GRANTS LITHIUM PROJECT

Environmental Impact Statement

Appendix D

Mine Closure Plan

Prepared by EcOz

October 2018

GRANTS LITHIUM PROJECT

DRAFT Mine Closure Plan

Prepared by EcOz Environmental Consultants for Core Exploration
Doc 164332

Document details

Project details	
Company name	Core Exploration
Title of the project	Grants Lithium Project
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Proponent contact details	
Name	Blair Duncan
Position	General Manager Project Development
Phone	08 7324 2987
Email	bduncan@coreexploration.com.au

MINE CLOSURE PLAN CHECKLIST

This checklist cross-references the requirements of the Western Australian *"Guidelines for Preparing Mine Closure Plans – June 2011"* (the guidelines) (DMP & EPA 2015) with the location in in this document where the requirement is addressed.

Item	Requirement	Y/N/NA	Page No.	Comments
1	Has the Checklist been endorsed by a senior representative within the tenement holder/operating company? (See bottom of checklist.)	Y	iv	
Cover page, table of contents				
2	Does the MCP cover page include: Project Title , Company Name, Contact Details (including telephone numbers and email addresses), Document ID and revision number, Date of submission (needs to match the date of this checklist)	Y	i	
Scope and Purpose				
3	State why the MCP is submitted (e.g. as part of a Mining Proposal, a reviewed MCP or to fulfil other legal requirements)	Y	1-1	
Project overview				
4	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	2-4	
Legal obligation and commitments				
5	Does the MCP include a consolidated summary or register of closure obligations and commitments?	Y	3-19	
Stakeholder engagement				
6	Have all stakeholders involved in closure been identified?	Y	4-20	
7	Does the MCP include a summary or register of historic stakeholder engagement with details on who has been consulted and the outcomes?	Y	4-20	
8	Does the MCP include a stakeholder consultation strategy to be implemented in the future?	Y	4-22	

Item	Requirement	Y/N/NA	Page No.	Comments
Post-mining land use(s) and closure objectives				
9	Does the MCP include agreed post-mining land use(s), closure objectives and conceptual landform design diagram?	Y	5-23	
10	Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?	N/A		
11	Has any soil or groundwater contamination that occurred, or is suspected to have occurred, during the operation of the mine, been reported?	N/A		
Development of completion criteria				
12	Does the MCP include an appropriate set of specific completion criteria and closure performance indicators?	Y	6-28	
Collection and analysis of closure data				
13	Does the MCP include baseline data (including pre-mining studies and environmental data)?	Y	7-36	
14	Has materials characterisation been carried out consistent with applicable standards and guidelines (e.g. GARD Guide)?	Y	7-62	Refer to waste characterisation report (EcOz 2018a) for further information
15	Does the MCP identify applicable closure learnings from benchmarking against other comparable mine sites?	NA		
16	Does the MCP identify all key issues impacting mine closure objectives and outcomes (including potential contamination impacts)?	Y	8-68	
17	Does the MCP include information relevant to mine closure for each domain or feature?	Y	8-68	
18	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	7-67	
19	Does the MCP include the process, methodology, and has the rationale been provided to justify identification and management of the issues?	Y	8-68	
Closure implementation				
20	Does the MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?	Y	9-73	
21	Does the MCP include a closure work program for each domain or feature?	Y	9-73	

Item	Requirement	Y/N/NA	Page No.	Comments
22	Does the MCP contain a schedule of research and trial activities?	Y	9-73	
23	Does the MCP contain a schedule of progressive rehabilitation activities?	Y	9-73	
24	Does the MCP include details of how unexpected closure and care and maintenance will be handled?	Y	9-73	
25	Does the MCP contain a schedule of decommissioning activities?	Y	9-74	
26	Does the MCP contain a schedule of closure performance monitoring and maintenance activities?	Y	10-82	
Closure monitoring and maintenance				
27	Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?	Y	10-82	
Final provision for closure				
28	Does the MCP include costing methodology, assumptions and financial provision to resource closure implementation and monitoring?	N/A	-	Financial provision will be included in MMP.
29	Does the MCP include a process for regular review of the financial provision?	N/A	-	
Management of information and data				
30	Does the MCP contain a description of management strategies including systems and processes for the retention of mine records?	Y	11-89	

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 the Preparation of a Mine Closure Plan.

Name: _____ Signed: _____

Position: _____ Date: _____

(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)

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Appendix A. Closure environmental risk register

1 INTRODUCTION

1.1 Purpose

This mine closure plan (MCP) has been developed to provide detail on the identification and management of closure issues and risks for the Grants Lithium Project (the project). The project triggered assessment by Environmental Impact Statement (EIS) under the *Environmental Assessment Act*. The NT Environmental Protection Authority (NT EPA) identified mine closure as a key risk to be addressed through the EIS process and the Terms of Reference (ToR) issued by the NT EPA require the draft EIS to include a MCP.

Additionally, mining authorisation under the NT's *Mining Management Act* requires the Mining Management Plan (MMP) for the project to outline the proponent's mine closure planning. The Department of Primary Industry and Resources (DPIR) require proponents to demonstrate their operation can be closed in a manner that prevents or minimises the potential adverse long-term environmental and social impacts that may otherwise have resulted from the mining and/or processing operation. DPIR refer to the Western Australian "*Guidelines for Preparing Mine Closure Plans – June 2011*" (the guidelines) (DMP & EPA 2015) as providing an accepted approach to preparing an MCP.

The checklist provided at the front of this document cross-references the requirements of the WA Guidelines with the relevant sections of this document where the requirement is addressed. Table 1-1 below cross-references the requirements from the EIS ToR.

Table 1-1. EIS terms of reference requirements for a mine closure plan

EIS ToR requirement	MCP Section
To mitigate and manage the potential impacts and risks to the environmental values related to land and soils, the draft EIS should include a draft Mine Closure Plan. The Mine Closure Plan should identify all closure objectives (including those associated with stakeholder expectations) and outline how those objectives would be achieved. The Mine Closure Plan should include description of:	
• proposed closure objectives, standards and criteria and future land tenure and land-use arrangements	5
• proposed approach for securing a safe, stable and non-polluting mine-site	9
• proposed staging and timing of rehabilitation and closure	
• removal of plant, equipment, infrastructure and water storages, and methods proposed for stabilisation of affected areas	
• proposed methods for topsoil management and soil profile reconstruction, with demonstration of their effectiveness for rehabilitating disturbed areas	
• proposed revegetation strategies, including seed collection and any research and investigations that may be required	
• measures to stabilise soils to erosion levels similar to comparable landforms in surrounding undisturbed areas	
• contingencies to make landforms and mine components secure and non-polluting in the long term	
• proposed funding and management arrangements for closure (both planned and unexpected), including responsibilities for post-closure management.	8
It is the NT EPA's preference that open pits or voids are progressively backfilled and rehabilitated. The draft Mine Closure Plan should include rehabilitation options for the site including progressive backfilling of the pit.	9.2.10

EIS ToR requirement	MCP Section
The draft Mine Closure Plan should identify risks to the successful rehabilitation and closure of the Proposal, including:	
• closure timeframes and objectives	8
• risks that the Proposal may create an ongoing environmental, social and/or economic legacy if operations are required to cease ahead of schedule due to unforeseen circumstances, prior to the planned closure and rehabilitation of the site	
• the post-closure risk assessment should include a discussion of the effects of: ○ changes in the assumptions used as a basis for the post-closure risk assessment ○ natural events, including earthquakes, rainfall events, fire and flood.	
The draft Mine Closure Plan should identify the factors that could influence unanticipated or early closure or care and maintenance of the mine and the impacts to rehabilitation objectives.	
Given the short term life of mine, the following should be provided in the draft Mine Closure Plan:	
• agreed closure objectives and post mining land use	5
• qualitative development of completion criteria	6
• detailed closure-based risk assessment and mitigation measures	8 and Appendix A
• well advanced closure and monitoring plans	10
• commitment to addressing knowledge gaps relating to informing closure specific information	7 & 10
• details of closure objectives with regard to final dimensions of landforms and topography for disturbed areas and availability, quantity and quality of materials (including cover material) required for closure.	7 & 5.4
The draft Mine Closure Plan required in section 4.1.2.4 should outline a plan for mine closure that takes into account the results of materials characterisation, data on the local environmental and climatic conditions, and consideration of potential impacts through contaminant pathways and environmental receptors. The Plan should:	
• describe post-mining management, monitoring and reporting for potential impacts and risks to downstream water quality following mine closure including evaluation of rehabilitation success and progress toward achieving closure objectives	10
• provide detail on the impacts and risks of the final mine pit lake with focus on appropriate water sampling, monitoring programs, risk avoidance measures and mitigation actions as per the WA guidelines (Appendix H)	7.3
• include contingency measures to be implemented in the event that monitoring demonstrates that rehabilitation closure objectives are not being met	10
Given the NT EPA's preference that open pits or voids are progressively backfilled and rehabilitated, the draft Mine Closure Plan should provide details on the potential impacts of alternative rehabilitation and closure options with respect to contaminant pathways and environmental receptors.	7

1.2 Scope & structure

The scope of this MCP includes rehabilitation and closure of all project components within Mineral Lease (ML) 31726 associated with mining and processing of ore from the Grants deposit over a 2-3-year mine life. Rehabilitation of water supply infrastructure located on ancillary ML's is also addressed. The plan is based on the information available at the time of writing, which is based on the Pre-Feasibility Study and further design work undertaken towards the Feasibility Study, which is due to be completed in late 2018. The MCP is intended to be updated as further information relevant to mine closure planning is obtained. It is a dynamic

document and will be updated based on results from ongoing project activities, results of monitoring, input from stakeholders, improvements in best practice knowledge and changes in regulations.

The MCP comprises the following components which are based on the sections specified in the guidelines[1]:

- Project overview (Section 2);
- Identification of closure obligations and commitments (Section 3);
- Stakeholder engagement (Section 4);
- Post-mining land use and closure objectives (Section 5);
- Development of completion criteria (Section 6);
- Collection and analysis of closure data (Section 7);
- Identification and management of closure issues (Section 8);
- Closure implementation (Section 9);
- Closure monitoring and maintenance (Section 10); and
- Management of information and data (Section 11)

[1] Although the guidelines call for the *Financial Provision for Closure,* financial security calculations are provided as part of the Mining Management Plan (MMP) prior to granting of mining authorisation by DPIR and are not provided as part of this mine closure plan.

2 PROJECT OVERVIEW

2.1 Project location and tenure

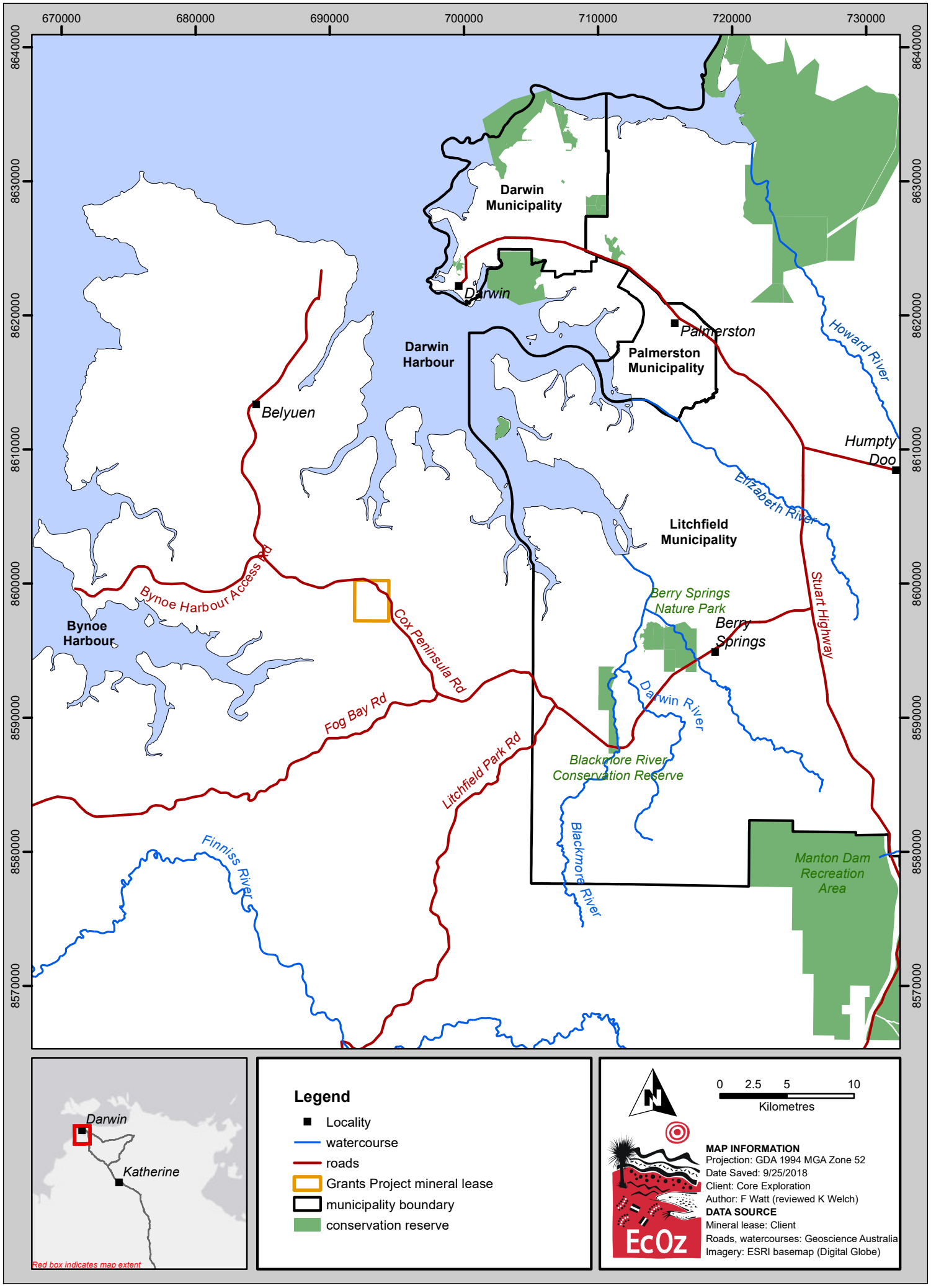
Grants Lithium project is located 500 m south of the Cox Peninsula Road, approximately 23 km west of Berry Springs township (33 km via road) and 22 km south of Darwin (85 km via road). The location is shown on Figure 2-1 and land details are summarised in Table 2-1. Access to the project is via the Cox Peninsula Road. Product will be transported to Darwin Port for shipment to China.

Table 2-1. Land information for the project area

Latitude	-12.66º
Longitude	130.78º
Tenement details	EL29698. ML(A)31726
Street Address	5484 Cox Peninsula Road, Cox Peninsula
Parcel description	Section 1 Hundred of Parsons
Zoning	Rural
Tenure	Vacant Crown Land owned by the NT Government

The project area is within and surrounded by undeveloped Vacant Crown Land. Currently, the main land-use is mining exploration. There are a number of historic mine sites visible on aerial photography of the surrounding area; the closest sites are located 1.5 km to the west and south-west of the project area. These sites have visible ground disturbance and pit lakes.

The project will occur within the area of ML31726 (the project area). The ML covers 750 ha, within which the mine site development envelope is approximately 147 ha, with the remainder of the ML providing a vegetated buffer to surrounding areas.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18108 - Grants Project Mine Closure Plan\01 Project Files\Figure 2-1. Project location in local and regional setting.mxd

Figure 2-1. Map showing project location in local and regional setting

2.2 Operations description

The defined maiden resource at Grants Lithium project is 2.03 million tonnes (at 1.5% lithium oxide concentration). The mineralised component (i.e. the fresh pegmatite that contains the lithium) is approximately 400 m in strike length and 32 m width based on the latest Mineral Resource Estimate (April 2018). Further drilling of the deposit continues to improve the Joint Ore Resources Committee (JORC) classification and may result in further resource material being identified to the south, but this drilling is unlikely to result in a materially larger pit.

An open cut mining method will be employed. Vegetation will be cleared from the project footprint. The top 20 cm of topsoil will be removed and stockpiled to the west of the waste rock dump (WRD) and run of mine (ROM) pad, for later use in rehabilitation of the site. Approximately 260,000 bcm of topsoil will be stockpiled.

All material (ore and waste) will require blasting, excepting the oxidised pegmatite waste, which is assumed to be free digging. Once blasted, excavators will be used to remove the material from the pit. Two excavators will be utilised to remove the overburden, then a single excavator will continue once the ore has been intercepted. The excavators will load the waste/ore into 90 t class dump trucks. The waste will be transported directly to the WRD and the ore to the ROM pad for crushing and screening.

There are two stages of ore processing proposed; crushing and primary screening to produce direct shipping ore, or 'DSO' (~1.5% Li_2O), and DMS processing to produce a concentrate (5.5% Li_2O). The high-level process flow is summarised in Figure 2-3. The circuit produces a concentrated product stream, which is stockpiled adjacent to the ROM pad, and two separate waste streams – fines (tailings) and coarse rejects.

Concentrate will be loaded for transport to Darwin Port and subsequent shipment to China. Tailings will be pumped to a thickener where flocculant is added to separate the slurry into an underflow component (tailings approximately 50% solids) and overflow component of process water that is returned back to the processing circuit. The thickened tailings slurry is then pumped to the TSF. The coarse rejects from the DMS circuit will comprise rocks with diameter larger than 6.3 mm. The rejects will be placed in the WRD, with no specific requirements for targeted placement or encapsulation.

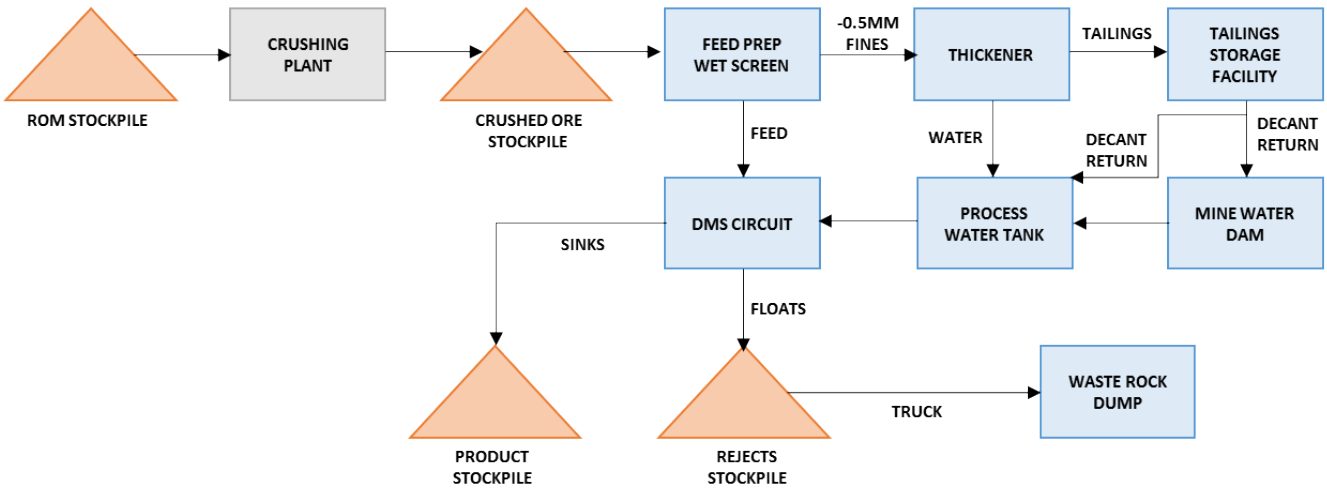


Figure 2-2. Processing block flow diagram

The mine life associated with extraction of 1.8 Mt of ore is expected to be two to three years. The pit will be mined over a period of 25 months. Ore is expected to be intercepted around month four in the schedule and

the first shipment from Darwin Port will occur around month six. Mining will occur in three phases as shown in

Table 2-2. Grants Lithium Project schedule

Year/Month	Months 1-7	Months 8-25	Months 26-30	Months 31 onward
Phase	**Pre-strip & construction**	**Operation**	**Rehabilitation & Closure**	**Post-closure**
Activities	Removal of oxide waste and oxidised pegmatite waste. Construction of site infrastructure and processing facilities.	Mining of the pegmatite ore body and adjacent 'fresh' waste, ore processing and transport of product to Darwin Port	Rehabilitation and mine closure activities	On-going monitoring of the mine site until rehabilitation completion criteria are achieved and the site is relinquished.

2.3 Project domains

Mining will create different landforms and infrastructure on site, the rehabilitation and closure requirements for each of these will vary. Landform(s) or infrastructure that has similar rehabilitation and closure requirements and objectives is termed a 'domain'. This section provides information on each of the project domains adopted for the purpose of closure planning. Closure objectives and completion criteria have been developed for each domain and closure issues/risks have been assessed separately for each domain.

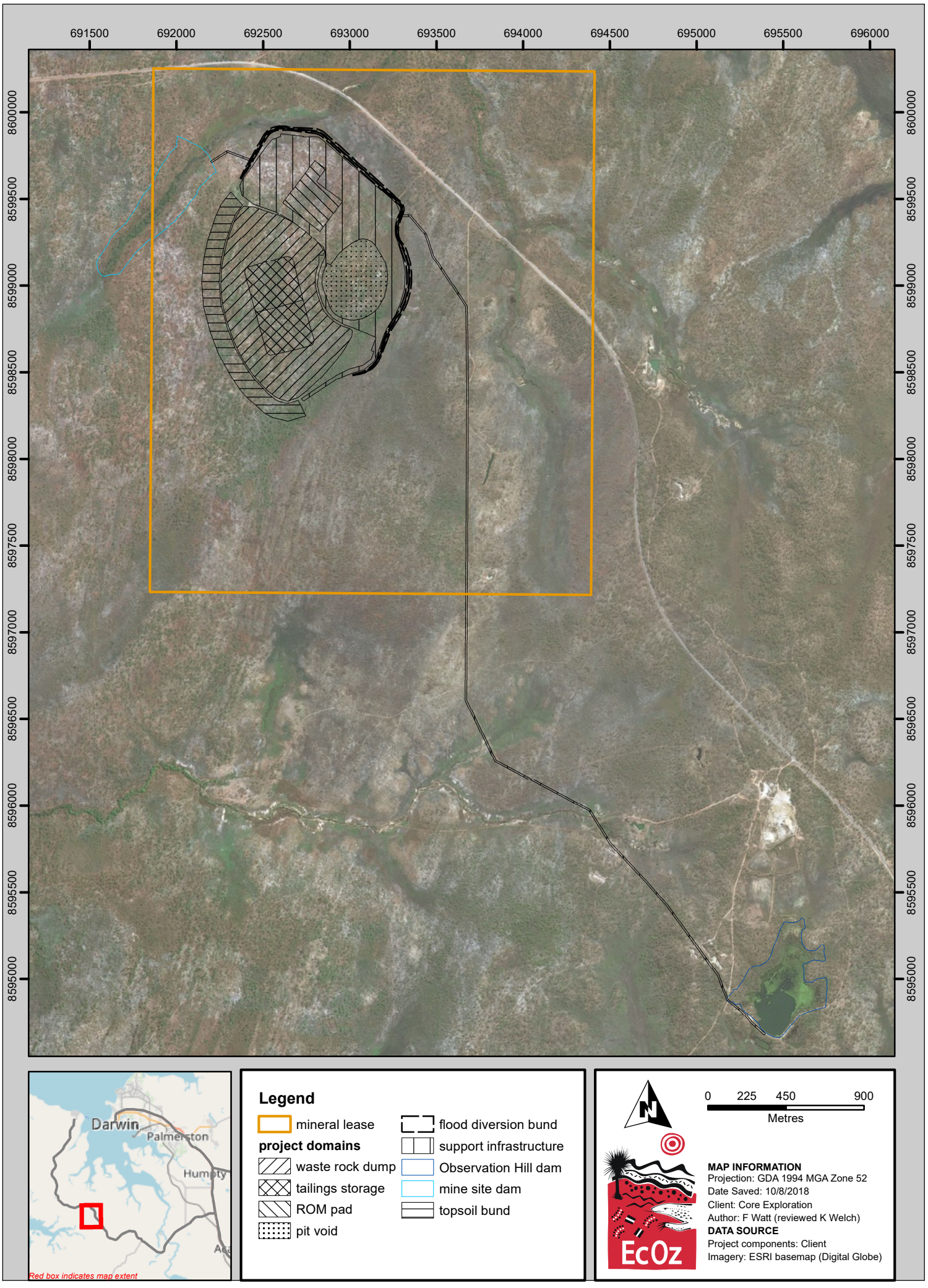
A site plan showing the project domains and associated component(s) and domains is provided at Figure 2-3. The approximate area of land disturbance required for the domains is summarised in Table 2-3. As operations have not commenced, there are no project components currently within the project area. Descriptions of each of the domains is provided in the following sub-sections.

