landform decommissioning plans including the development of the engineered cover over the TSF.
- TSF Geochemistry studies.
- Waste characterisation and rehabilitation material balance studies.
- Surface water drainage assessment studies.
- Establishment of a Data Management system (e.g. PRAC).

A number of social studies will be required as a part of the development of the stakeholder engagement strategy to ensure tenement relinquishment meets community expectation criteria including:

- Social impact assessments.
- Post closure land management plan.

A nominal amount has been included within the pre-closure cost estimate to undertake trials that will help to inform the closure plan for the site.

31. References

- Safety Bund Walls Around Abandoned Open Pit Mines – Guideline DMIRS WA, 1997.
- Guidelines for Preparing Mine Closure Plans – DIMRS WA, May 2015.
- Cost Estimation Handbook, Second Edition, Monograph 27, AusIMM, 2012

Perth

Ground Floor, 226 Adelaide Tce,
PERTH, WA 6014
Tel +61 (08) 6222 7000

www.stantec.com

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