Table 2-3. Area of disturbance for each project component

Domain	Component	Approximate dimensions (l x w x d) and/or capacity	Extent (ha)
Waste Rock Dump	Waste rock dump	1150m x 570m	153ha
Tailings storage facility	Tailings storage facility		
Run of Mine Pad	Run of Mine (ROM) pad	270m x 220m	
	Processing plant	310m x 80m	
Pit void	Mine pit	470m x 375m x 180m	
Flood diversion bund	Flood diversion bund	2,390m x 30m	
Support infrastructure	Access roads	2,900m x 30m	
	Mine Operations Centre	175m x 150m	
	Raw water dam	70m x 70m (4.6ML)	
	Mine water dam 1	380m x 180m (240ML)	
	Mine water dam 2	180m x 120m (60 ML)	
	Water pipeline	6km (l) x 10 m (w)	
Observation Hill dam	Observation Hill dam	Area of inundation with wall lift: 700m x 570m; Capacity ~ 628ML	9ha[2]
Mine Site dam	Mine Site dam	Area of inundation: 930m x 230m Capacity (max. required) = 387 ML	19ha[3]
		Total area of disturbance	**181ha**

[2] 9ha is the additional area inundated by raising the spillway to 31.5mAHD. The entire inundation footprint of the Observation Hill dam is approximately 40ha.

[3] Dam sizing is based on worst-case that off-site dams need to supply the entire project water requirements at some stage during the life of mine. Current modelling of pit inflows and TSF decant return indicate project is likely to rely on the off-site dams for less than 5% of the water requirement. Capacity of off-site supply requirements will be confirmed in the detailed planning phase.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18108 - Grants Project Mine Closure Plan\01 Project Files\Figure 2-2. Site plan and proposed disturbances.mxd

Figure 2-3. Map showing site plan and proposed disturbances

2.3.1 Domain 1 – Waste Rock Dump

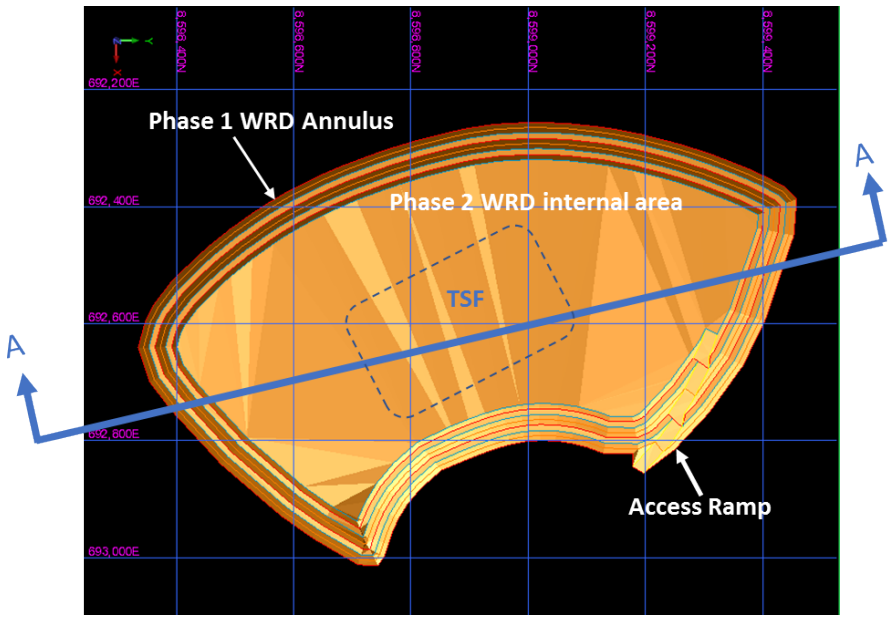
The strip ratio for the Grants deposit is 13.8:1. Estimated waste rock volumes and tonnage are presented in Table 2-4. A WRD will be constructed to accept all waste rock material removed from the pit and rejects from the crushing and screening process. The Tailings Storage Facility (TSF) (refer section 2.3.2) is co-located within the WRD. The landform is located adjacent to the pit, ROM pad and DMS processing plant as shown in Figure 2-3. A plan view of the combined WRD/TSF concept is shown in Figure 2-4. Approximate dimensions of the final WRD landform are 1,000 m (l) x 600 m (w) x 25 m (h).

The WRD will be constructed in two phases. Phase 1 construction will utilise the weathered waste materials excavated from the shallower parts of the pit shell to construct the WRD annulus. Low permeability material will be set aside for lining of the WRD internal area. This construction strategy allows the final external face of the WRD to be shaped, covered with reserved topsoil, ripped and seeded early in the Project life. It is expected that these rehabilitation works would occur around the end of year 1 of the mine schedule. Once the WRD annulus is constructed, the remaining waste rock and rejects from the crushing and screening process will be placed in the WRD internal area (Phase 2).

The WRD will accept all waste rock material removed from the pit and coarse rejects from the crushing/screening process. Waste characterisation studies (see section 7.8) have concluded that there is very limited potential for production of acid, saline or metalliferous drainage from the waste rock and therefore no requirement for construction of containment cells. The processing rejects are coarse and also do not pose an AMD risk. Some of the shallow waste material has dispersive characteristics and will be unsuited for use as a construction material or for placement in the WRD annulus. Further geotechnical testing and assessment is required to inform materials selection so that rehabilitation outcomes are maximised. Material from the deeper parts of the pit shell will be placed in the centre of the WRD and therefore dispersive characteristics in these materials is not of management concern.

Table 2-4. Estimated waste rock volumes (bcm) mined over the life of mine

Year 1	Year 2	Year 3	Total (bcm)
8,051,666	1,513,102	0	8,920,762



** A-A cross section is shown section 5.4*

Figure 2-4. Waste rock dump/tailings storage facility concept plan view

2.3.2 Domain 2 – Tailings Storage Facilities

The Tailings Storage Facility (TSF) will be integrated within the WRD. This design concept has the benefit of minimising the mine site footprint and allows for the WRD to entirely encircle the TSF on closure, therefore avoiding ongoing issues associated with water management and revegetation of an exposed tailings dam.

The TSF will consist of retaining embankments constructed from pit overburden / waste rock. The TSF will consist of two cells (Cell 1 to the north and Cell 2 to the south) (Figure 2-5), with centrally located decant water return structures. The overall footprint of the TSF will be approximately 15 ha, with a maximum height of approximately 9 m. The TSF has been sized to store a minimum of 3-years tailings production, equating to approximately 460,000 t. Tailings will be delivered sub-aerially through pipelines running around the perimeter of each cell, with spigot offtakes at 50 m centres.

Based on the waste characterisation work to date, tailings are expected to be geochemically benign with a very low risk of acid, metalliferous or saline drainage. No chemical processing is required in the DMS plant. The TSF design has therefore been structured to maximise drainage, without a need for preventative measures for oxidation of the material or containment of residual processing chemicals. The base of the structure will be appropriately treated to provide a low permeability barrier, which, along with the underdrainage system, would allow effective management of any risk of groundwater mounding.

The containment embankments will feature an upstream zone (Zone 1) of low permeability, primarily fine-grained materials sourced from residual soils from pit overburden excavations. This zone will allow the TSF to be a water retaining structure. The majority of the embankment will consist of weathered earthfill / rockfill won from the pit overburden (Zone 3). Zones are shown on Figure 2-6.

Each cell will contain a centrally located decant water return structure, and associated access causeway constructed out of Zone 3 material. Directly around the decant return structure will be a zone of clean, durable filter rock. The decant structures will consist of precast concrete, vertical slotted pipe, with a submersible return pump within the structure.

The embankment batter slopes have been conservatively designed at 2.5 Horizontal : 1 Vertical (2.5H:1V). This will be further refined upon completion of site investigations and testing of the foundations and embankment materials.

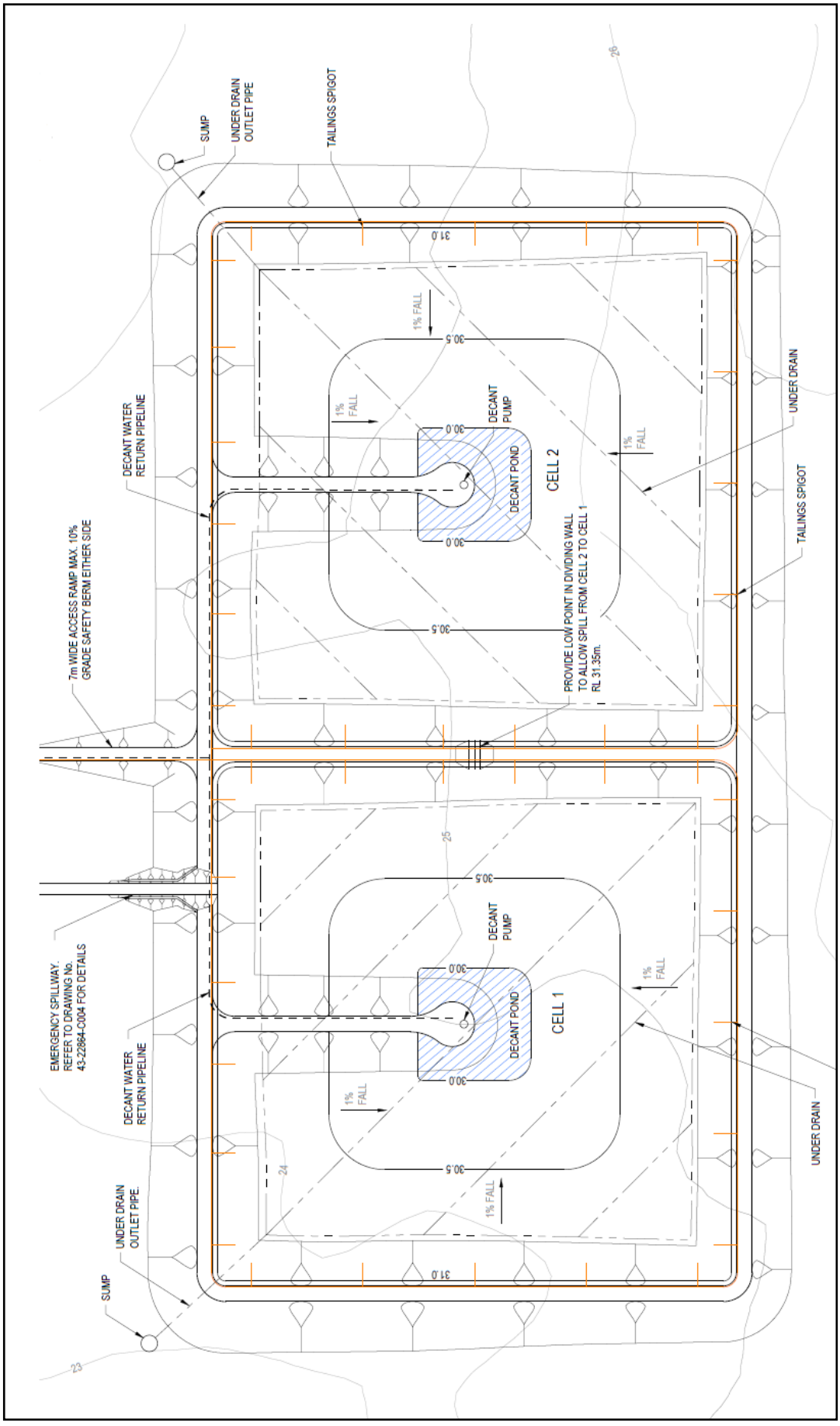
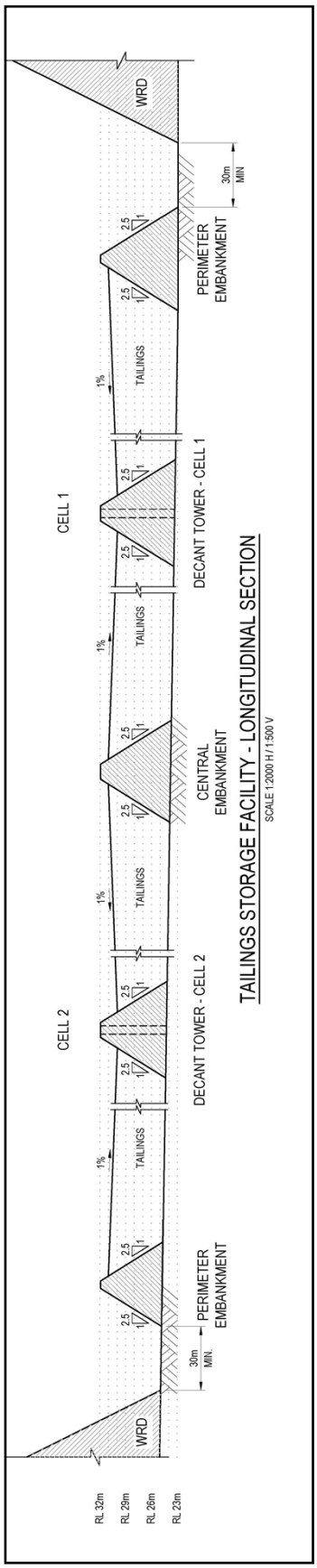


Figure 2-5. Tailings storage facility concept plan view



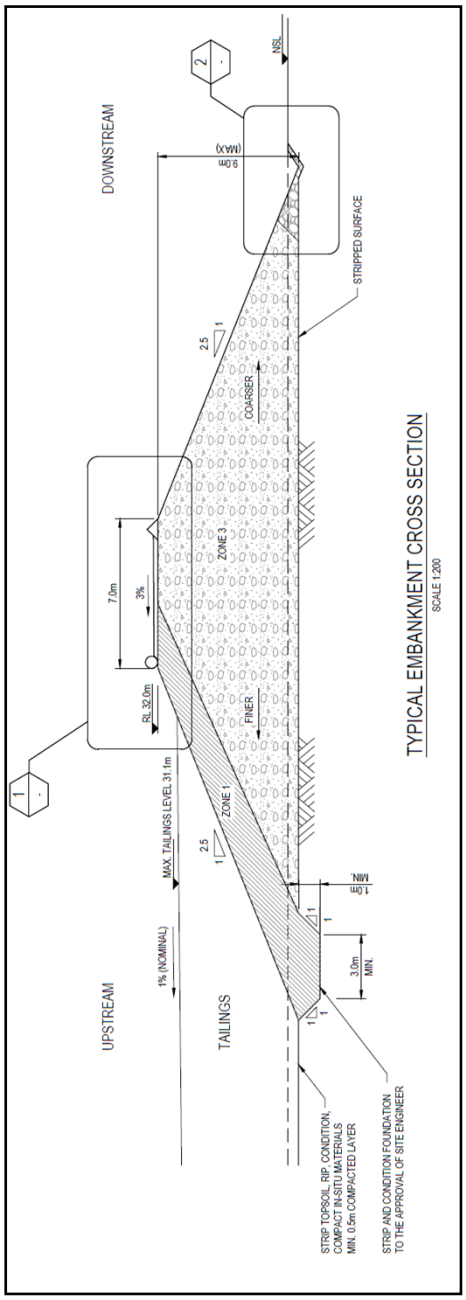


Figure 2-6. Tailings storage facility concept cross-sections

2.3.3 Domain 3 – Run of mine pad and processing infrastructure

The run of mine (ROM) pad will be constructed from overburden material to be a raised level surface. The ROM pad dimensions will be 445 m by 300 m and will cover 12 ha. The crushing and screening operation and dense media separation (DMS) processing plant will be located within the ROM pad. There will be two ROM stockpiles, a product stockpile and a rejects stockpile for low grade ore exiting the DMS circuit. Location of the ROM pad is shown in Figure 2-3, proposed layout of ROM pad is shown in Figure 2-7.

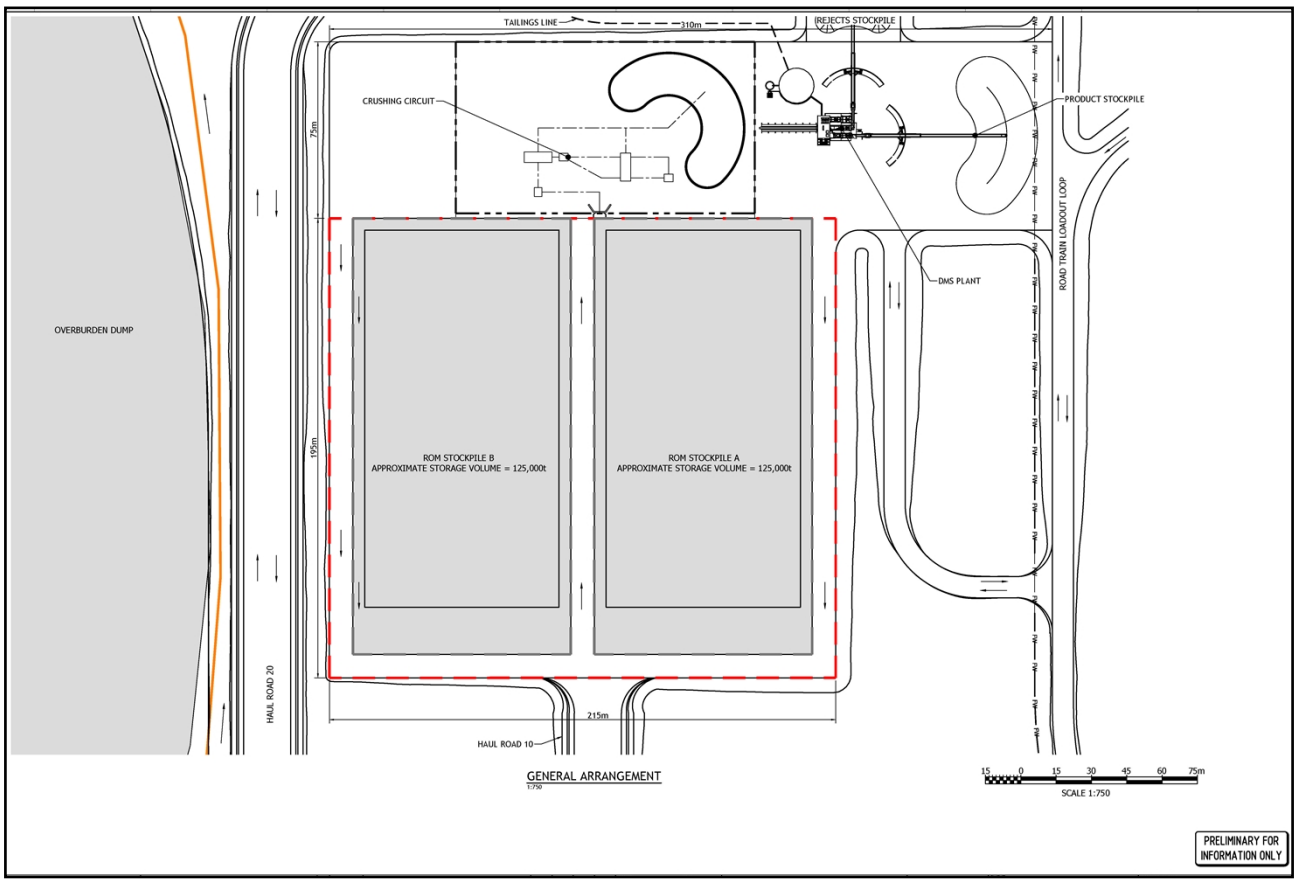


Figure 2-7. Proposed layout of ROM pad

2.3.4 Domain 4 – Pit void

The pit will occupy a surface area of 14 ha, will be approximately 500 m north-south, 350 m east-west and approximately 180 m deep. A pit design study has been completed by SRK Consulting (2018), using geotechnical, structural and hydrogeological data to provide design parameters and recommendations on a Ground Control Management Plan (i.e. the plan used to manage the risks associated with ground movement). The acceptance criteria for the pit design was based on *Guidelines for Open Pit Slope Design* (Read and Stacey, 2009).

The optimised pit shell will comprise three separate design sectors where the characteristics of the rock types encountered (weathered, transitional and fresh pegmatite) dictate different wall heights and batter configurations in order to achieve pit wall stability. The pit will have a 25 m wide dual lane access ramp

(from the surface down to 130 m below ground level, where it will reduce to a single lane (12.5 m wide) for the remaining depth down to the pit floor. The ramp will exit at the north west of the pit (close to the ROM pad and WRD). The conceptual design details of the pit are summarised in Table 2-5.

Table 2-5. Pit design criteria (Source: SRK 2018).

Design Sectors	Height	Inter ramp angle (º)	Batter Configuration		
			Bench face angle (º)	Bench height (m)	Bench width (m)
Weathered rock (to -20mRL)	40	38.1	60	10	7
		40.3	60	10	6
Transitional rock (-20 to -40mRL)	20	45.7	60	20	8
Fresh rock (beneath -40mRl)	140	60	80	20	8

2.3.5 Domain 5 – Flood diversion bund

A flood diversion bund will be constructed around the eastern and northern extent of the mine site, joining with the topsoil bund to fully enclose the mine site. The purpose of the bund is to divert wet season surface water flows and prevent inundation/flooding. The design parameter for the flood diversion bund is 1% Annual Exceedance Probability (AEP), which is the flood height that has a 1% chance of being equalled or exceeded in any given year.

The location of the bund has been selected outside of the calculated zone of instability around the pit shell, with the intent that post-closure, the bund will function as an abandonment bund to make the site safe and secure. The location and extent of the bund is shown in Figure 2-3. The bund will be constructed from low permeability clay material excavated from the pit.

2.3.6 Domain 6 – Support infrastructure

Water storages

A raw water dam (RWD) will be constructed to store water pumped from the off-site water supply dams. The RWD will provide make-up water for the processing circuit, potable and non-potable supply to the MOC facilities and will be equipped with a dust suppression stand-pipe. The RWD has been designed to hold 48 hours of operational supply without inputs.

Mine Water Dam 1 (MWD1) has a 240 ML capacity, allowing for predicted storage of pit inflows (groundwater and rainfall runoff) without release during the dry season. It is expected that releases of water from MWD1 will be required during the wet season, at an approximate maximum rate of 50 L/s.

Mine Water Dam 2 (MWD2) has a capacity of 60 ML. It has been designed as a contingency storage, and may be used for either of the following:

- Additional storage for pit inflows, in the event of variations from the modelled scenarios; or
- Wet season run-off from the TSF, to assist in water and tailings management.

Both dams will consist of a full perimeter embankment, with materials for construction won from within the storage areas (cut / fill balance). The embankments will be built primarily out of homogenous, low permeability, primarily fine-grained residual material. A low permeability basal liner will also be constructed, either utilising in-situ material or imported from pit overburden materials as required. Rip-rap erosion protection will be placed on the upstream face, with a rockfill source to be confirmed. The downstream face will consist of a weathered rockfill layer, won from within the storage area.

The embankment batter slopes have been conservatively designed at 2.5H:1V. This will be further refined upon completion of site investigations and testing of the foundations and embankment materials.

Each dam will include a floating outlet structure, with a pipe running under the embankment and a valve on the downstream end. This valve will allow water to either be returned to the process plant (with an in-line pump), or released to the environment by gravity when downstream mixing conditions allow. The dams will also be equipped with a dust suppression stand-pipe.

Storm-water management infrastructure

Drains and sediment dams will be constructed to capture and treat storm-water that falls directly onto the mine site. Indicative drainage lines and sediment dam locations are shown in Figure 2 3. Water will be treated with flocculants to remove the sediments prior to release off-site. Design criteria for the site drainage and sediment dams is provided in the ESCP for the project.

Access roads

There will be a single, dual lane access/haul road constructed from the Cox Peninsula Road into the mine security and access point (approximately 500 m). The intersection design will include slip lanes and signage to provide for safe entry-exit from the public road. The access road route follows the route of an existing exploration access track and crosses a broad drainage area where the road will be raised with culvert drains to allow water to pass underneath and provide all weather access. The road will provide access for light and heavy vehicle traffic and will be engineered to be capable of supporting the 95 tonne quad road trains, which will be used to haul product to Darwin Port.

From the mine security and access point, road trains will travel 660 m along the northern internal haul route to a road train load out loop located alongside the product pad. Internal haul roads will provide Heavy Vehicle (HV) access between the pit, ROM pad, WRD and workshop area. A Light Vehicle (LV) access road will be constructed to the processing plant. The location of haul and access roads is shown in Figure 2-3.

Water supply pipeline

A water pipeline will be installed between the Observation Hill Dam and the mine site. The pipeline will be constructed of polyethylene plastic and will be buried to a sufficient depth to provide for protection from bushfire. The pipeline corridor is 6 km and traverses Vacant Crown Land. The corridor will be 10 m wide and will include an unsealed access track, which will be used for inspection and maintenance.

Mine operations centre

A mine operations centre (MOC) will be located just beyond the site security and access point. The area will be separated into a Core area and Contractor area. The Core controlled area has provisions for equipment laydown area, LV car parking and wash-down facilities, site office, emergency facilities and services. The Contractor controlled area includes a HV workshop and wash-down facilities, refuelling station and contractor offices.

Potable water supply to the MOC will either be brought in from off site or supplied from the RWD through a reverse osmosis treatment plant. Water for ablutions and other facilities will be supplied from the RWD. Sewage will be managed by connection to an onsite wastewater management system (septic).

Explosives compound

A compound will be constructed to store explosives materials and components used for blasting. The explosives compound will be approximately 27 m (w) x 86 m (l), within which there will be an explosives magazine, a detonator magazine, a 65,000 kg bulk emulsion tank and two cubed freight containers for storage of ammonium nitrate. The compound will be constructed to comply with Australian Standard *AS2187 Explosives – Storage, transport and use*, which includes requirements for perimeter man-proof fencing and access restrictions, signage and surveillance monitoring, minimum separation distances between materials storages and construction of earth bunds around magazines. Pursuant to the NT *Dangerous Goods*

Regulations, Core will apply for an explosives business licence, which will licence storage and handling of explosives on the mine site.

2.3.7 Domain 7 - Observation Hill Dam

Observation Hill Dam (OHD) is located 5 km south-south-east of the mine site and was built by a previous operator that mined tin and tantalum in the area in the 1980's. The current dam spillway height is 30mAHD and the modelled capacity of the dam is 364 ML. Hydrological modelling undertaken to analyse the dam yield across low, medium and high rainfall years indicates that a deficit would likely occur if all of the project water requirements were pumped from OHD.

Raising of the dam wall spillway was investigated as an option to increase the water storage capacity. Dam yield assessments were prepared by a hydrologist for two scenarios; raising the spillway by approximately 1.5m (to 31.5mAHD) and 3.6 m (to 33.6mAHD) (EnviroConsult 2018). Based on the current understanding of the site water supply requirements, Core's proposal includes works to raise the OHD spillway height to 31.5mAHD, which will increase the storage capacity by 58% to 628 ML.

Materials required for raising the dam wall will be sourced from the overburden waste removed from the pit. Materials specifications, sources and construction treatments will be developed following further geotechnical testing.

The surface area covered by the increased volume of water storage, compared to the existing storage, is 9 ha shown in Figure 2-1. The area that would be inundated if the spillway was raised to 35.1m AHD is also shown for reference. The results of hydrological modelling of the potential impact to down-stream flows are discussed in 7.4.

2.3.8 Domain 8 - Mine Site Dam

A second surface water storage, referred to as the Mine Site Dam (MSD), may be required to ensure that there is sufficient water available for mining operations (including dust management) in the event of drier than average years or an unexpected increase in water requirements. The current mine site water balance indicates that the site water demand can most likely be met over the life of mine by dewatering of pit in-flows combined with pumping from OHD. Refinement of the site hydrogeological model, water reuse volumes and the design of on-site water storages, will inform Core's final decision on whether or not to proceed with construction of the new dam.

The location of the proposed MSD is on an unnamed ephemeral stream in the western portion of the ML, approximately 2.5 km upstream of the upper tidal limit of West Arm (Figure 2-3). The required spillway height will be dependent on the water volumes required to supplement supply from dewatering of pit in-flows and pumping from OHD, in lower than average wet seasons. However, as a basis for assessing potential environmental impacts, modelling of the required dam yield has been undertaken based the OHD spillway height remaining at 30 mAHD and a constant pump rate from the MSD applied across the year (i.e. water use is not offset by dewatering of pit-inflows and/or reduced dust suppression requirement in the wet season). The maximum required yield from the MSD under this worst-case scenario is 387 ML, equating to 1.5 times (nominal allowance) the modelled average yield deficit (258 ML), and assuming no raise to OHD and no alternative processing water storages.

To achieve the required spillway dimensions whilst still providing realistic earthworks requirements, the maximum spillway level was found to be RL 16.5 m. This provides a storage capacity of 310 ML. This is less than the worst-case scenario requirement of 387 ML; however, given the additional water storages outlined within this report, this is considered sufficient for the feasibility stage. If additional storage is required, then this may be achieved by excavation within the storage area.

The embankment batter slopes have been conservatively designed at 2.5H:1V. This will be further refined upon completion of site investigations and testing of the foundations and embankment materials. The

embankment will consist primarily of homogenous, low permeability, primarily fine-grained, non-dispersive residual soil from the pit overburden. The upstream face will consist of rip-rap erosion protection, with a layer of weathered rockfill (won from pit overburden) placed on the downstream face for erosional stability.

Materials required for raising the dam wall will be sourced from the overburden waste removed from the pit. Materials specifications, sources and construction treatments will be developed following further geotechnical testing.

The footprint of the dam embankment, storage area and spillway is approximately 20 ha. The results of hydrological modelling of the potential impact to down-stream flows are discussed in 7.4.

3 CLOSURE OBLIGATIONS AND COMMITMENTS

The EIS process and subsequent permits and licences obtained for specific project activities, identify specific closure obligations and commitments in relation to project. These are outlined in Table 3-1.

Table 3-1. Register of closure obligations and commitments

Note: This version of the MCP was prepared for submission with the draft EIS. As a result, obligations and commitments are not yet known. This table will be completed in the version of the MCP submitted to DPIR with the project MMP.

Source document	Section/condition	Closure obligation/commitment
Grants Lithium Project EIS	To be updated based on outcomes of EIS process and subsequent licencing where applicable	
NT EPA Recommendations		
Waste Discharge Licence		
Water Extraction Licences		

4 STAKEHOLDER ENGAGEMENT

Stakeholder engagement is required to allow contribution to the closure planning process and to obtain agreement on the post mining land use. Additionally, planned or unplanned mine closure has the potential to affect both internal and external stakeholders whom may have an interest in how and when the project is completed and decommissioned. The sections below summarise consultation undertaken to date and future plans to engage stakeholders in closure planning.

4.1 Summary of consultation undertaken to date

Core has employed local communications experts, True North Strategic Communication (True North) to assist with identifying and engaging with key project stakeholders during project planning and development. Early communication commenced with key stakeholders in late 2017, prior to submission of a Notice of Intent to the NT EPA. Subsequent communication and consultation activities have been undertaken over the period July-September 2018 as part of preparing the Social Impact Assessment (SIA) for the proposal. Detailed consultation reports have been prepared for both activities. The information below is summarised from these reports.

Using the International Association for Public Participation (IAP2) principles that guide good community engagement, the approach adopted for the project is designed to inform, consult and involve stakeholders. The objectives of the engagement program were to:

Communication objectives

- Identify all stakeholders and the best communication methods for each i.e. phone, email, face-to-face meetings, interviews and presentations.
- Ensure key stakeholders receive objective information direct from the company rather than from media or third parties.
- Build relationships and make it is easy to contact the company to clarify issues and address rumours and misinformation.
- Give stakeholders a chance to provide early input on issues that may affect them and provide regular updates to these stakeholders.

Consultation objectives

- Listen to and understand the perspectives of all stakeholder groups
- Manage stakeholder expectations
- Early identification of local knowledge that may contribute to better project design, avoiding mistakes or mitigating negative impacts
- Support delivery of a project that is environmentally, economically, culturally and socially acceptable to the community and key stakeholders (i.e. earn social licence to operate)
- Provide regulators with confidence that all positive and negative impacts are well understood and can be managed through all phases of the project
- Provide guidance to the company's long-term social performance.

Stakeholder identification initially focussed on groups and agencies with a key role in decision-making and regulation of the proposal. The stakeholder list was then broadened to include a wide range of groups, agencies, individuals and the broader public, who may be affected by and/or have an interest in the proposal.

In November 2017, stakeholder briefings by Core together with True North provided an outline of the project during a face-to face briefing sessions. The targeted key stakeholder groups were:

- Department of primary Industry and Resources, Minister for Primary Industry and Resources
- Local elected representatives
- Local government including City of Palmerston and Litchfield Shire Council
- Local industry associations including Chamber of Commerce
- Non-government organisations, including environmental groups, in particular the Amateur Fisherman's Association and the Environment Centre NT.

A further communication and engagement program was run over July, August and September 2018 in Darwin, Palmerston, Litchfield and the Berry Springs area. The program was designed to update previously contacted key stakeholders, and to reach out to a wider range of organisations that could be directly affected by or have a specific interest in the proposal, and the local community more broadly. The communication and engagement program implemented by True North included:

- An email sent out to stakeholders with a fact sheet outlining the project, information on the consultation process and an invitation to participate (either with an offer of a briefing and/or invitation for a formal SIA interview).
- 18 face-to-face briefings.
- 13 SIA interviews.
- An information stall at the Berry Springs Market on 26 August to reach local community members. The factsheet, maps and product samples were available at the stall to assist with informing members of the community about the project. Approximately 25-30 people engaged with Core or True North staff with another 25 people passing the stall and taking a fact sheet. It is estimated a further 30 people passed by without engaging at all.

Several informal discussions also took place, and contact was made with a number of additional stakeholders and community members following suggestions made at earlier briefings and interviews. Some stakeholders were also provided with brief content to include in their respective newsletters to maximise the reach to potentially affected people.

Mine closure planning was one of the key themes raised by stakeholders. Most stakeholders wanted to know about closure plans, and acknowledged that the Northern Territory has a negative history with legacy mines. Some stakeholders expressed concern that the pit would not be backfilled. Other stakeholders saw a good opportunity to develop an open body of water for recreational purposes, in an area that doesn't have much water.

4.2 Key stakeholder engagement

The guidelines define key stakeholders as post-mining land owners/managers and relevant regulators. Key project stakeholders for mine closure planning are:

- Department of Primary Industry and Resources (DPIR)
- Department of Infrastructure Planning and Logistics (DIPL)
- Department of Environment and Natural Resources (DENR)
- Northern Territory Environmental Protection Authority (NT EPA).

Through the consultation program to date, only the NT EPA has identified a specific closure consideration. The NT EPA prefers backfilling of the pit as part of closure. This preference has been included as part of the EIS ToR for the project and is considered in this MCP.

Each of the above stakeholders will have the opportunity to review and provide feedback on this MCP as part of the EIS process. It is anticipated that as result of feedback from stakeholders, the NT EPA will

provide a number of recommendations relating to mine closure. Subsequent revisions of this MCP will identify and address closure issues raised by key stakeholders.

4.3 Closure related stakeholder engagement strategy

Endorsement of the post-mining land use, closure objectives and completion criteria will be sought from the key stakeholders following their initial review and feedback on the MCP. Core will meet with the key stakeholders to discuss and incorporate any feedback on the post-mining land use, closure objectives and completion criteria into future iterations of this MCP.

5 POST-MINING LAND USE AND CLOSURE OBJECTIVES

The *Guidelines for Preparing Mine Closure Plans* identify two principle closure objectives for post mining land use:

- To be physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating and capable of sustaining an agreed post-mining land use.
- To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.

These been considered when determining post mining land use for the project and site-specific closure objectives.

5.1 Pre-mining land use

The project area is located on undeveloped vacant crown land (Section 1 Hundred of Parsons) and is surrounded by this land tenure for 7 to 8 km in all directions. There are no active industrial sites nearby (including no active mines or extractives quarries). Currently, mining exploration is the main land-use in the area surrounding the proposed mine site, and rural living, recreation and tourism are the main land-uses across the peninsula more broadly. The nearest formal residence is located on a freehold parcel of land 10 km to the south of the proposed mine site. Vegetation within the project area is consistent with surrounding areas and is dominated open woodland of *Eucalyptus miniata* and *E. tetrodonta.*

5.2 Post mining land use objective

The post mining land use objective for the project area is that:

Grants Lithium Project is a stable non-polluting landform which supports self-sustaining native vegetation comprising local species.

Achieving the post mining land-use objective involves the following:

- All processing and office infrastructure being removed from site.
- All domains are made stable and non-polluting
- Project domains to be rehabilitated are ripped, covered in topsoil and seeded.
- Project domains, except for the pit void, are rehabilitated to self-sustaining native vegetation communities comprising local species.
- Hydrological flow patterns being comparable to pre-mining conditions.
- Water quality within and coming from site is of suitable quality to not adversely affect ecosystems.

The WRD landform and an open pit lake will remain as a permanent feature of the landscape. The WRD and inundation bund will be joined to form an abandonment bund surrounding the pit to deter public access to the open pit. Erosion and sedimentation control devices, to be identified in a closure erosion and sediment control plan, will remain in place as required until stabilisation of the site is achieved.

An assessment of the proposed pit lake through a risk based approached has been undertaken as part of this MCP (Section 7.3). A water monitoring program has been developed and will be implemented (see section 10.4) to assess the water quality of the pit lake, surrounding surface and groundwater and ensure that it meets the defined post mining land use (non-polluting).

5.3 Site-specific closure objectives

Following the completion of mining operations, Core intends to leave the project area in a safe and stable condition such that the tenements can be relinquished without any future financial, environmental or safety liability for the company, land managers or the community. The specific closure objectives for each site domain are detailed in Table 6-1 along with completion criteria established for the purpose of monitoring and reporting on closure progress and outcomes.

5.4 Conceptual final landform designs

Conceptual final landform designs have been developed whilst considering the site-specific closure objectives for Grants lithium Project. Following closure, three constructed landforms will remain within Grants Lithium Project – the WRD with associated TSF, the pit void and flood diversion bund. The resulting landform profile is shown in Figure 5-1 and the location of these landforms are shown in Figure 5-2. Details of the remaining constructed land forms are provided in the following sections. The remainder of the site will be returned to the original landform.

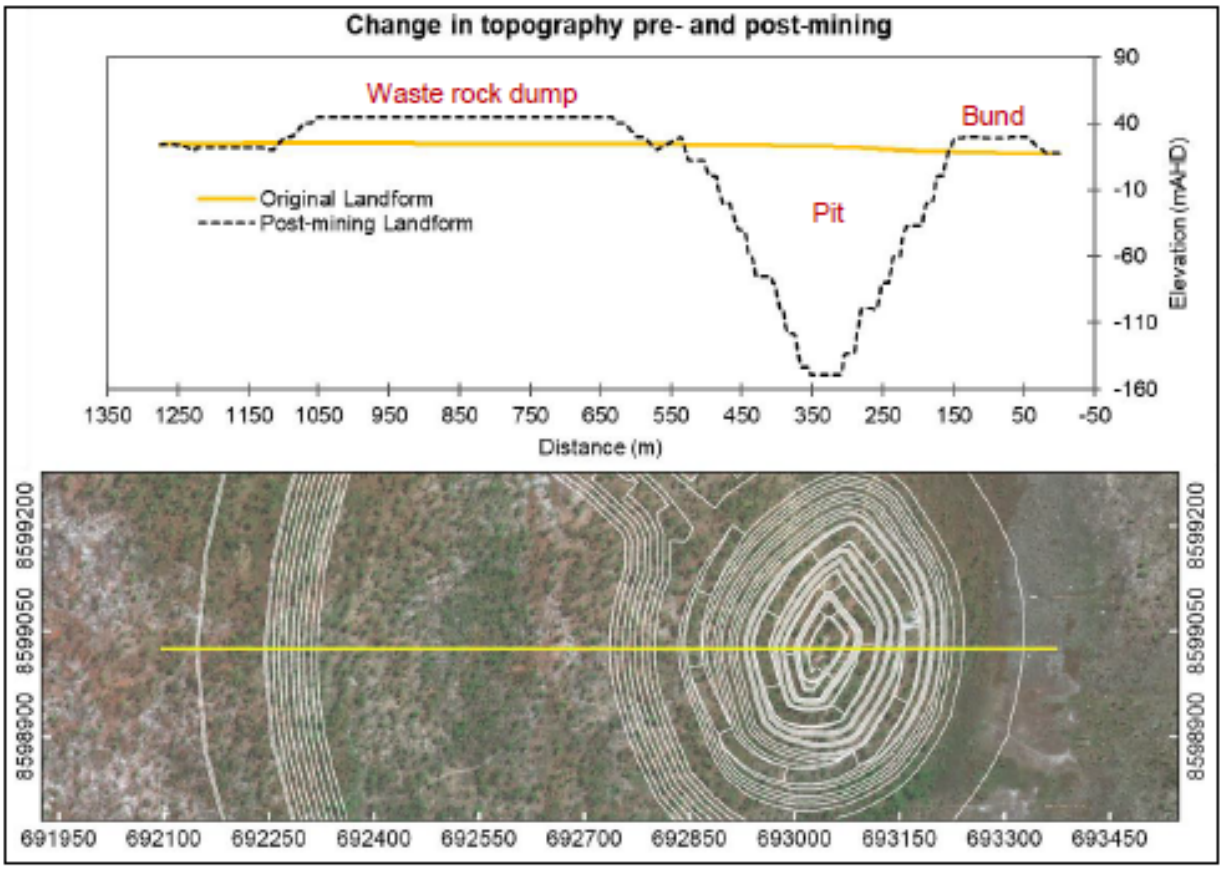
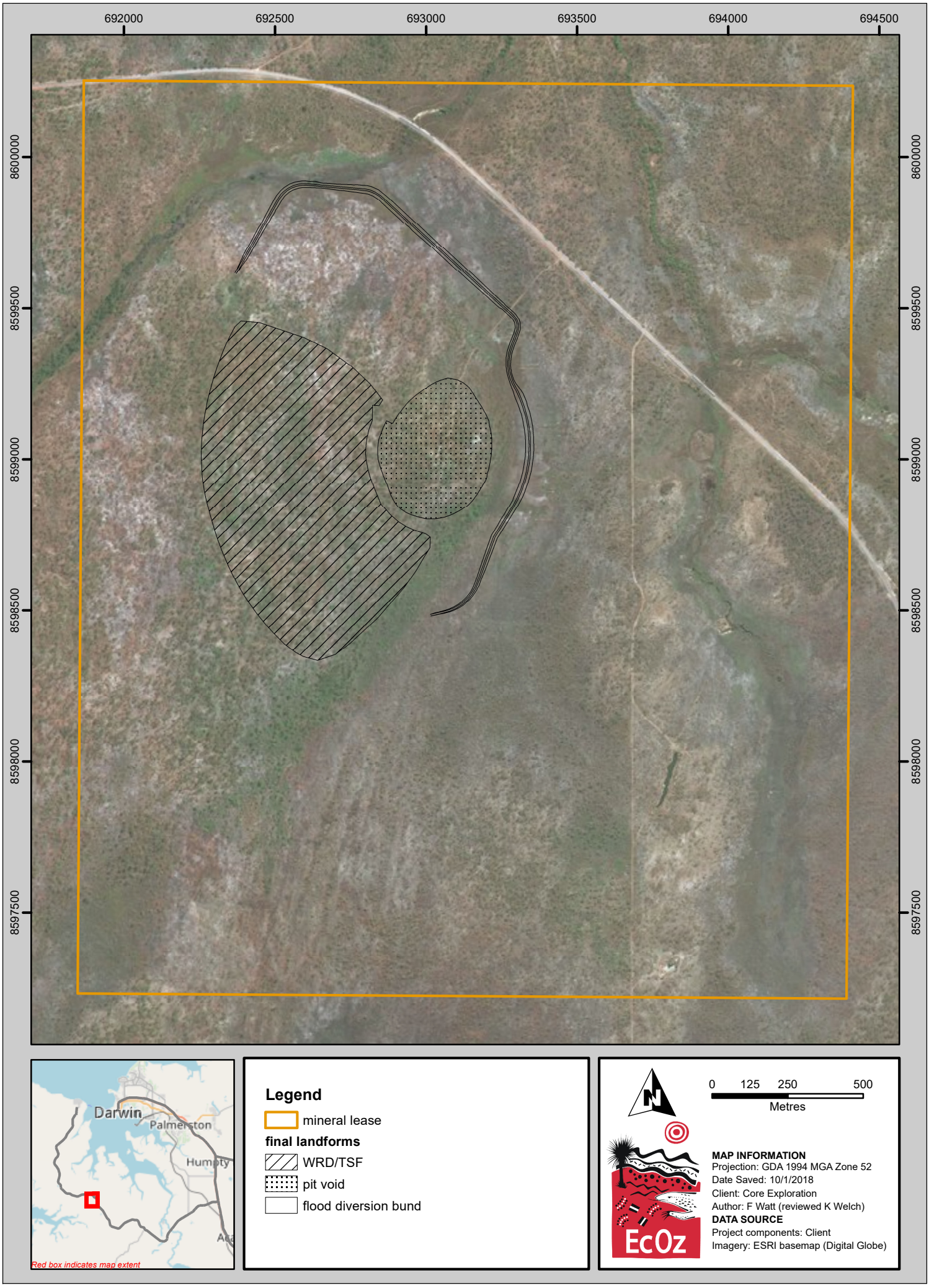


Figure 5-1. Pre- and post-mining landform[4]

[4] This is a conceptual profile designed to show the relative pit depth and WRD height. The final position of the bund and WRD in relation to the zone of instability is not accurately represented.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18108 - Grants Project Mine Closure Plan\01 Project Files\Figure 5-1. Final landforms post closure.mxd

Figure 5-2. Map showing location of final landforms post closure

5.4.1 Waste rock dump

The final landform of the combined WRD / TSF is intended to provide a structure that will be geotechnically stable in perpetuity, and effectively blend with the natural landscape in the surrounding area. As the waste rock and tailings have a low risk of geochemical instability, it is not expected that there will be a need to restrict percolation through the landform, and therefore a low permeability barrier has not been included in the cover design.

A cross-section of the final landform concept is shown in Figure 5-3. Approximate dimensions of the final WRD landform are 1,000 m (l) x 600 m (w) x 25 m (h). The design comprises three tiers with slope lengths ranging between five and ten metres to help reduce water runoff velocity and therefore reduce erosion potential. The final height, slope lengths and batter angles will be refined following further geotechnical assessment of the materials available on site. The design criteria for the WRD are summarised in Table 5-1.

Following closure of the TSF, the waste rock will be tipped and pushed in nominal 2 m layers over the TSF to reach the final waste dump surface profile. The top surface of the waste rock dump will be shaped to provide a nominal 1 % water shedding profile (Figure 5-3). The top surface will be covered with 0.5 m (nominal) of growth medium with 0.3 m rock mulch (Figure 5-4). Erosion and sediment control structures within the landform will be detailed in the Closure ESCP and will remain in place until permanent stabilisation is achieved. The surface will be reseeded with local species.

Table 5-1. WRD final landform conceptual design criteria

Design Element	Batter Configuration			Overall Batter Angle
	BFA (º)	BH (m)	BW (m)	
Tier 1	30	6 to 15	10	20º
Tier 2	30	10	10	
Tier 3	30	5		

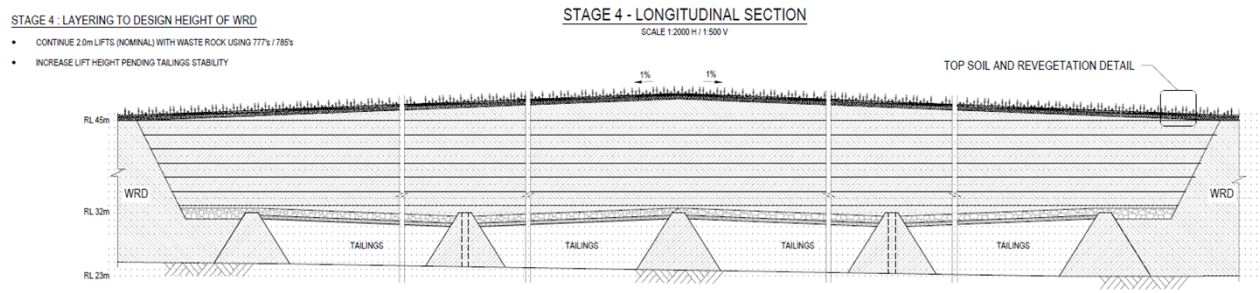


Figure 5-3. Final WRD surface and internal profile.

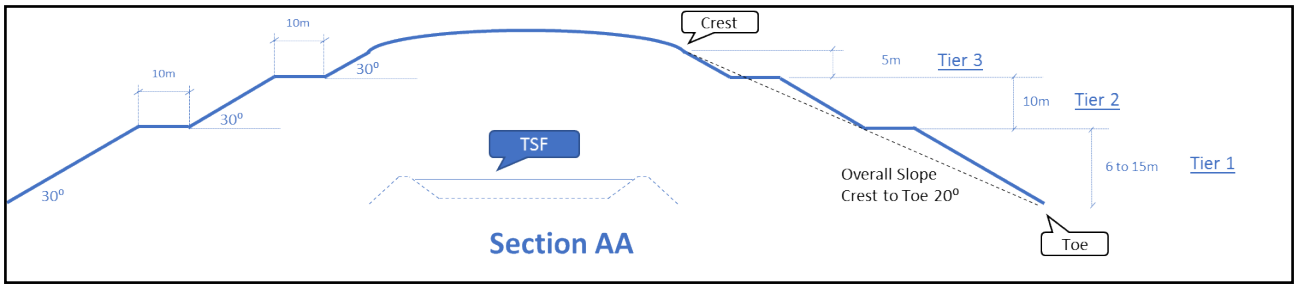


Figure 5-4. Detail of final WRD surface.

5.4.2 Pit void and abandonment bund

The final pit void will be approximately 180 m deep at the deepest point. The design criteria for the operational pit are shown in section 2.3.4.

The flood diversion bund constructed to protect the site during operations will form the post closure abandonment bund around the northern and eastern portion of the pit. The flood diversion bund will be located 10 m from the zone of instability (shown as potentially unstable pit edge zone in Figure 5-5) in accordance with the *Western Australian Safety Bund Walls Around Abandoned Open Pit Mines* (DoIR, 1997). The WRD will form the abandonment bund on the western and southern sections of the pit. 'Gaps' in the inundation bund will be 'filled' to form an abandonment bund surrounding the pit.

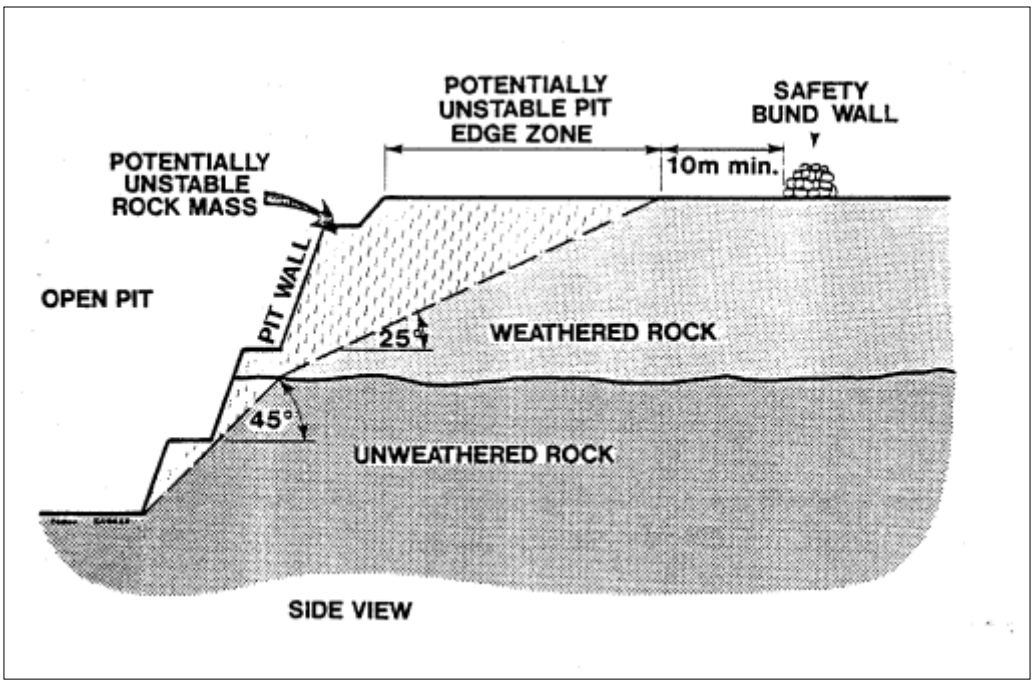


Figure 5-5. Model profile of post closure pit wall (source DoIR 1997)

6 COMPLETION CRITERIA

Completion criteria have been developed for each site specific closure objective relative to each domain. The criteria have been designed following the SMART framework. Each criterion is:

- **Specific** to an environmental or project consideration
- **Measureable** to demonstrate that rehabilitation is trending towards objectives
- **Achievable** for the project
- **Relevant** to the identified feature
- **Timeframe** dependent.

This framework provides an accepted approach for effective monitoring, reporting and auditing of mine closure and rehabilitation.

Quantitative criteria have been developed where possible. Values for quantitative criteria have been based on data collected through relevant environmental and engineering studies described in section 7. Where suitable quantitative values are not possible to develop (i.e. through lack of data), qualitative criteria have been used. These qualitative criteria will be refined as more data is obtained.

The completion criteria for the project, along with associated measurement tools and/or monitoring programs are shown in Table 6-1. Details on monitoring programs are provided in section 10.

Table 6-1. Closure criteria for Grants Lithium Project

Domain	Closure objective	Completion criteria	Measurement tools / monitoring programs
Compliance	All legally binding conditions and commitments relevant to rehabilitation and closure are met	All conditions and commitments relevant to rehabilitation and closure are met	Audit of conditions of mining authorisation and commitments made in project assessment
Domain 1 – WRD	The waste rock dump is a stable, non-polluting and erosion resistant landform.	Waste rock dump is built in accordance with the final landform specified in this plan and designs and design criteria detailed in the Mining Management Plan.	Inspection of waste rock dump on the completion of the WRD annulus and at the completion of mining activities.
		WRD surfaces have been suitably covered with topsoil on completion of operations.	Inspection of WRD following the operations for top soil coverage.
		Final surfaces do not significantly erode following rainfall events greater than levels at analogue sites.	Erosion monitoring program (refer Section 10.3).
		All erosion sediment control structures are in place and maintained for as long as required in the ESCP.	
		No evidence of sediment discharge at surface water monitoring points.	Water monitoring program (refer Section 10.4).
		No AMD[5] runoff from the WRD	Yearly visual inspection of WRD and surrounding soil condition during and for two years post mining activities (or longer if AMD/NMD/MMD present). Soil analysis if inspection identifies potential geochemical issues.
	The WRD supports self-sustaining native vegetation groundcover, comparable to that of the surrounding ecosystems	Ground cover of WRD is greater than or equal to the total percent ground cover of reference sites for two consecutive years post closure.	Vegetation monitoring program (refer Section 10.2).
		Ground cover species richness is greater than or equal to 70 % of that of reference sites.	
		Density of weed species within WRD is less than that of reference sites.	

[5] AMD – Acid and metalliferous mine drainage. AMD also refers to neutral and saline mine drainage.

Domain	Closure objective	Completion criteria	Measurement tools / monitoring programs
		No declared weed species not previously recorded in the mining lease is present within the WRD.	
	Surface water quality is not affected such that aquatic ecosystems are adversely impacted.	Post mining surface water quality (for the identified parameters) downstream of the WRD is within the range of pre-mining surface water quality and reference sites.	Water monitoring program (refer Section 10.4).
	Groundwater hydrological processes and water quality are not adversely affected such that they would impact future regional groundwater users	Post mining groundwater quality down groundwater gradient is within range of pre-mining groundwater quality.	Water monitoring program (refer Section 10.4).
		Groundwater levels post mining return to levels consistent with seasonal variations in groundwater levels pre-mining, and are within predictions of hydrogeological model.	
	Post mining landscape is in a condition that does not present a safety risk to humans or fauna.	Waste rock dump is built in accordance with the design criteria detailed in the Mining Management Plan.	Inspection of waste rock dump on the completion of the WRD annulus and at the completion of mining activities.
Domain 2 - TSF	Tailings storage facilities are non-polluting and are built to limit infiltration and seepage.	TSFs are constructed in accordance with the engineered design.	Visual inspection of each TSF by a suitably qualified person yearly during mining operations.
		Tailings are sufficiently consolidated prior to covering.	Testing of tailings prior to coverage (e.g. monitoring of the pore pressure build up from rapid loading (with push in piezometers) and monitoring bearing strength of the tailings (with shear vane testing equipment).
		TSFs are initially covered with initial 0.5 m thick layer of waste rock material	Monitoring of un-drained shear strength and pore pressure dissipation during loading by suitably qualified person. Visual inspection of covering material by a suitably qualified person.

Domain	Closure objective	Completion criteria	Measurement tools / monitoring programs
		TSFs are secondarily covered with initial 1 m thick layer of waste rock material	Monitoring of un-drained shear strength and pore pressure dissipation during loading by suitably qualified person. Visual inspection of covering material by a suitably qualified person.
		Groundwater quality down the groundwater level gradient from the TSFs does not demonstrate variation beyond the range observed in baseline water quality.	Water monitoring program (refer Section 10.4).
Domain 3 – ROM pad and stockpiles	ROM pad is returned to pre-mining and stable landform.	Hard-pack and infrastructure is removed and disposed of within the pit or WRD.	Inspection of areas post closure. Records of material movement and disposal.
		Domain is re-profiled to pre-mining conditions. Re-profiled surface is ripped and covered with topsoil.	Inspection of areas post closure.
		All required erosion and sediment control measures identified in the progressive ESCP remain in place for as long as required.	Erosion monitoring program (refer Section 10.3).
		Final surfaces do not significantly erode following rainfall events greater than levels at analogue sites	Erosion monitoring program (refer Section 10.3).
	Rehabilitated ROM pad supports self-sustaining native vegetation similar in form and function to what was on site prior to mining and that of surrounding areas.	Groundcover is greater than or equal to the total percent groundcover of reference sites.	Vegetation monitoring program (refer Section 10.2).
		Groundcover species richness is greater than or equal to 70 % of that of reference sites.	Vegetation monitoring program (refer Section 10.2).
		Dominant species (3) in the ecological dominant layer/ emergent layer that defined the pre-disturbance vegetation community are present as samplings and/or trees.	
		Density of weed species is less than that of reference sites.	
		No declared weed species not previously recorded in the mining lease is present.	

Domain	Closure objective	Completion criteria	Measurement tools / monitoring programs
	Surface water quality is not affected such that aquatic ecosystems are adversely impacted.	Post mining surface water quality downstream of Domain 3 is within the range of pre-mining surface water quality and reference sites.	Water monitoring program (refer Section 10.4).
		All erosion sediment control structures are in place and maintained for as long as required in the ESCP.	Erosion monitoring program (refer Section 10.3).
		No evidence of sediment discharge at surface water monitoring points.	Water monitoring program (refer Section 10.4).
	All infrastructure and waste is removed from site on the completion of operations.	Crushing and processing plant is removed on completion of mining operations.	Inspection of areas post closure.
		No stockpiles remain on the ROM pad and all material is disposed of appropriately.	Inspection of areas post closure.
Domain 4 - Pit void	The remaining pit void is stable and safe.	Pit is constructed in accordance with the design criteria specified within the MMP	Inspection of areas post closure.
		Pit ramps are blocked by bund(s) to deter access.	Inspection of pit ramps following closure.
		Pit abandonment bunds constructed in accordance with the guideline on “Safety Bund Walls Around Abandoned Open Pit Mines” (DoIR, 1997).	Audit by geotechnical engineer to confirm pit abandonment bunds are located and constructed in accordance with completion criteria.
	Groundwater hydrological processes and water quality are not affected such that they would adversely impact future groundwater users.	Water level in pit lake aligns with prediction in the hydrogeological model.	Water monitoring program (refer Section 10.4).
		Post mining groundwater quality is within range of pre-mining groundwater quality.	
		Groundwater levels post mining return to levels consistent with seasonal variations in groundwater levels pre-mining.	
	Pit lake water is of quality that it will not adversely affect local ecosystems or fauna.	Pit lake salinity is less than the maximum predicted by through mass balance modelling for the pit lake assessment.	Water monitoring program (refer Section 10.4).
Domain 5 - Flood diversion bund	Flood diversion bund is a stable, erosion resistant landform that is effective in diverting surface water	Flood diversion bund is built in accordance with the design criteria detailed in the Mining Management Plan.	Inspection of flood diversion bund on the completion of mining activities.

Domain	Closure objective	Completion criteria	Measurement tools / monitoring programs
	around the project area.	Final surfaces do not significantly erode following rainfall events greater than levels at analogue sites.	Erosion monitoring (refer Section 10.3).
		All erosion sediment control structures are in place and maintained for as long as required in the ESCP.	
		No evidence of sediment discharge at surface water monitoring points.	Water monitoring program (refer Section 10.4).
	The flood diversion bund supports self-sustaining native vegetation groundcover, comparable to that of the surrounding ecosystems	Ground cover of flood diversion bund is greater than or equal to the total percent ground cover of reference sites for two consecutive years post closure.	Vegetation monitoring program (refer Section 10.2).
		Density of weed species within flood diversion bund is less than that of reference sites.	
		No declared weed species not previously recorded in the mining lease is present within the flood diversion bund.	
Domain 6 - Support infrastructure	Support infrastructure domain is returned to pre-mining and stable landform.	Hard-pack and built up infrastructure is removed and disposed of within the pit or WRD.	Inspection of areas post closure.
		Domain is re-profiled to pre-mining conditions. Re-profiled surface is ripped and covered with topsoil stored on-site and seeded	
		All required erosion and sediment control measures identified in the progressive ESCP remain in place for as long as required.	Erosion monitoring (refer Section 10.3).
		Final surfaces do not show signs of erosion of moderate or above.	
	Support infrastructure domain supports self-sustaining native vegetation similar in form and function to what was on site prior to mining and that of surrounding areas.	Ground cover is greater than or equal to the total percent ground cover of reference sites.	Vegetation monitoring program (refer Section 10.2).
		Ground cover species richness is greater than or equal to 70 % of that of reference sites.	
		Dominant species (3) in the ecological dominant layer that defined the pre-disturbance vegetation community are present as samplings and/or trees.	

Domain	Closure objective	Completion criteria	Measurement tools / monitoring programs
		Density of weed species is less than that of reference sites.	
		No declared weed species not previously recorded in the mining lease is present.	
	All infrastructure and waste is removed from site on the completion of operations.	All processing and administration infrastructure is removed from site on the completion of mining activities.	Inspection on completion of mining activities.
		All waste is removed from site on the completion of mining activities.	
		Standpipes and above ground components of the water supply pipeline are removed from site on the completion of mining activities	
		All pumping infrastructure is removed from site on the completion of mining activities.	
Domain 7 - Observation Hill Dam	Surface water quality and hydrological flows are not affected such that ecosystems are adversely impacted.	Water quality downstream of dam is within range of baseline water quality	Water monitoring program (refer Section 10.4).
		Riparian vegetation downstream of OHD is of comparable structure and composition to pre-operation condition	Vegetation monitoring program (refer Section 10.2).
	Observation Hill Dam is a stable and safe structure.	Observation Hill Dam is constructed to engineered designs	Inspection by suitable qualified person following construction.
		Observation Hill Dam is a non-eroding structure.	Erosion monitoring (refer Section 10.3).
	Observation Hill Dam supports self-sustaining native vegetation groundcover, comparable to that of the surrounding ecosystems	Ground cover of Observation Hill Dam wall is greater than or equal to the total percent ground cover of reference sites for two consecutive years post closure.	Vegetation monitoring program (refer Section 10.2).
		Ground cover species richness is greater than or equal to 70 % of that of reference sites.	
		Density of weed species within Observation Hill Dam wall is less than that of reference sites.	
		No declared weed species not previously recorded in the mining lease is present within the Observation Hill Dam wall.	

Domain	Closure objective	Completion criteria	Measurement tools / monitoring programs
Domain 8 – Mine Site Dam	Surface water quality and hydrological flows are not affected such that ecosystems are adversely impacted.	Water quality downstream of dam is within range of baseline water quality	Water monitoring program (refer Section 10.4).
		Riparian vegetation downstream of Mine Site Dam is of comparable structure and composition to pre-operation condition	Vegetation monitoring program (refer Section 10.2).
	Mine Site Dam is a stable and safe structure.	Observation Hill Dam is constructed to engineered designs	Inspection by suitable qualified person following construction.
		Observation Hill Dam is a non-eroding structure.	Erosion monitoring (refer Section 10.3).
	Observation Hill Dam supports self-sustaining native vegetation groundcover, comparable to that of the surrounding ecosystems	Ground cover of Observation Hill Dam wall is greater than or equal to the total percent ground cover of reference sites for two consecutive years post closure.	Vegetation monitoring program (refer Section 10.2).
		Ground cover species richness is greater than or equal to 70 % of that of reference sites.	
		Density of weed species within Observation Hill Dam wall is less than that of reference sites.	
		No declared weed species not previously recorded in the mining lease is present within the Observation Hill Dam wall.	

7 COLLECTION AND ANALYSIS OF DATA

This section summarises key environmental data which has been used to develop closure objectives and completion criteria for the project area. The data will be updated as more data is collected.

7.1 Climate

The project area has a wet/dry tropical climate with a distinct dry season (approximately April to October) and wet season (November to March). The annual average rainfall in the Project area is 1,800 mm. Monthly rainfall statistics for sites in close proximity to the Project are shown in Figure 7-1.

Monthly mean maximum temperatures range from 30.6°C (August) to 33.3 °C (October & November)[6] and monthly mean minimum temperatures range from 19.3°C (July) to 25.3 °C (November and December).

The region can experience cyclones, typically between the months of December to April.

Evaporation (Figure 7-1) is highest at either end of the wet season, with peaks in evaporation occurring in April-May and November-December. This correlates to periods when the temperature is higher and there is lower rainfall and associated cloud coverage.

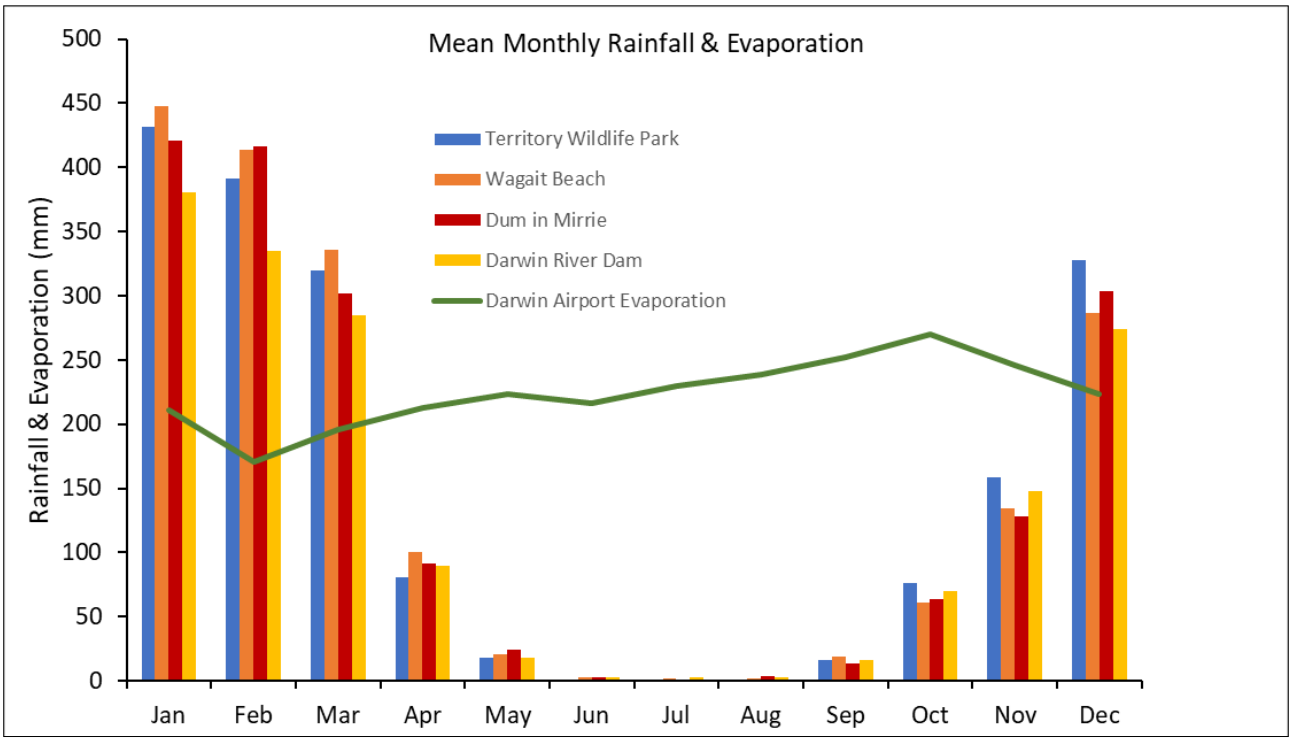


Figure 7-1. Mean monthly climate statistics for similar sites to the project area

Wind direction is predominately from the north through west most of the year (August to March) and particularly during the wet season (September to March). During the dry months (April to July) winds come predominately from the east. The highest mean afternoon (3 pm) wind speeds occur in September (20.9 km/h) and the lowest in June (16.2 km/h). Mean morning (9 am) are highest in June (14.7 km/h) and lowest in November (8.7 km/h). Mean wind speeds are invariably higher in the afternoon than the morning; the highest 9 am mean wind speed is lower than the lowest 3pm mean wind speed.

[6] Monthly mean maximum and minimum temperature statistics from the Darwin Airport weather station (Bureau of Meteorology Station #14015)

7.2 Geology

The geology of Grants Deposit is comprised of 10 geological rock-type domains of homogenous character, as described in Table 7-1 and summarised below:

- Soil and Laterite cover (“surface zone”) no more than 3 m thick and generally <1m thick
- Weathered (Oxide) Burrell Creek Formation averaging 50 m thick
- Transitional (Partial Oxide) Burrell Creek Formation averaging 10 m thick
- Fresh (Reduced) Burrell Creek Formation to the base of current planned pit, and well beyond.
- Weathered pegmatite averaging 50 m thick
- Transitional pegmatite averaging 1 m thick
- Fresh pegmatite to the base of current planned pit (economic ore)
- Weathered quartz veins of several cm to 1 m thickness
- Transitional quartz veins of several cm to 1 m thickness
- Fresh quartz veins of 1 cm to 1 m thickness.

Geometrically, these are assembled as per Figure 7-2. The pegmatite body that is host to the economic lithium, is a continuous near-vertical body that is surrounded on each side by host Burrell Creek Formation. The pegmatite body is elongate almost north-south (azimuth 015 degrees) and is a simple lozenge shape, tapering to the north and south. There is a southerly plunge component as well, such that at the northern end the tapered base of the pegmatite is reasonably well defined. It is up to 35 m wide and 300 m in strike length, as currently defined in the near-surface environment. It is likely to extend north and south as a thin sub-economic “slither”, beyond the planned pit.

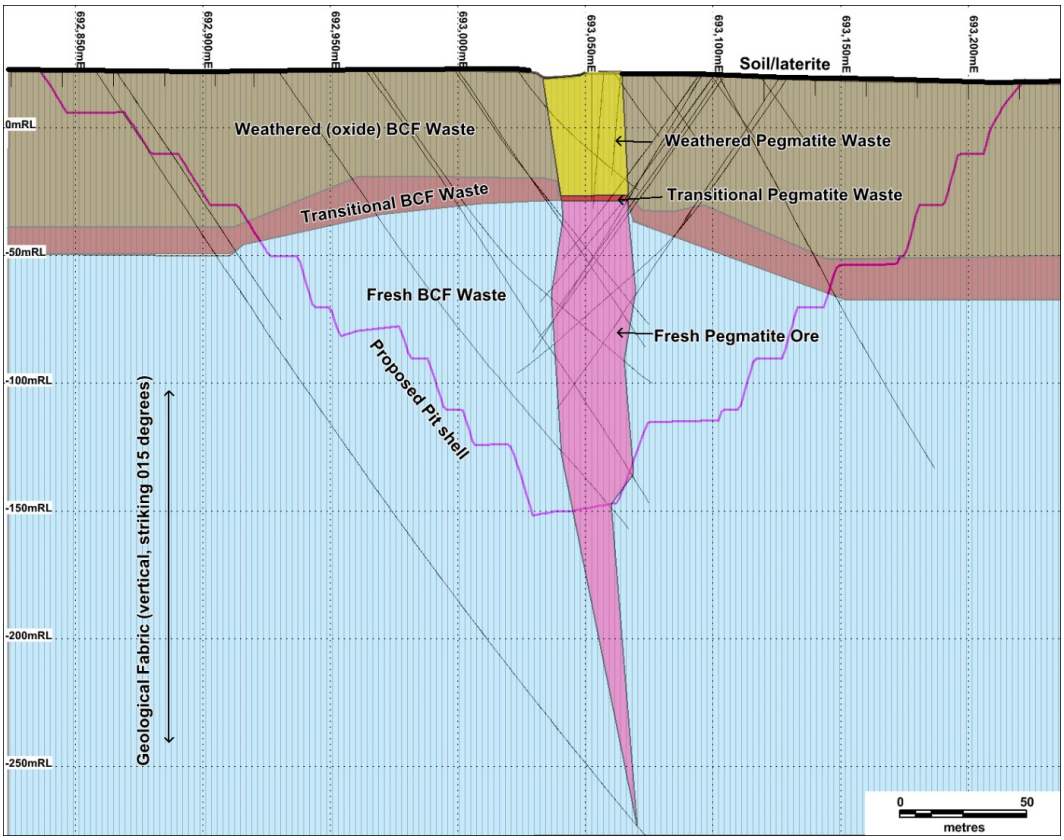


Figure 7-2. Cross section through Grants pit at 8599075N showing the various rock-type domains.[7]

[7] Note that quartz veins are too small and discontinuous to show.

Table 7-1. Summary of the rock-type domains and indicated volumes within Grants pit shell

Weathering Category	Description			
	BCF	**Pegmatite**	**Soil/Laterite**	**Quartz veins**
Surface zone (1-2 m thick)	NA	NA	Thin 0-3 m of soil or laterite. Complete destruction and alteration of primary mineralogy and textures. Variable distribution geographically. Usually red/brown in colour.	NA
Volume (m^3)	**0**	**0**	**85,000**	**0**
Weathered (Oxide) Zone (30-60 m thick)	Almost complete destruction of primary mineralogy and textures. Dominated by fine clay and altered mica. Usually orange/brown in colour.	Complete destruction and alteration of primary mineralogy and textures. Dominated by white clay and quartz fragments. Generally soft or rarely silcreted.	NA	White quartz with minor haematite staining.
Volume (m^3)	**4,230,000**	**300,000**	**0**	**8,000**
Transitional Zone (1-20 m thick)	Original mineralogy and textures identifiable with minor iron staining present. Usually light grey to brown in colour.	Predominately hard and competent with primary mineralogy clearly visible. Alteration of minerals to clay along grain boundaries.	NA	White quartz with minor haematite staining.
Volume (m^3)	**950,000**	**6,000**	**0**	**1,500**
Fresh Zone	Fine grain, dark grey, thinly laminated siltstones and minor fine sandstone metamorphosed to phyllite. Usually very finely micaceous with zones of abundant fine garnets.	Very hard and coarse grained white to grey/green in colour. Mineralogy dominated by clear to grey quartz, white feldspar, pale green spodumene and minor clear to brown muscovite.	NA	White quartz with minor sulphides.
Volume (m^3)	**2,410,000**	**530,000**	**0**	**5,000**

The gross weathering profile within the proposed pit is horizontal and not unlike the surrounding area, based on Core's regional drilling experience. It is considered typical of the northern Australian Tropical weathering profile. The only diversion is that the transition from Oxide to Fresh in the pegmatite occurs over a short vertical distance (1m) - the transition in the surrounding Burrell Creek Formation is more gradual (10m) and somewhat arbitrary to define. Within each of the defined geological rock-type domains there is little variability. This is evidenced by the lack of ambiguity in geological logs beyond the establishment of the degree of weathering/oxidation in the Burrell Creek Formation transition zone, which is purely based on colour. This can be somewhat subjective in the logging, as the colour changes are subtle and progressive.

Detailed information on the geological domains is provided in the Material Characterisation Report (EcOz 2018a).

The volumes of these rock-type domains in the proposed pit have been calculated using wireframes defined by geological logging of drill core or RC chips. These volumes are summarised in the pie-chart below (Figure 7-3).

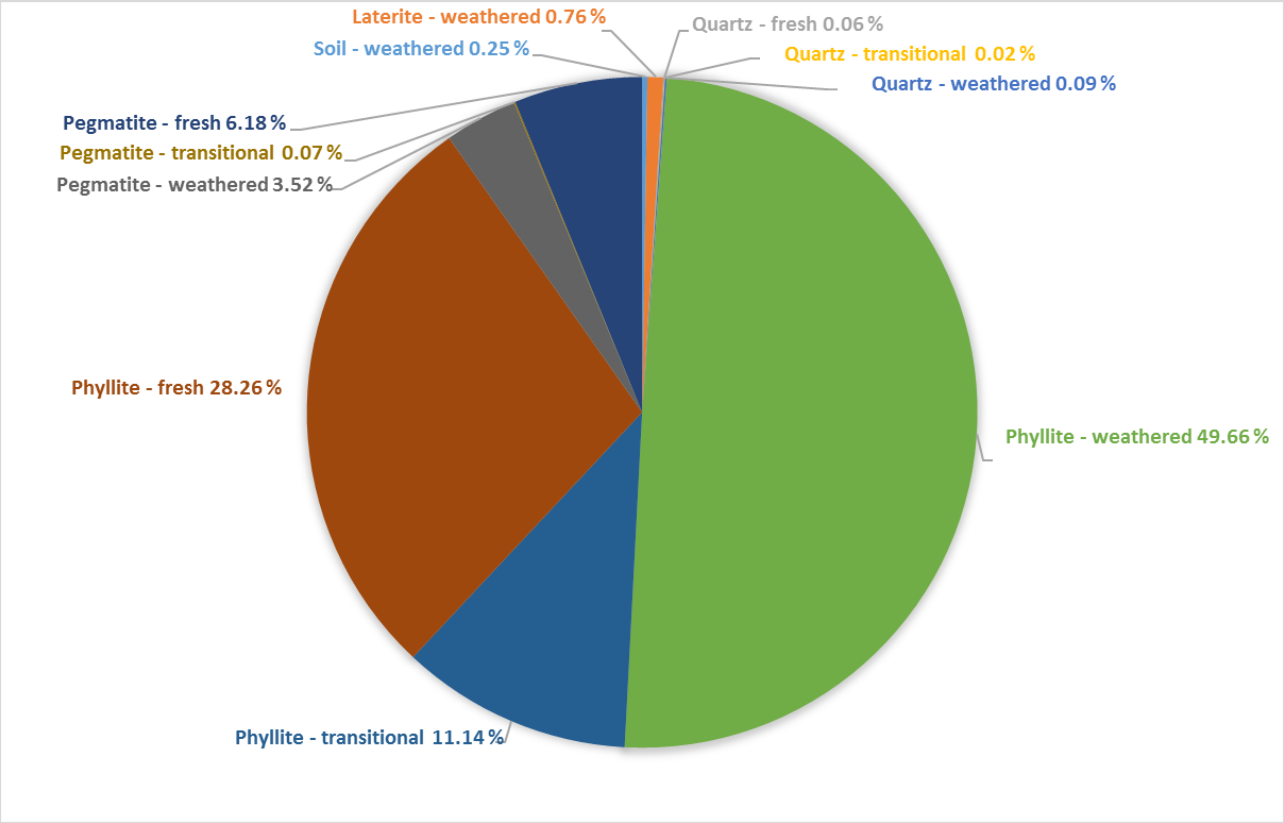


Figure 7-3. Volume of each rock type domains within the proposed Grants pit

7.3 Hydrogeology

A groundwater model has been prepared to describe the hydrogeology of the project area and model the effects of mining operations on local and regional hydrogeology.

The Burrell Creek Formation forms the principal aquifer beneath and in the immediate surrounds of the study area. It is categorised on the Cox Peninsula Hydrogeology Map (NRETA, 2008) as a fractured and weathered rock aquifer with minor groundwater resources. Typical bore yields are less than 0.5 L/s largely due to the lack of primary porosity and open fracturing within the Burrell Creek Formation – this mapped category has the lowest groundwater resource potential in the Greater Darwin region. Higher yields have

been recorded in the Burrell Creek Formation where drilling intersects fracture zones or bands of quartz veining. Groundwater is typically intersected within and at the base of weathering zone. The un-weathered Burrell Creek Formation is less permeable, though groundwater intersections have been observed where drilling intersects discrete fracture zones within the formation. There is also potential for minor aquifers in the Cenozoic Formations (sand, clay, gravel and laterite) in areas with thicker alluvial cover (i.e. along drainage lines) or where the laterite profile is more extensive.

Groundwater depth and fluctuation

Groundwater levels in bores within the deeper weathered Burrell Creek Formation (GWB01, GWB03, GWB07, GWB08) range from 0.5 to 2.1 mBGL in the wet season and from 3.1 – 5.5 mBGL in the dry season. All bores show an increase in groundwater level in response to wet season rainfall and a gradual decline in water levels through the dry season. The seasonal change in water levels in the Burrell Creek Formation ranges from 2.3 – 3.4 m.

Groundwater recharge, drawdown and flow

In the immediate area around the proposed mine pit and infrastructure groundwater flows in a north to north-easterly direction (Figure 7-4), moving from the more elevated rises in the south of the study area toward the lower lying areas and incised drainage lines in the north . The groundwater flow pattern does not vary significantly between the wet and dry seasons; however, groundwater levels are 2-3 metres higher in the Wet season surface (Figure 7-4). Regionally, there is limited groundwater level and elevation data, but the water table around the study area is expected to mirror the topography - flowing generally from south to north toward Darwin Harbour and locally from areas of higher topography to areas of lower topography such as drainage features and discharging as small seepages adjacent to the rivers and lowlands. Groundwater discharge to surface features will be relatively low as the aquifer has a low hydraulic conductivity.

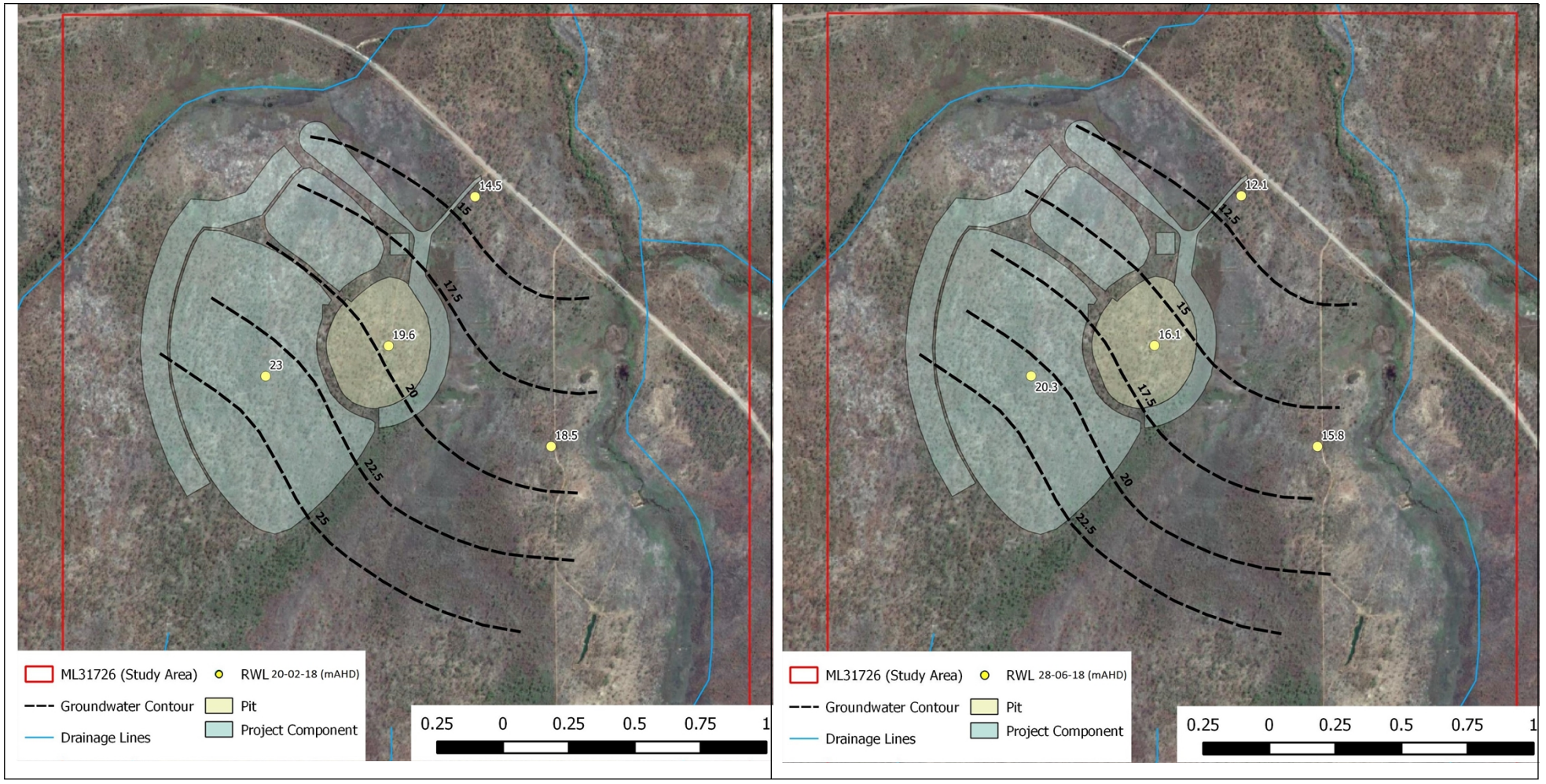


Figure 7-4. Grants Lithium Project mine site potentiometric surfaces (a) wet season (20/2/2018) (b) dry season (28/06/2018)

The forecast drawdown impacts at the end of the 2 year mining period are presented below in Figure 7-5 (sourced from Kanpton and Fulton 2018). The drawdown at the end of mining does not extend beyond the exploration lease and also does not intersect any of the ephemeral drainage lines on site.

The final post closure drawdown contours are presented in Figure 7-6. This figure shows the drawdown surface after 70 years of recovery post mine closure (year 2090). The pit lake operates as a groundwater sink and will result in 0.5 m drawdown with a radial extent of approximately 500 m around the pit lake. The change in water-table surface resulting from the mining activities and the pit lake is not expected to extend beyond the mining lease or change groundwater conditions beneath ephemeral drainage lines.

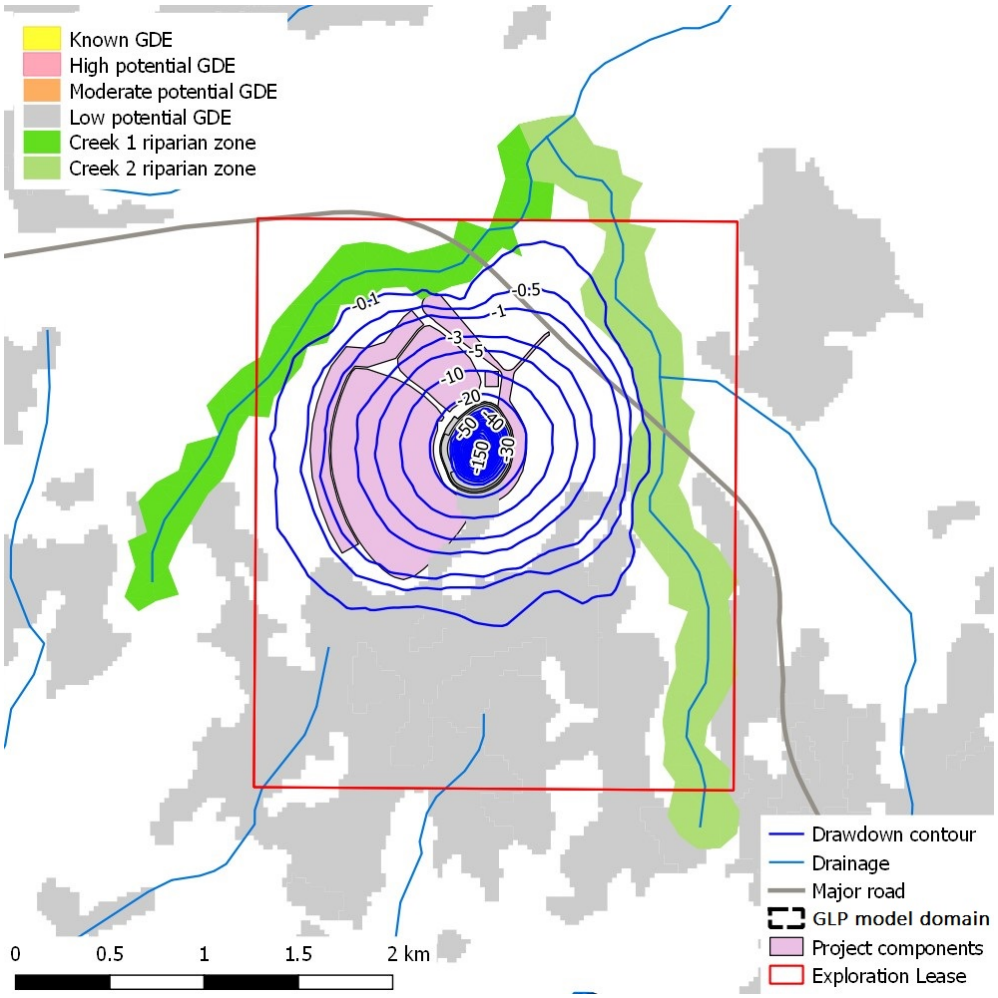


Figure 7-5. Final drawdown contours after 2 years of mining

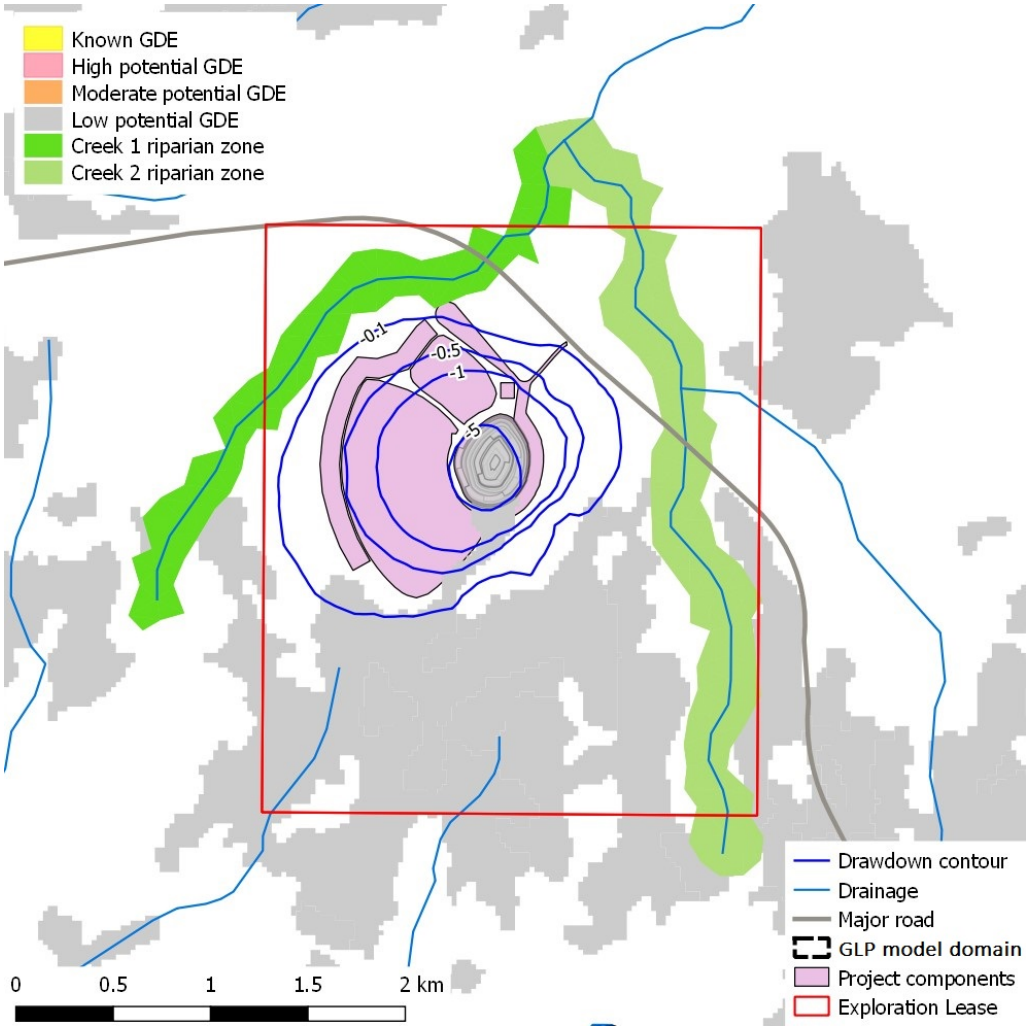


Figure 7-6. Post closure final drawdown contours after 70 years of recovery at year 2090.

Groundwater quality

Three groundwater sampling rounds have been undertaken on the six GLP monitoring bores: an initial event after bore construction (June 2017) followed by wet season and dry season sampling events in January and May 2018 respectively.

The groundwater quality in the deep monitoring bores (screening slightly weathered to fresh Burrell Creek Formation) is neutral to slightly acidic (pH 6.4 – 7.2) and fresh with an EC range of 168 – 280 µS/cm. There are no apparent spatial trends in EC between the bores or temporal trends between sampling events. The groundwater quality in GWB10 (shallow bore) is very fresh (EC 20 – 25 µS/cm) and mildly acidic (5 – 5.2 pH), these results are characteristic of rainfall. The bore has a very shallow screened interval (0.5 – 6 m) which suggests the shallow groundwater is well connected with surface drainage at this location

Water quality samples for the 2018 sampling events have been analysed against the ANZECC 2000 water quality guideline for 95% freshwater ecosystem protection. The arsenic concentration exceeds guideline values in all four deeper bores (GWB01, GWB03, GWB07, GWB08), copper and zinc concentrations exceed guideline values in GWB10. All bores (excluding GWB06) exceed nutrients guidelines for Ammonia and Total Phosphorus, GWB10 also exceeds the Nitrate and Nitrite guideline for 2018 dry season sampling event. All other dissolved metal and nutrient concentrations are below guideline values.

Pit lake assessment

At the completion of mining the pit is modelled to fill over a period of approximately 50 years forming a pit-lake with a final water level of 12 – 13 mASL reached around 2070 (see Figure 7-7). With a surface elevation around 20 mASL this corresponds to a pit lake water level in the order of 7 – 8 m below the existing land surface.

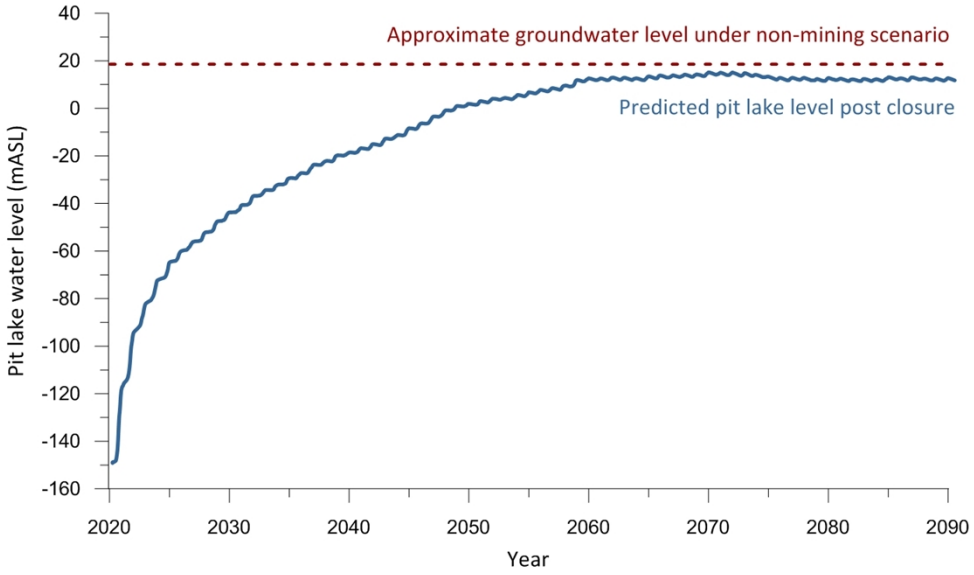


Figure 7-7. Pit lake water level after mine closure

The pit-lake will only reach a level below the predicted 12 – 13 mASL if the groundwater inflow is less than 260 m^3/d (~3 L/s) resulting in a deficit in the annual pit water budget. If groundwater inflows into the pit are greater than approximately 3 to 4 L/s the pit water lake will recover to a level approaching the pre-mining condition.

Under the modelled closure scenario, the pit lake is categorised as a groundwater sink using the classifications in the Western Australian interim guidance on pit lake assessments (DMP, 2015). A pit lake operating as a groundwater sink has an average lake level that is lower than the surrounding water-table resulting in the creation of groundwater gradients toward the pit lake and groundwater discharge into the pit lake.

The inflow and outflow volumes are drawn from the model pit lake water balance from 2020 – 2090. The model assumes a groundwater input salinity of 220 µS/cm which represents the average EC from the deep monitoring bores across the site. The model assumes a rainfall salinity of 10 µS/cm which is consistent with Darwin rainfall EC from the peak wet season months (Crosbie et al. 2012).

The estimated pit lake salinity from mine closure to 2090 is shown in Figure 7-8. The model suggests that the pit lake salinity will rise from an initial value of around 40 µS/cm to a final salinity of 290 µS/cm in 2090.

A review of water quality sampling from other similar pit lakes/dams in the vicinity of the GLP shows OHD with an EC of 19 µS/cm and an abandoned historic BP mining pit 5 km south of the GLP with a salinity ranging from 17 – 26 µS/cm. These results are notably fresher than the modelled salinity for the GLP pit lake and suggest that the mass balance model is overestimating the long term EC in the GLP pit lake. A contributing cause may be the groundwater input salinity, the model assumes a groundwater inflow EC based on the deep observation bores. Once the Lake level has stabilised the majority of groundwater inflow will be drawn from the shallow groundwater system. Water quality sampling results from observation bore GBW10 indicates the shallow groundwater has an EC in the order 25 µS/cm in contrast to the deeper system with an average salinity of 220 µS/cm. Re-running the mass balance model with a groundwater inflow EC of 25 µS/cm results in a final pit lake EC of 50 µS/cm (Figure 7-8), which is more consistent with EC values observed in neighbouring pit lakes/dams.

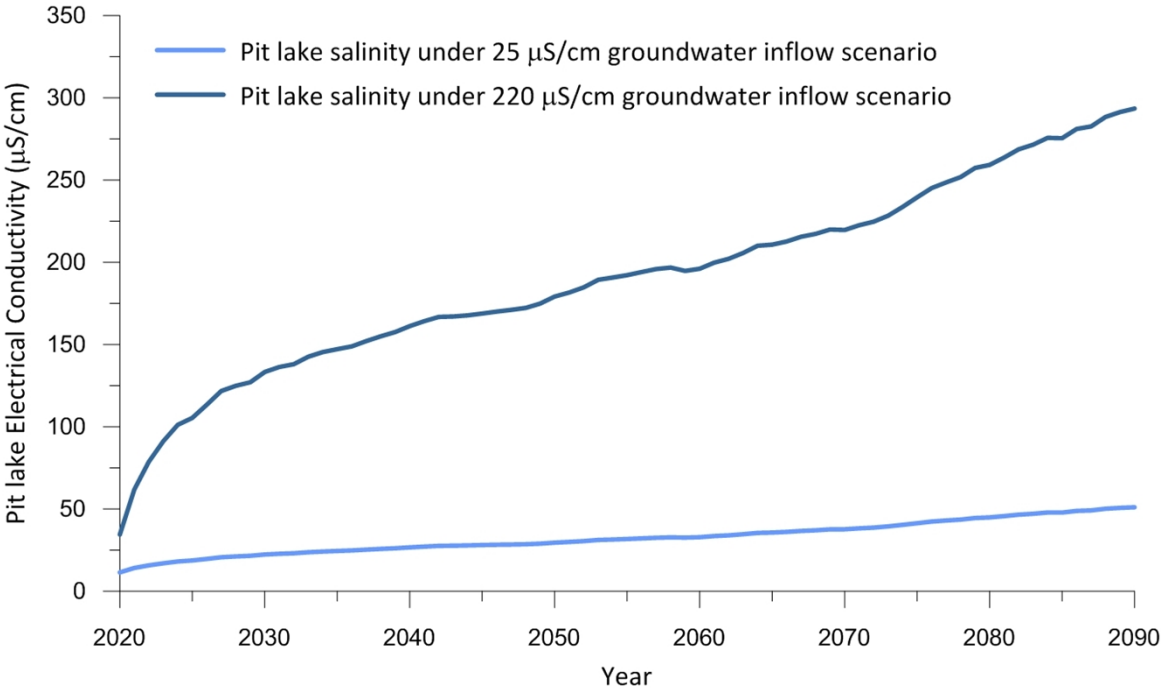


Figure 7-8. Projected pit lake EC under two groundwater EC inflow scenarios

7.4 Hydrology

Site hydrological description

The two major watersheds dividing the Project area are the Darwin Harbour West Arm watershed and the lower reaches of the into Bynoe Harbour/Charlotte River watershed (Figure 7-9).

Most of the natural drainage on the lease drains north towards West Arm. There is a small amount of drainage on the lease toward the southwest into Bynoe Harbour. The pit, WRD and processing infrastructure are all within the Darwin Harbour West Arm watershed. OHD is within the Charlotte River/Bynoe Harbour watershed.

Figure 7-9. Map showing catchments, drainages and discharge points used in modelling

Within the two major watersheds stream catchments and sub-catchments have been defined. There are two stream catchments within the Darwin Harbour West Arm watershed (catchments 2 & 5) and two stream catchments within the Bynoe Harbour/Charlotte River watershed (catchments 1 & 4). A fifth catchment, Catchment 3, which is located outside the boundaries of ML 31726, contains the OHD. Details of the catchments are given in Table 7-2. All channels within the catchments are ephemeral apart from the lower tidal reaches for Catchments 1 and 4.

Table 7-2. Catchment dimensions, locations and RFFE peak discharges

Catchment	Area (km^2)	Stream slope (%)	Catchment Outlet		Catchment Centroid		RFFE Peak Q 1% AEP (m^3s^{-1})
			Easting (m)	Northing (m)	Easting (m)	Northing (m)	
1	7.85	0.8	689399	8595418	690486	8597417	100
2	6.27	0.6	689491	8594946	694459	8598489	98.2
3	1.65	NA	695354	8594041	695525	8595204	43.8
4	10.70	0.6	689836	8595229	692746	8595951	124
5	7.27	0.5	693329.7	8600669	692144	8599234	109

Within the catchments there is a number of sub-catchments. The sub-catchments were used to develop a site hydrological model. The details of the sub-catchments and the outputs of the model are shown in the next section.

Surface water flow

Surface water flows were modelled using a HEC-HMS model (EnviroConsult 2018) for each of the sub-catchments within the Darwin Harbour West Arm and Bynoe Harbour/Charlotte River watersheds under pre-mining conditions.

Table 7-3. Pre-mining water balance modelling

Sub-catchment	Area (km^2)	Low rainfall year		Average rainfall year		High rainfall year	
		Streamflow (ML)	Losses (ML)	Streamflow (ML)	Losses (ML)	Streamflow (ML)	Losses (ML)
5a	4.8	3375	1426	6318	2355	10697	2903
5b	2.4	1550	791	2934	1295	5004	1628
2a	3.4	1893	1310	3674	2112	6533	2540
2b	3.0	1907	1082	3634	1765	6248	2218
1a	3.93	2996	903	5514	1530	9118	1928
1b	1.96	1304	644	2460	1059	4190	1329
1c	2.26	1307	931	2541	1502	4540	1799
4a	4.20	3004	1160	5551	1972	9412	2384
4b	2.94	2672	239	4898	361	7609	638
4c	3.58	2460	1094	4613	1808	7833	2235

The sub-catchments were combined to show changes in water flows under pre- and post-mining scenarios in catchments 2 and 5 (where all mining infrastructure is located; flows associated with OHD are assessed separately). Models were run for low, average and high rainfall years and included all mine infrastructure (located in catchments 2 and 5). The changes in streamflow and where the loss occurs are shown in Table 7-4.

Table 7-4. Changes in flow conditions associated with mine infrastructure

Rainfall scenario	Pre-mining conditions		Post-mining conditions (with mine infrastructure and possible dam C5)					
	Streamflow (ML)	Losses (ML)	Streamflow (ML)	Losses (ML)	Storage in pit (ML)	Storage in Pool 1 (ML)	Storage in Pond 2 (ML)	Storage in dam C5 (ML)
Low rainfall year	8738	4432	7716	5492	62	503	156	308
Average rainfall year	16592	7441	15547	8453	153	501	155	291
High rainfall year	28503	9088	26092	11342	256	503	156	309

These simulations show that for the post-mining conditions, total catchment outflow decreases by 6.3% of the pre-mine outflow for the average rainfall years, 8.5% for the high rainfall years and about 11.7% for the low rainfall year. The average reduction due to the dam is only about 1.6% of the total pre-mine outflow. This additional flow reduction is due to evaporation of water from the dam.

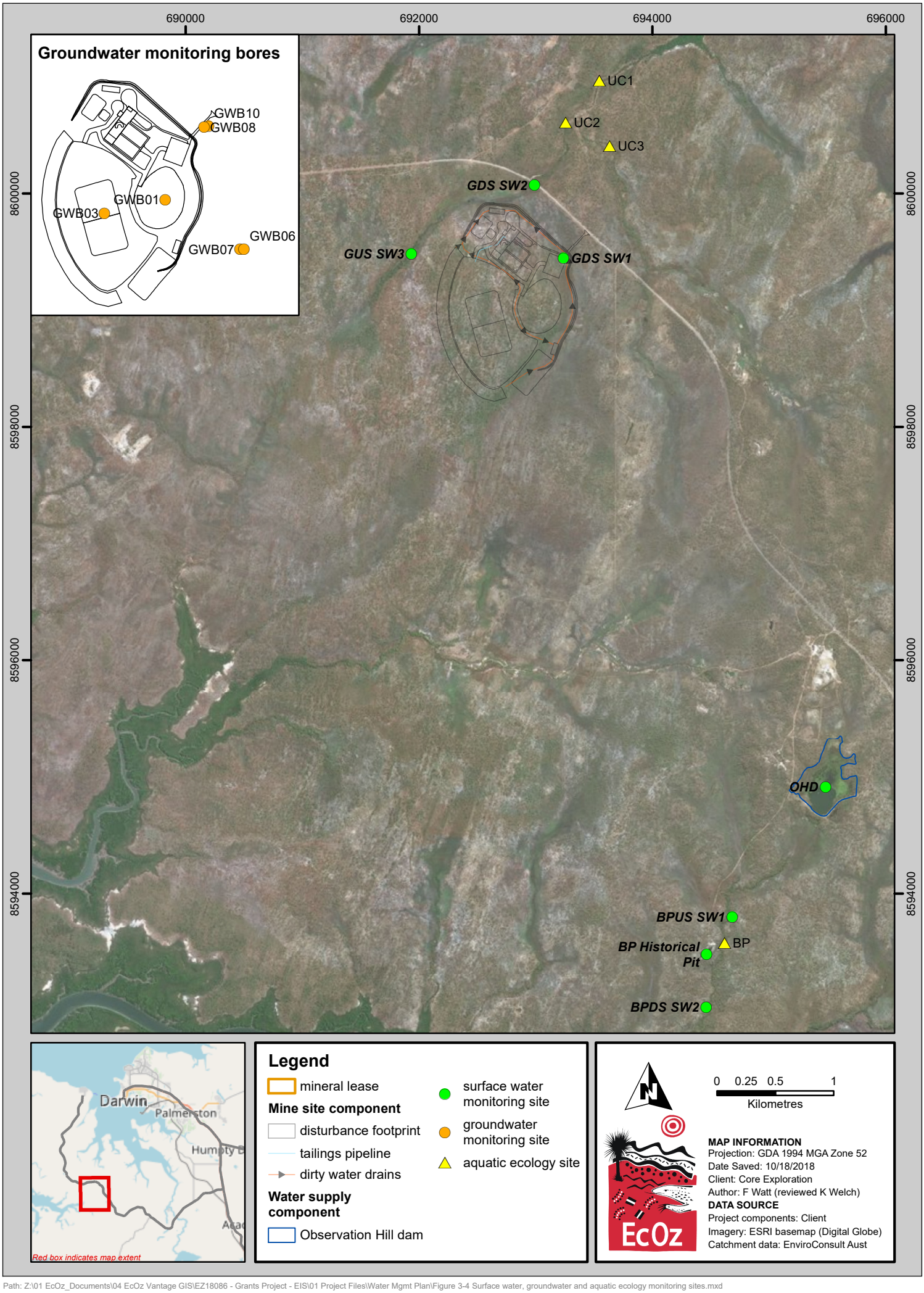
Streamflow in the Bynoe Harbour/Charlotte River Catchment will be affected by extraction of water for operational purposes and an increase in the height of the OHD wall. Raising the OHD wall height to a spillway level of 31.5 mAHD and pumping 2.02 MLd^{-1} reduces the streamflow volume by 1.79 % at the watershed outlet.

Surface water quality

A surface water quality monitoring program has been undertaken for over 12-months before commencement of mining. Surface water quality measurements have been recorded at 6 locations around the Project area; 3 within the Darwin Harbour West Arm watershed and three within the Bynoe Harbour/Charlotte River watershed (Figure 7-10). Details of the surface water monitoring sites are shown in Table 7-5.

Table 7-5. Water quality monitoring sites

Site ID	Coordinates MGA Zone 52		Catchment		Flows
	Easting	Northing			
GDS SW1	693238	8599446	**Darwin Harbour Catchment**	Site receives run-off direct from mining pit area.	Dries up early in the dry season.
GDS SW2	692989	8600072		Site receives run-off from mining pit area via GDS SW2 and other minor drainages also leading from the mine.	Possibly flows throughout the year.
GUS SW3	691935	8599484		Site located upstream of the mining pit area.	Dries up early in the dry season.
BP Historic Pit	694464	8593025	**Bynoe Harbour Catchment**	Historic mining pit now full of water. Mining was of a pegmatite very similar to that at Grants Lithium Project.	Water remains in the pit throughout the year.
BPUS SW1	694684	8593798		Site located upstream of historic mining pit.	Possibly dries up towards end of dry season.
BPDS SW2	694461	8593025		Receives run-off from historic mining pit area and any overflows from the pit.	Possibly dries up towards end of dry season.
OHD	695530	8594763		Historic dam used for mining. A water supply for Grants Lithium Project	Holds water year round.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18086 - Grants Project - EIS\01 Project Files\Water Mgmt Plan\Figure 3-4 Surface water, groundwater and aquatic ecology monitoring sites.mxd

Figure 7-10. Water quality monitoring locations

Water quality results are compared to the *Water Quality Objectives for the Darwin Harbour Region* (NRETAS 2010) for the reasons outlined in Section 3.2.3 above.

Field parameters measured at the sites upstream and downstream of the mine footprint (GUS SW3, GDS SW1 and GDS SW2) show the water is:

- Fresh, with low EC concentrations generally between 9 and 15 µS/cm, and always well below the water quality objective of 200 µS/cm.
- For the three sites, pH varies widely between 5.41 and 8.14 with no apparent seasonal pattern or trends. Within-site variability is also very large with each of the three sites recording both acidic and alkaline pH's at various times; often above and below the guideline range (i.e. outside the range 50% of the time). The reason for this is that pH in these waterways is highly responsive to change depending on the time of day, cloud-cover, flow velocity, groundwater, rainwater and run-off inputs, and the effect of photosynthesising/respiring plants and algae within the water column.
- Dissolved oxygen (DO) is generally between 60 and 100% and remains within the guideline range. There was no seasonal patterns or trends and within-site variability was large for the same reasons explaining pH variability. The low DO of 41%saturation measured at GUS SW3 in May 2018 is likely due to low flow conditions as the stream dries up in the absence of rainfall and the oxygen demand placed on the remaining small volume of water from organic matter breakdown and plant respiration (this reading was taken during the early morning following the night time period where plants are respiring and not photosynthesising).
- Turbidity levels are generally always low, even during high rainfall periods; remaining below 12 NTU and well below the water quality objective of 20 NTU.

Field parameters measured at the OHD site, BP Historic Pit site, and sites upstream and downstream of the BP 33 pit show the water is:

- Fresh, with low EC concentrations generally between 14 and 35 µS/cm, and always well below the water quality objective of 200 µS/cm.
- Similarly to the sites described above, pH varies widely at all four sites between 5.06 and 9.31 with no apparent seasonal pattern or trends. Within-site variability is also very large with each of the sites recording both acidic and alkaline pH's at various times; often above and below the guideline range (i.e. outside the range 50% of the time). The reason for this is that pH in these small, shallow drainage lines is highly responsive to change depending on the time of day, cloud-cover, flow velocity, rainwater and run-off inputs, and the effect of photosynthesising/respiring plants within the water.
- Dissolved oxygen (DO) is generally between 60 and 100% and remains within the guideline range. There was no seasonal patterns or trends and within-site variability was large for the same reasons explaining pH variability. The low DO of 41%saturation measured at GUS SW3 in May 2018 is likely due to low flow conditions as the stream dries up in the absence of rainfall and the oxygen demand placed on the remaining small volume of water from organic matter breakdown and plant respiration (this reading was taken during the early morning following the night time period where plants are respiring and not photosynthesising).
- Turbidity levels are generally always low, even during high rainfall periods; remaining below 12 NTU and well below the water quality objective of 20 NTU.

7.5 Seismicity

The Geoscience Australia Atlas of Seismic Hazard Maps of Australia (Leonard, et al. 2012), the 0.0 s Spectral Acceleration (SA) peak ground acceleration hazard value in the area for return period of 500 years is estimated between 0.03 g and 0.04 g (SA for Darwin is 0.0370 g in a 500 year return period). This is an area of low seismic activity and the Project area is at low risk from seismic activity.

7.6 Flora and fauna

Vegetation mapping, threatened species desktop assessments and targeted threatened species surveys have been undertaken across the project area.

7.6.1 Vegetation communities

Vegetation that occurs on the ML has been surveyed and mapped by EcOz Environmental Consultants (EcOz 2018b). Vegetation community descriptions of areas outside the ML, i.e. the water pipeline and the Observation Hill dam inundation footprint, have been derived from 1: 25,000 scale land unit mapping.

Five different vegetation communities occur in the disturbance footprint. Brief descriptions and areas of each of these communities within the disturbance footprint are documented in Table 7-6. Mapped vegetation communities, in conjunction with project components, are shown in Figure 5 1.

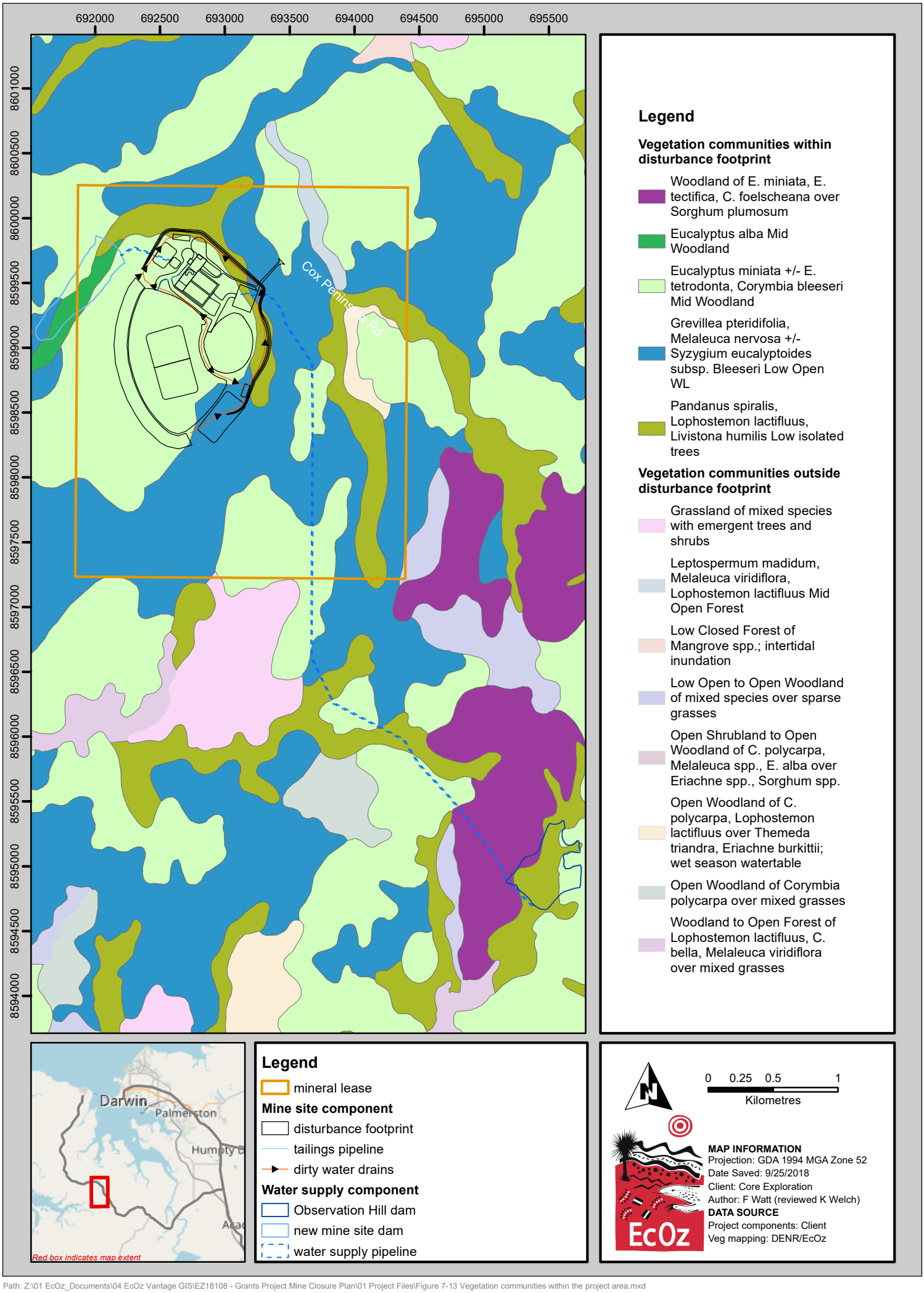
The disturbance footprint is dominated by Eucalyptus miniata, E. tetrodonta and Corymbia bleeseri woodland over open tussock grassland (75 % of the area). Drainage lines with Pandanus spiralis, Lophostemon lactifluus and Livistona humilis isolated trees over tussock understorey, and a small area of Eucalyptus alba woodland comprise 15 % of project area, and there are small shrubland to open woodland areas (10 %) of Grevillea pteridifolia and Melaleuca nervosa over open tussock grassland.

Table 7-6. Vegetation communities within the disturbance footprint

Vegetation description	Corresponding land unit	Area (ha)			Total
		Mine site	Off-site dams	Water pipeline	
Rises					
Woodland of *Eucalyptus miniata, E. tectifica, Corymbia foelscheana* over *Sorghum plumosum*	1b	-	2	1	**2**
Open woodland of *Eucalyptus miniata, E. tetrodonta* and *Corymbia bleeseri* over *Livistona humilis, Xanthostemon paradoxus* and *Erythrophleum chlorostachys* over open tussock grassland *Heteropogon triticeus, Sorghum intrans* and *Eriachne obtusa*	2a1	121	9	2	**133**
Drainage systems					
Low open woodland of *Grevillia pteridifolia, Melaleuca nervosa +/- Syzygium eucalyptoides subsp. Bleeseri* over open shrubland of *Petalostigma pubescens, Livistona humilis, Banksia dentata* over open tussock grassland of *Themeda triandra,*	6b	14	2	2	**18**

Eriachne obtusa and *Heteropogon triticeus*					
Alluvial plains					
Low isolated trees of *Pandanus spiralis, Lophostemon lactifluus, Livistona humilis* over sparse shrubland of *Pandanus spiralis, Lophostemon lactifluus, Livistona humilis* over tussock grassland of *Sorghum stipoideum, Eriocaulon spectabile, Melaleuca nervosa*	5a	12	6	<1	**19**
Woodland of *Eucalyptus alba* over a sparse shrubland of *Eucalyptus alba, Lophostemon lactifluus, Pandanus spiralis* over tussock grassland of *Sorghum plumosum, Germania grandifolia, Lophostemon lactifluus*		-	9	-	**9**
		147	**28**	**6**	**181**

The project area is dominated by *Eucalyptus miniata*, *E. tetrodonta* and *Corymbia bleeseri* woodland over open tussock grassland. There were also large areas of open woodland of *Grevillea pteridifolia* and *Melaleuca nervosa* over open tussock grassland. Drainage lines with *Pandanus spiralis*, *Lophostemon lactifluus* and *Livistona humilis* isolated trees over tussock understorey comprised 97 ha. Mapped vegetation communities, in conjunction with project components, are shown in Figure 7-11.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18108 - Grants Project Mine Closure Plan\01 Project Files\Figure 7-13 Vegetation communities within the project area.mxd

Figure 7-11. Vegetation communities within the project area

7.6.2 Significant and sensitive vegetation

In the NT, sensitive vegetation types are those considered 'significant' under the NT Land Clearing Guidelines (NRETAS 2010). These are rainforest, vine thicket, closed forest or riparian vegetation, mangroves, monsoon vines forest, sandsheet heath and vegetation containing large trees with hollows suitable for fauna. Riparian vegetation (associated with ephemeral streams) and some seasonal wetlands (drainage depressions) occur within the ML and surrounding areas, and mangroves associated with the upper reaches of West Arm occur approximately 1.7 km downstream of the mine site. The location of these vegetation types is shown in Figure 7-16. No other sensitive vegetation types are present.

Riparian vegetation is 'a distinct forest community occurring on the banks of rivers or streams that directly influences the adjacent water body' (DENR, 2018). When in good condition, riparian vegetation is considered a sensitive vegetation type as it supports a unique selection of habitat features that are relied upon by a range of flora and fauna species. Field surveys recorded a small patch of riparian vegetation in the north-east of the ML, to the north of Cox Peninsula Rd. The patch occurs on an ephemeral stream and is dominated by *Leptospermum madidum, Melaleuca viridiflora* and *Lophostemon lactifluus* (Figure 7-13).

Riparian vegetation at sites downstream of the Mine Site Dam and Observation Hill dam were surveyed and described by GHD (2017). The unnamed ephemeral streams downstream of the mine site, in the upper West Arm catchment, support a narrow band of generally sparse riparian vegetation dominated by overhanging Melaleuca spp. (Figure 7-12). A more dense and continuous riparian rainforest is evident along the watercourses downstream of Observation Hill dam that flow into Charlotte River (Figure 7-14). The structure of these communities suggests that they are supported by stream flows that extend into the dry season; however, the extent of groundwater dependence is unclear as surveys of the area by EcOz in October 2017 found that flows had ceased and water was confined to remnant pools.

No permanent wetlands are located within the project area. Some seasonally inundated areas are patchily distributed; these seasonal wetlands generally support sedges and herbs in the ground layer, and dry out later in the dry season (Appendix R of EIS). These patches, shown in Figure 7-15. Seasonal wetlands on the mineral lease and mapped in Figure 7-16. Sensitive vegetation in the broader project area, are not within the disturbance footprint.

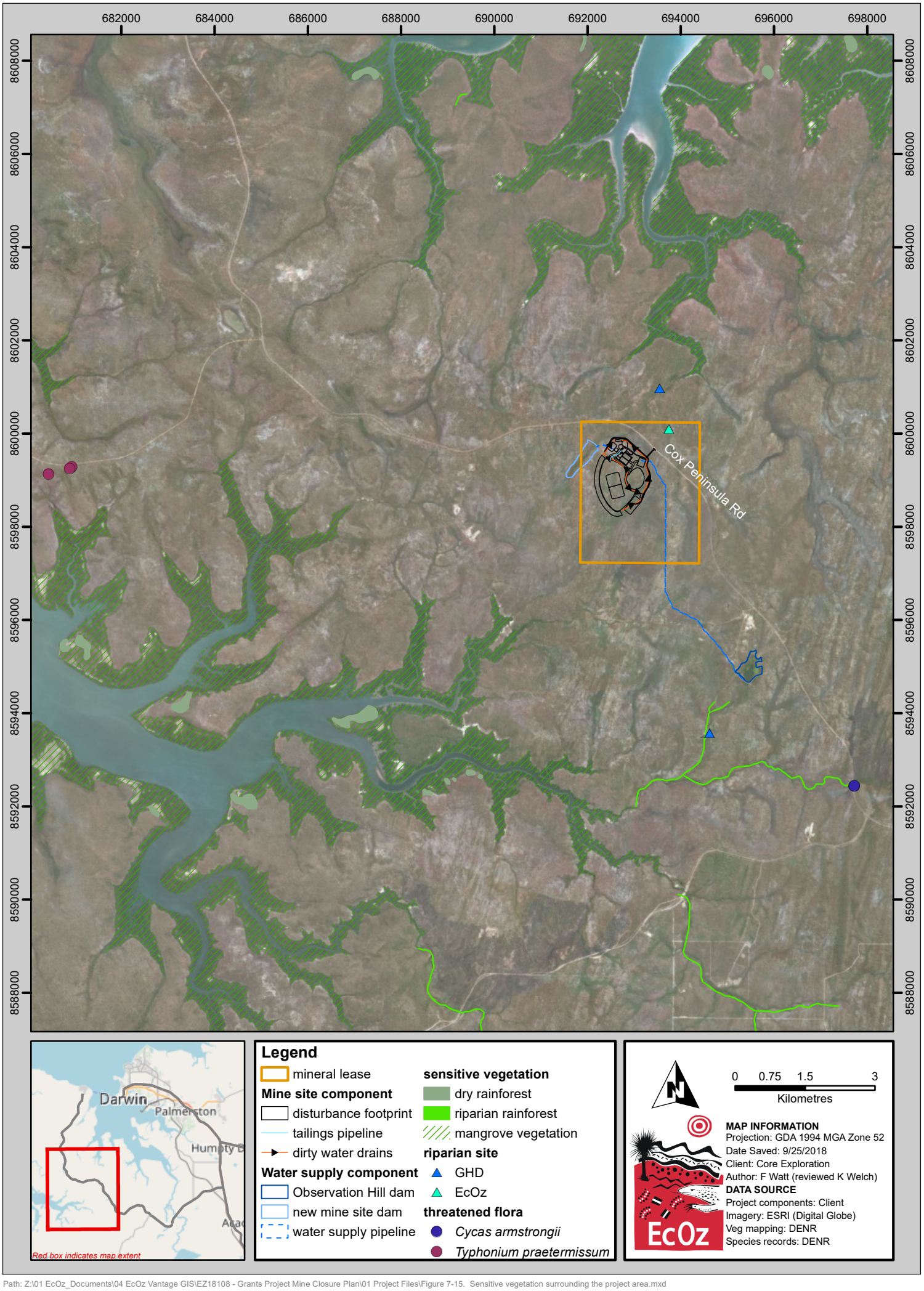
No riparian, wetland or mangrove communities are located in the direct disturbance footprint of the proposal.

Figure 7-12. Riparian vegetation within the project area

Figure 7-13. Riparian vegetation along unnamed ephemeral streams downstream of the Mineral Lease and Mine Site Dam

Figure 7-14. Riparian vegetation at site downstream of the Observation Hill dam

Figure 7-15. Seasonal wetlands on the mineral lease



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18108 - Grants Project Mine Closure Plan\01 Project Files\Figure 7-15. Sensitive vegetation surrounding the project area.mxd

Figure 7-15. Sensitive vegetation surrounding the project area

7.6.3 Threatened species

The likelihood that threatened species occur within the project area and the potential impact of the project on these species if they do, has been considered in the environmental assessment of the project (Chapter 5 of EIS). The assessment concluded that there would not be a significant impact to any threatened species through project development. Given that the project area does not provided habitat for threatened species and/or the project will not impact threatened species, rehabilitation does not aim to provide habitat for threatened species post closure. As such threatened species are not discussed further within this document.

7.6.4 Weeds

In the NT, introduced plants can be listed as weeds under the NT *Weed Management Act* as class A, class B and Class C weeds. The class of each weed confers different management responsibilities on the holder of the land on which the weed is found, these are:

- Class A: To be eradicated
- Class B: Growth and spread to be controlled
- Class C: Not to be introduced to the Northern Territory

Weeds can also be listed as a Weed of National Significance. There are two introduced plant species previously recorded within 10 km of the Project area (NR Maps NT 2018) – only one of these (Lantana) is a listed weed species. Species which may occur in the surrounding area are listed in Table 7-7.

Table 7-7. Introduced flora species within or near to the project area

Species	Observed during survey	NT *Weed Management Act* Classification	Weed of National Significance
Records from NR Maps NT			
Lantana *Lantana camara*	-	B/C	Y
Cynodon *Cynodon radiatus*	-	-	-
Ruellia tuberosa	-	-	-
Other introduced species within potential to occur in or near the project area			
Mission grass - perennial *Cenchrus polystachios*	-	B/C	-
Mission grass - annual *Cenchrus pedicellatus*	Y	-	-
Gamba grass *Andropogon gayanus*	-	B/C	Y
Euphorbia heterophylla	-	-	-
Coffee bush *Leucaena leucocephala*	-	-	-
Sicklepod senna *Senna obtusifolia*	-	B/C	-
Flannel weed *Sida cordifolia*	-	B/C	-
Paddy's lucerne *Sida rhombifolia*	-	B/C	-
Red natal grass *Melinis repens*	Y	-	-

Key: B/C – the species is listed as a Class B weed in the Northern Territory (Class B weeds are also listed as a Class C weed). Y – Yes

Field surveys determined that weeds density is low across the site. Although the site has historically been used for exploration and resource extraction, weeds have generally not established. There was one small patch of Annual Mission Grass along the existing access track from Cox Peninsula Road to the mine site. Annual Mission Grass was also observed along Cox Peninsula Road near the project area. Mission Grass and Gamba Grass are generally the most problematic weeds in the region and are the species of most concern for the project area.

7.7 Soils

Soils are classified in accordance with *Soil Groups of the Northern Territory* (Table 7-8); land unit mapping for the Grants Project (Greater Darwin 1:25,000) shows there are two soil groups within the mine site disturbance area. Land units are shown in Figure 7-17.

Table 7-8. Land unit and soils within the mine site disturbance area.

Land unit	Vegetation description	Drainage	Soil	Area (ha)	%
Rises					
2a1	Open woodland of *Eucalyptus miniata*, *Eucalyptus tetrodonta*, or *Corymbia foelscheana, Corymbia confertiflora*, *Eucalyptus tectifica* over mixed grasses	Nil to low level of seasonal waterlogging	Rudosols	121	82 %
Drainage systems					
6b	Tall shrub land to low open woodland of *Grevillea spp.*, *Melaleuca spp., Lophostemon lactifluus* over annual *Sorghum* sp., *Heteropogon triticeus.*	Severe level of seasonal soil waterlogging or inundation for extended periods	Hydrosols	14	10 %
Alluvial plains					
5a	Grassland of *Sorghum stipoideum*, *Eriachne burkittii*, *Paspalum scrobiculatum* with emergent trees	Severe level of seasonal soil waterlogging or inundation for extended periods	Hydrosols	12	8 %

The majority of the mine site disturbance area comprises Rudosol soils associated with land unit 2a1, with small areas of Hydrosols associated with land units 6b (drainage systems) and 5a (alluvial plains) (Table 7-8). Rudosol and Hydrosol soils are described below.

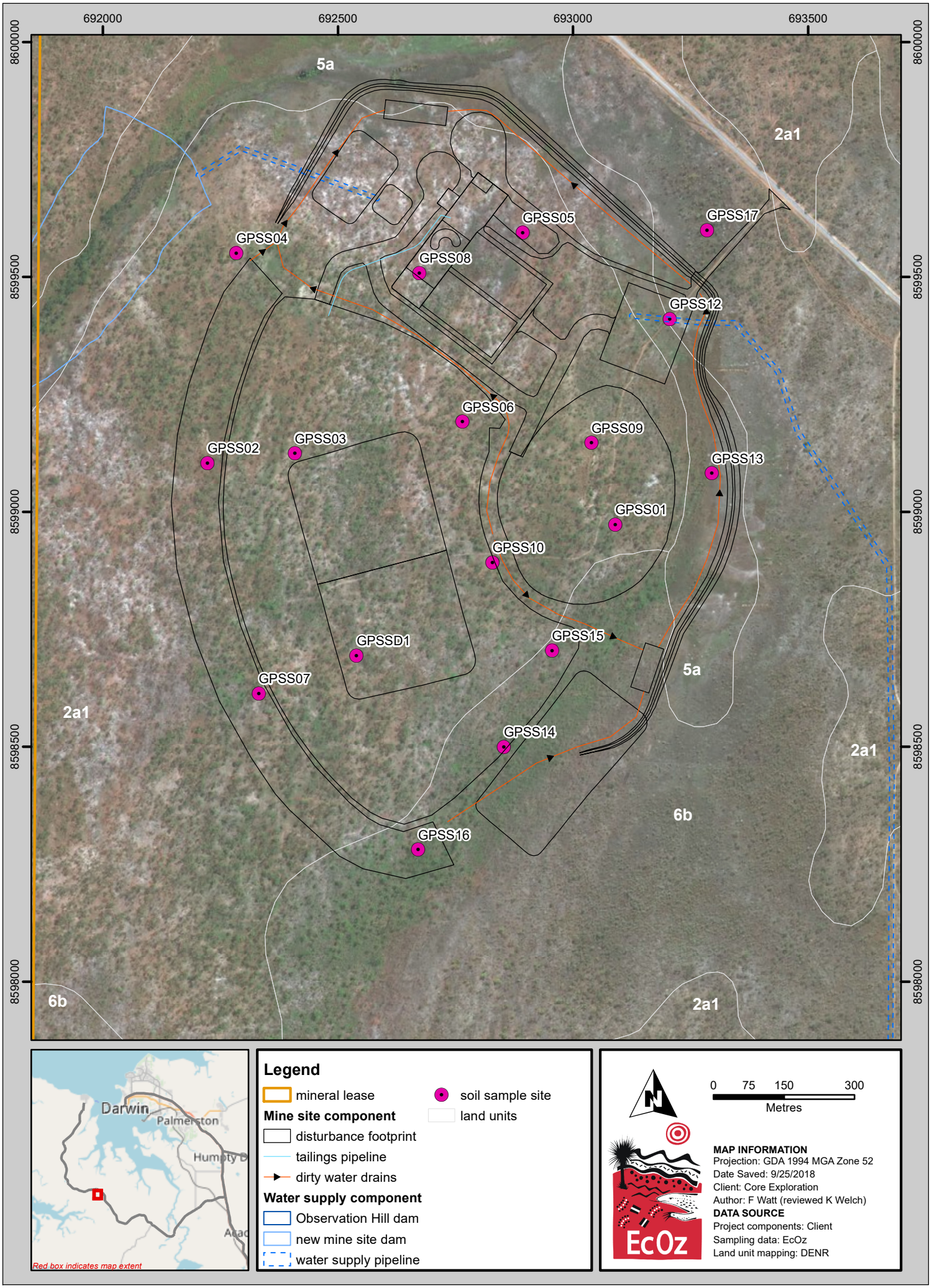
Land unit mapping shows the project area has a Nil (Class 1) risk of Acid Sulfate Soils (ASS) which correlates with the Land Systems of the Northern Part of the Northern Territory which shows there is no potential ASS within the project area.

Soil characterisation has been undertaken as part of the waste characterisation (Appendix E of EIS). The locations of the soil sample sites are shown in Figure 7-17.

The aims of the soil characterisation were to:

- determine the baseline growth medium attributes of each major soil type including nutrient status;
- evaluate potential risks associated with salinity, wind erosion and water erosion.

By characterising soils to address each of these aims, the suitability of the soils for rehabilitation of the site post closure can be inferred. The soils at the site, whilst having deficiencies, are considered suitable for rehabilitation. The key issues relating to soil suitability for rehabilitation and proposed management (where required) are discussed below.



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18107 - Grants Project - Waste characterisation\01 Project Files\Figure 3-2 Soil sample sites and land units within the mineral lease.mxd

Figure 7-17. Location of soil sample sites, land units and project components

7.7.1 Soil structure and stability

The soils may be described as clayey-silty gravelly sand. The soil particle density averages 2.59 g/m3 almost at the approximate value (2.65 g/m3) for most soils. Most of the soils within the disturbance area have loamy sand to sandy clay loam textures.

The potential for wind and water erodibility based on aggregate size is considered moderate to low. Erosion of soil is further considered in the Erosion and Sediment Control Plan (ESCP) for the project (refer Appendix F of EIS). The ESCP applies slope characteristics in conjunction with soil characteristics to determine the erosion hazard of each landform. Of note, the ESCP determined the erosion hazard for the waste rock dump to be moderate whilst the erosion hazard for other landforms to be very low; aligning to the results presented here.

A large percentage of the soils at the site may be regarded as moderately to highly sodic: 40 % of the samples (loamy and gravelly sand) are non-sodic whilst 28 % (in equal proportions) are low to moderately sodic and 32 % highly sodic. Soils at the site fall generally in Emerson Class 4 which suggests slaking but not dispersion and consequently the development of crusts and hard set layers. In order to counteract the effect of acidity and excessive sodium on the exchange complex and to reinstate soil aggregation, organic matter and calcium (gypsum) may be added, if required, which will lead to increasing pH and the removal of sodium and its replacement by calcium on the exchange sites which in turn reduces de-flocculation and allows natural aggregation of particles that eventually, improves soil structure. The application of gypsum is likely required for the soils at the site, the ratio of gypsum application should be determined through the rehabilitation trials.

7.7.2 Growth medium attributes

Based on the soils high sand and gravel content, the soil is estimated to have a bulk density between 1.3 g/cm^3 and1.7 g/cm^3 which is towards the upper end of the range where root growth is restricted (1.6 g/cm^3). Water holding capacity of sand is lower than other soils types and could affect rehabilitation success. This indicated low water holding capacity is backed up through determination of soil cation exchange capacity (CEC), which is low for soils from the site (0.2 meq/100g to 2.4 meq/100g). Soils with a low (< 10 meq/100g) CEC have low water holding capacities and are prone to leaching and nutrient loss which may be offset by maintaining organic matter in these soils.

Sulfur, nitrate (NO^2 + NO^3 as N), phosphorous and organic carbon (TOC) are below their desirable levels. However, the concentration of these nutrients fluctuate with soil and weather conditions over very short periods of time.

All of the soils are considered marginally acidic but of similar acidity of soils in the region. Soils are not considered acidic enough to cause aluminium toxicity, however, plant selection should take into consideration the soil acidity. Local species are expected to be able to deal with the soil acidity.

Analysis of baseline growth medium attributes indicates that whilst soils at the site have low nutrient concentrations and likely low water holding capacity, there are no major issues which will cause rehabilitation failure. The effect of nutrient concentrations, water holding capacity and acidity on rehabilitation success will be quantified during rehabilitation trials.

7.8 Waste rock characterisation

Sub-surface materials (waste rock) characterisation was undertaken for the purpose of:

- Characterising the physical stability (i.e. suitability for re-use as lining or armouring material) and potential growth medium attributes for rehabilitation.

- Evaluating potential risks associated with Acid Sulphate Soils (ASS), sodic/dispersive materials, acidic/metalliferous drainage and saline materials and/or drainage.

The characterisation program was developed with reference to the following guidelines:

- *Draft Guideline - Materials Characterisation – Baseline Data Requirements for Mining Proposals* (WA Department of Mines and Petroleum 2016).
- *Global Acid Rock Drainage Guide (GARD Guide)* (International Network for Acid Prevention (INAP), 2009).

The sampling methods, parameters analysed and results are summarised below from the complete report provided at Appendix E of the EIS.

Geological information

Geological logging from the Grants deposit drilling program indicates there are 10 geological rock-type domains of homogenous character that occur in the proposed pit shell. The lithologies and weathering profiles are described in Table 7-1. The proportional volumes of each rock type are indicated on the pie-chart at Figure 7-3.

Sampling and analysis

Samples from each weathering zone/lithology within the Grants pit shell were collected and analysed progressively as part of the exploration drilling program undertaken over 2016-2018. Samples were chosen to provide representation of the variability within each weathering zone/lithology encountered, with numbers of samples selected for analysis from each based on the relative contribution to the total waste rock volumes and the likelihood of Potentially Acid Forming (PAF) material.

A total of 156 samples were collected and submitted for analysis. The greatest number of samples were taken from the weather and fresh phyllite, which together comprise nearly 80% of the pit shell and therefore will be the predominant materials within the WRD. The drill hole locations are shown in Figure 7-18. The number of samples taken from each lithology/weathering profile is summarised in Table 7-9.

The weathered phyllite is a geological domain unlikely to be classified as PAF; however, because it comprises almost 50% of the pit shell and will be the main source of construction materials, a larger number of samples were taken to account for natural variability. Fresh phyllite is the geological domain at Grants most likely to be classified as PAF[8] and therefore a larger number of samples were collected from this rock type.

[8] Preliminary waste characterisation laboratory analyses suggested there is little sulfur present in the material, which is typical of the sedimentary environment in which it was deposited – rapid deposition inhibits sea-floor sulfur precipitation. The scarcity of pyrite in geological logging of drill core and reverse circulation (RC) drilling chips also supports this contention.

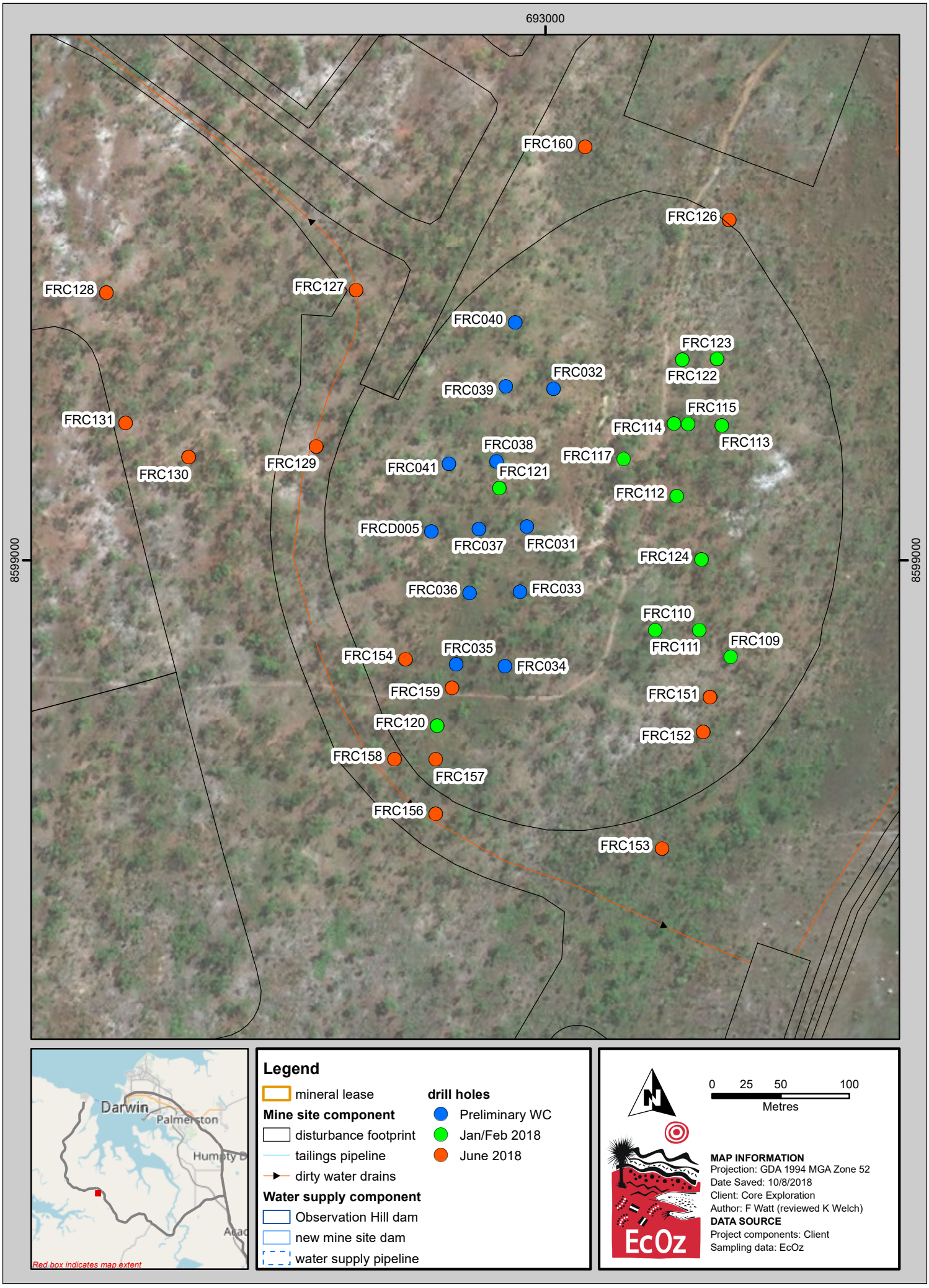
Table 7-9. Total number of samples per lithology/weathering profile

Material Type	Weathered	Transitional	Fresh	Total
Soil	2	-	-	**2**
Laterite	11	-	-	**11**
Clay	7	-	-	**7**
Pegmatite	4	1	2	**7**
Phyllite	58	15	44	**117**
Quartz/ Phyllite and Quartz	6	-	2	**8**
Sandstone	2	1	1	**4**
Grand Total	**90**	**17**	**49**	**156**

Samples were analysed for the parameters recommended in the *Draft Guideline - Materials Characterisation – Baseline Data Requirements for Mining Proposals* (WA Department of Mines and Petroleum 2016) (see Table 7-10). Laboratory tests were performed by Australian Laboratory Services (ALS), a National Association of Testing Authorities (NATA) accredited facility. NORM testing on a selection of samples was undertaken using a RadEye B20 – ER contamination meter (17 kEv – 3 MeV).

Table 7-10. Sub-surface materials analysis

Parameter	Relevance
Sulfur - Total as S	AMD screening
pH	AMD screening
Electrical Conductivity	AMD screening; saline drainage
Emerson Aggregate Test	Dispersive or sodic materials
Exchangeable Cations	Dispersive or sodic materials
Leachable metals	Metalliferous drainage
Soluble metals	Metalliferous drainage
Acid Neutralising Capacity (ANC)	Acidic drainage
Net Acid Production Potential (NAPP)	Acidic drainage
Net Acid Generation (NAG)	Acidic drainage
Naturally occurring radioactive material (NORM)	Radioactive materials



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ18107 - Grants Project - Waste characterisation\01 Project Files\Figure 4-1 Location of drill holes for waste characterisation.mxd

Figure 7-18. Location of drill holes for waste characterisation sampling

Waste rock characteristics

Table 7-11 summarises the waste rock characteristics.

Table 7-11. Summary of waste rock characteristics

Acid Sulphate Soils
None of the soil samples collected at the site are indicative of ASS. This result concurs with the land unit mapping, which shows the project area has a Nil (class 1) risk of ASS conditions.
Acid drainage potential
The majority of sub-surface material collected (164 samples) at the site have a sulfur concentration less than 0.05 %, which indicates a low risk of PAF material. 17 of 164 samples had an elevated sulfur concentration; only 1 of these within the pit shell is classified as potentially acid forming material. The sulfur concentrations in samples are low; total sulfur concentrations vary between <0.01 %S and 1.88 %S. 148 samples (or 90% of all samples) have total sulfur concentrations <0.05 %S indicating non- PAF material. Approximately 10% of samples have concentrations ≥ 0.05 %S. All of the samples were from depths > 50 m below surface level with the majority coming from deeper than 100 m below surface. All samples with a sulfur concentration > 0.10 %S (7 samples) were from greater than 100 m deep. Subsequent classification of samples based on NAPP and NAGpH (pHOX) results found only two samples classified as PAF. These samples are fresh hard rock phyllite located 125 m deep or deeper from the surface. One sample is from the south east section of the pit shell and the other from the central western half. Overall the waste rocks are considered materials with no AMD potential primarily due to the absence/scarcity of sulfur, which is typical of the sedimentary environment in which it was deposited. Waste rocks that classify as PAF will be limited in volume; they are not confined to a specific area and will be excavated with NAF materials and placed in the waste rock dump surrounded and underlain by materials that have sufficient ANC to offset any potential acid generation.
Metalliferous drainage potential
126 samples were analysed for soluble metal concentrations. Some samples have detectable but very low concentrations of As, Mn, Se and Zn whilst Cd, Cr, Co, Cu, Pb, Ni, V and Hg. All below their limits of reporting. Ten of these samples with Total Sulfur concentrations >0.04 %S was submitted for determination of leachable metals. The leachates contained As (1 sample at 0.2 mg/L), Ba (ten samples at between 0.2 mg/L and 0.3 mg/L), Cu (one sample at 0.1 mg/L), Zn (ten samples at between 0.1 mg/L and 0.4 mg/L) and Mn (ten samples at between 0.2 mg/L and 11.9 mg/L averaging 2.4 mg/L). Be, B, Cd, Cr, Co, Pb, Ni, Se, V and Hg were absent in leachates. Waste rocks may leach metals; however, concentrations will be low. This finding is corroborated by baseline surface and ground water monitoring which indicates: • Groundwater contains elevated concentrations of As (0.009 mg/L and 0.166mg/L) and Fe. Most other metals i.e. Al, Cd, Cr, Cu, Pb, Ni, Se, Zn and Hg are generally absent except for a few minor detections at very low concentrations. • Surface water contains Al (between 0.01 mg/L and 0.08 mg/L) and As (between <0.001 mg/L and 0.007 mg/L) whilst metals such as Cd, Cr, Cu, Pb, Ni, Se, Zn, Sn and Hg are below their limits of reporting.
Saline drainage potential
All had very low electrical conductivity (0.004 dS/m - 0.280 dS/m) and are considered low saline and highly unlikely to produce saline drainage.
Sodic or dispersive potential
33% of samples spread across the pit shell and at varying depths, were classified non-sodic but potentially dispersive. These samples have an Emerson Class Number 3 which indicates that remoulding (at moisture content near optimum for compaction) may cause dispersion. A high portion of the samples were from the highly to moderately weathered phyllite, with the highest occurrences in the eastern portion

of the pit shell from surface to 5m depth and from 8-54m depth across the whole pit shell. Where this material occurs in the shallow parts of the pit it is a potential source of construction materials and therefore further detailed geotechnical testing and assessment is required to characterise physical characteristics stability. Material from the deeper parts of the pit shell will be placed in the centre of the WRD and therefore dispersive characteristics in these materials is not of management concern.
Naturally Occurring Radioactive Material
Background and materials to be extracted from the pit shell as waste rocks have low concentrations of NORM which do not warrant further investigation and assessment and/or management measures.

Management

Approximately 9 million bcm of waste rock will be mined from the Grants pit. The shallow waste rock will be used in construction of roads, hardstands, water storages and dams, and in construction of the WRD base, annulus and TSF. Low permeability materials will be set aside for lining of the WRD internal area and TSF.

The sub-surface materials characterisation results indicate that some of the shallow waste rock has sodic or dispersive potential that could render it unsuited to use as a construction material. Some materials may also be unsuited as a sub-soil growth medium and should not be used in the WRD annulus or inundation bund. Further geotechnical testing of the shallow waste rock is required to characterise the physical stability of the materials. In conjunction with this work and as part of rehabilitation trials in year one of the mining schedule, further testing of the shallow waste rock will be undertaken to characterise growth medium attributes for rehabilitation.

Material not suited to or required for construction of site facilities, will be stored in the WRD. During Phase 1 the weathered waste materials excavated from the shallower parts of the pit shell will be used to construct the WRD annulus. Material with high clay content will be set aside for lining of the WRD internal area. This lining will encase any waste material that is prone to slaking or dispersion, and will provide a foundation for the TSF. Once the WRD annulus is constructed, waste rock and rejects from the crushing and screening process will be co-disposed in the WRD internal area. The waste rock characteristics indicate there is no requirement for specific containment structures within the WRD.

7.9 Volumes of materials for rehabilitation

Rehabilitation materials will be required for capping of the TSF cells and topsoil coverage of all domains. The capping material for the TSF cells will come from the overburden material extracted from the pit. The volume required still needs to be confirmed through geotechnical investigations, however, the relatively small volume of material required is expected to be available from the large estimate volume of overburden - 8,920,762 bcm.

The volume of topsoil required for rehabilitation also needs to be finalised. The topsoil stripped from site will be used for rehabilitation purposes. The volume of material, 211,000 bcm, is expected to be sufficient for rehabilitation of domains.

7.10 Further information required

This section provides results of baseline information that has informed the identification of closure issues (section 8). Although it is considered sufficient for the identification of risks to rehabilitation, further information is required to refine the severity of potential impacts and inform management measures. Core proposes to collect the following information through the remaining of project planning and through mine operations:

- Determination of physical stability of overburden waste material and its suitability for construction
- Determination of material volume requirements for rehabilitation and sources of material
- Selection of plant species for rehabilitation – determined through rehabilitation trials.

8 IDENTIFICATION AND MANAGEMENT OF CLOSURE ISSUES

8.1 Assessment approach

A whole-of-proposal impact analysis and risk assessment was undertaken for preparation of the EIS. Separate risk assessments were undertaken for the construction/operations phase and the rehabilitation/closure phase. For the closure phase, potential impacts and risks were assessed for each of the closure domains.

Criteria were developed to rank the likelihood and consequence (severity) of each identified impact. The likelihood descriptors take into account the type of activity, the nature of the environment where the proposal will take place and experience in relation to similar activities/projects. The consequence descriptors take into account the scale, intensity, duration and frequency of impacts (i.e. criteria used to determine the severity of potential impacts) and also the importance/sensitivity of the receiving environment. The criteria used in the risk assessment process are set out in Table 8-1 and Table 8-2 respectively.

Only general categories are shown in the consequence table – full consequence descriptions have been developed for each environmental area (factor) and are available in chapter 4 of the EIS. The risk matrix (Table 8-3) was used to assign risk ratings, which consider both the severity of the potential impacts (consequences) and the likelihood of those impacts occurring.

Table 8-1. Likelihood categories and descriptions used in risk assessment.

Categories	Score	Description
Almost certain	5	The event/impact will occur or is expected to occur. The impact occurs regularly in association with similar projects and/or in similar environments.
Likely	4	The impact will probably occur in most circumstance but there is some uncertainty about the likelihood. The impact has occurred on more than one occasion in association with similar projects and/or in similar environments.
Possible	3	The impact could occur in some circumstances. The impact has occurred infrequently on similar projects and/or in similar environments.
Unlikely	2	The impact is not expected to occur. The impact occurs very infrequently on similar projects and/or in similar environments.
Rare	1	The impact is very unlikely to occur. The impact has not occurred on similar projects and/or in similar environments.

Table 8-2. Consequence categories and descriptions used in the risk assessment.

Consequence category	Score	Terrestrial Flora and Fauna	Terrestrial Environmental Quality	Inland Water Environmental Quality	Hydrological processes	Social, Economic & Cultural Surrounds	Community Health & Safety
Severe **A Severe impact has two or more of the following characteristics:** **Widespread =** Impact occurs across the broader Cox Peninsula region and/or extends to the marine waters of West Arm or Bynoe Harbour. **High Intensity =** Impact alters the integrity of environmental values. **Permanent** = Impact is permanent - values will never recover.	5	Widespread impacts to terrestrial flora and fauna that permanently alter biodiversity and/or ecological integrity.	Widespread soil disturbance, erosion or contamination that irreversibly alters the integrity of environmental values that rely on good soil quality.	Permanent major exceedance of water quality criteria for beneficial uses in the marine receiving waters of West Arm or Bynoe Harbour.	Catchment wide reduction in surface water flow volumes and/or timing of flows/discharges that permanently alters the ecological health, land-uses and/or amenity. Drawdown of groundwater in a regional scale aquifer that permanently alters ecological health, land-uses and/or amenity.	Permanent impact that is felt by the majority of the regional population. Unauthorised destruction of Aboriginal Sacred Sites and/or sites of national heritage significance.	One or more fatalities. More than 1 people injured with permanent disabilities.
Major **A Major impact has two or more of the following characteristics:** **Regional =** Impact occurs over a larger area than the Mineral Lease/s and/or extends to the catchment outlets to West Arm or Charlotte River. **Moderate to High Intensity** = Impact compromises the integrity of environmental values. **Long-term** = Impact that is felt for many years post-closure.	4	Regional scale impacts to terrestrial flora and fauna that compromise biodiversity and/or ecological integrity. Recovery is possible but will take many years.	Regional scale soil disturbance, erosion or contamination that compromises environmental values that rely on good soil quality. Recovery is possible but will take many years.	Major exceedance of water quality criteria for beneficial uses at the catchment outlets to West Arm or Charlotte River. Recovery is possible but will take many years.	Reduction in surface water flow volumes and/or timing of flows/discharges that compromises ecological health, land-uses and/or amenity. Recovery is possible but will take many years. Drawdown of groundwater in a regional scale aquifer that compromises ecological health, land-uses and/or amenity. Recovery is possible but will take many years.	Long-term impact that is felt by some of the regional population. Impact is felt for many years post-closure. Unauthorised damage/desecration of Aboriginal Sacred Sites and/or sites of regional heritage significance such that site integrity is lost.	No fatalities. One injury with permanent disability. More than 10 injuries requiring hospitalisation.
Moderate **A Moderate impact has two or more of the following characteristics:** **Localised =** Impact to environmental values within boundaries of Mineral Lease/s or in the ephemeral watercourses downstream of the sub-catchment outlet. **Low Intensity =** Impact alters the quality, abundance or distribution of environmental values without compromising ecological integrity. **Medium term** = Impact that is felt during operations and for some months post-closure.	3	Localised impact to flora and fauna that alters the quality, abundance or distribution of ecosystem components but with no measurable impact to biodiversity and/or ecological integrity. Recovery is possible within a short-period of time post-closure.	Localised soil disturbance, erosion or contamination that alters soil characteristics but with no measurable impact to environmental values that rely on good soil quality. Recovery is possible within a short-period of time post-closure.	Minor sustained exceedances of water quality criteria for beneficial uses in the ephemeral water courses downstream. Impact occurs throughout operations but ceases within months post-closure.	Reduction in surface water flow volumes and/or timing of flows/discharges that extends downstream of the sub-catchment outlet but with no impact on ecological health, land-uses and/or amenity. Localised drawdown of groundwater throughout operations that recovers within a short period of time post-closure.	Medium term impact that is felt by a small number of people during mining operations. Impact ceases within months post-closure. Unauthorised entry to a Restricted Works established for protection of Aboriginal Sacred Sites but with no physical impact to the site. Unauthorised damage to protected archaeological heritage sites assigned a Moderate level of significance such that site integrity is lost.	No fatalities. No permanent disability. 5-10 injuries requiring hospitalisation.
Minor **A Minor impact has two or more of the following characteristics:** **Limited =** Impact occurs within the immediate disturbance footprint only or in the short-section of ephemeral watercourse between the mine site and sub-catchment outlet **Very Low Intensity =** Impact does not noticeably alter the quality, distribution or abundance of environmental values. **Short-term =** Impact that is felt during the mining operations phase only.	2	Limited impact to flora and fauna that does not noticeably alter environmental values. Impact ceases once operations cease.	Short-term soil disturbance, erosion or contamination that does not noticeably soil characteristics outside of the immediate disturbance footprint (limited).	Minor temporary exceedances of water quality criteria for beneficial uses at the mine site discharge points and immediate sub-catchment area. Impact occurs throughout operations but ceases immediately once operations cease.	Reduction in surface water flow volumes and/or timing of flows/discharges in the immediate sub-catchment area with no impact on ecological health, land-uses and/or amenity downstream. Impact ceases once operations cease. Limited drawdown of groundwater throughout operations that recovers immediately once operations end.	Short-term disruption/ nuisance that is felt by a small number of people. Impact is felt during the mining operations phase only. Unauthorised damage to protected archaeological heritage sites assigned a Low level of significance.	No fatalities. No permanent disability. Less than 5 injuries requiring hospitalisation.
Insignificant No noticeable/measurable impact to values	1	No measureable impact to terrestrial flora and fauna	No measurable soil disturbance, erosion or contamination	No measurable exceedance of pre-development water quality conditions.	No measurable change to hydrological regimes	No noticeable impact to stakeholder and/or community values. No impact to Aboriginal Sacred Sites and/or heritage sites.	No fatalities. No permanent disability. No injuries requiring hospitalisation.

Table 8-3. Risk assessment matrix

			Consequence Severity				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Severe
Likelihood	5	Almost Certain	2 - Medium	3 - High	3 - High	4 - Very High	4 - Very High
	4	Likely	2 - Medium	2 - Medium	3 - High	3 - High	4 - Very High
	3	Possible	1 - Low	2 - Medium	3 - High	3 - High	3 - High
	2	Unlikely	1 - Low	1 - Low	2 - Medium	3 - High	3 - High
	1	Rare	1 - Low	1 - Low	1 - Low	2 - Medium	3 - High

Table 8-4. Risk level and target action matrix used to evaluate risks

Risk Level	Target action
Very High	Risk is unacceptable. Specific action plans required to reduce risk to an acceptable level. Director/CEO level management attention required.
High	Risk is generally unacceptable without action. Specific action plans required to reduce risk to ALARP. Senior management attention required.
Medium	Risk is generally acceptable. Proactive action is required to reduce risk to ALARP. Requires routine monitoring and adaptive management in accordance with Environmental Management Plan (EMP). Line management attention required.
Low	Risk is acceptable. Management by routine policies and procedures.

8.2 Risk assessment summary

Table 8-5 provides a summary of closure risks with a high inherent risk rating. The full risk register is provided in Appendix A.

Table 8-5. Summary of closure issues identified during the risk assessment

Closure risk	Possible causes	Domains
Failure of rehabilitation	Unsuitable rehabilitation works Poor drainage design Lack of suitable materials for rehabilitation	All
Landform instability	Inappropriate landform design Poor drainage management/ erosion and sediment controls	All
Sedimentation of watercourses	Inappropriate erosion and sediment controls Dam wall failure Inappropriate landform design	All
Contamination of surface water or groundwater	Hydrocarbon contamination from fuel storages Contamination of surface water or groundwater through mine drainage	Support infrastructure Pit WRD
Safety due to landforms or infrastructure	Slips trips or falls from land forms or infrastructure Lack of barriers to prevent access	ROM pad Pit WRD
Downstream flooding	Failure of dam walls	OHD, MSD

8.3 Management of closure issues

The risk assessment was used to identify potential issues that may impact on Core's ability to meet the post-mining land use objective and closure criteria and thus the ability to relinquish the site. For each potential impact, mitigation measures were identified to reduce risk to as low as reasonably practicable (ALARP). These measures are documented in the risk register at Appendix A. Table 8-6 summarises the key management controls identified for each closure domain.

Table 8-6. Summary of management controls

Domain	Management Controls
WRD	Progressive rehabilitation of external faces Ongoing materials characterisation Closure ESCP
TSF	Inspection of TSF on closure to ensure constructed in accordance with design Encapsulation of TSFs within WRD landform
ROM pad	Removal of all infrastructure on mine closure Removal of fuels from site on closure Closure ESCP
Pit void	Installation of abandonment bund Geochemical testing of pit wall lithologies during mining
Flood diversion bund	Progressive rehabilitation of flood diversion bund

Domain	Management Controls
	Closure ESCP
Support infrastructure	Removal of infrastructure and re-profiling to match surrounding landform Rehabilitation on closure Soil testing and remediation of any contamination Closure ESCP
Observation Hill Dam	Inspection of Dam wall on closure Closure ESCP
Mine Site Dam	

8.4 Residual risk

Implementation of management controls and other closure tasks detailed in the Closure Work Program (Section 9.2) aims to reduce the risk of the potential impacts affecting successful mine closure. Subject to effective implementation of the controls outlined in this MCP, most risks were reduced to medium or low.

There are two potential impacts with a high residual risk:

- Reduced habitat value of the WRD due to failure of rehabilitation (establishment/weeds)
- Landform instability of WRD leads to erosion of surface of time.

Although the WRD will be progressively rehabilitated with species representative of local species, experience from other mine sites in the NT, indicates that rehabilitation failure leading to reduced habitat quality is a common occurrence. This may be due to poor soil quality, erosion, or the relatively steep landforms that are an outcome of WRD creation. Similarly, although there is low weed numbers and abundance at Grants Lithium Project, weed invasion and spread during rehabilitation is still a moderate risk based on experience. Despite the implementation of a weed management plan, and weed monitoring during rehabilitation, weed impacts on habitat quality are a possibility. Rehabilitation will be monitored until the rehabilitation criteria are met, allowing for early intervention if there are areas where rehabilitation has failed.

The WRD is outside the calculated zone of instability around the pit edge. The Mine Closure Plan includes details of the zone of instability and works that will be undertaken to stabilise the pit high walls. Subject to effective implementation of the closure plan, landform instability due to failure slumping of the pit wall is unlikely to contribute to erosion. Landform instability could also occur as a result of unconsolidated tailings in the TSF. As the TSF will be contained within the WRD landform, any TSF closure issues could impact long-term stability and lead to erosion. To ensure a stable foundation for placement of the TSF cover layer, tailings will need to be monitored in advance of placement. This will include monitoring of the pore pressure build up from rapid loading (with push in piezometers) and monitoring bearing strength of the tailings (with shear vane testing equipment). Monitoring of tailings during cover construction may indicate a change to the construction method is required, for example slowing the placement to allow pore pressure dissipation, or ability to increase cover layer thickness if tailings strength is sufficient to support this. Prior to commencement of TSF closure works, the Mine Closure Plan will be updated to reflect the program of works required to close the as constructed facilities. This plan will be subject to review and approval by DPIR. Subject to development and implementation of a final closure plan that is acceptable to DPIR, the TSF is not expected to be a major cause of instability in the WRD landform.

The WRD is outside the calculated zone of instability around the pit edge. Subject to effective implementation of the closure plan, landform instability due to failure slumping of the pit wall is unlikely to contribute to erosion.

9 CLOSURE IMPLEMENTATION

9.1 Closure strategy

The planned closure strategy will involve the following key components:

- Shut-down and infrastructure removal
- Stabilise and secure open pit
- TSF closure
- Temporary stabilisation of post-mining landforms
- Permanent stabilisation.

This planned closure strategy is reflected in the work program detailed in Section 9.2 where further detail is provided. Although not anticipated, mining may cease earlier than expected through temporary suspension (care and maintenance) or unforeseen closure; an example of when this is required if there were financial or safety reasons. Under these scenarios landforms and features will not have been finalised to an agreed closure standard and completion criteria will not have been met. Under either of these scenarios, the environmental and rehabilitation liability remains with Core who is committed to minimising the environmental impact through these closure scenarios and minimising the liability placed on the Northern Territory Government. The process in these scenarios is detailed in Section 9.3.

9.2 Closure work program

The closure work program is detailed below. The closure work program provides the general activities that will be undertaken for each of the stages outlined in the closure strategy. As much information is provided on each task as possible but the current stage of project planning (feasibility stage) means this level of information varies between tasks. The closure work program will be updated in future revisions of this plan.

9.2.1 Schedule

The bulk of closure and rehabilitation activities are planned to occur over months 26-30 of the project schedule. Some progressive rehabilitation of the WRD will occur at the end of year one, as once the external face (annulus) is complete the surface can be re-profiled (as required) covered with reserved topsoil, ripped and seeded. The flood bund will also be revegetated early in the mine life to minimise erosion.

9.2.2 Progressive rehabilitation and rehabilitation trials

The short mine life limits the opportunity to complete rehabilitation progressively; however, Core is proposing to progressively rehabilitate the outer walls of the WRD annulus. Once the annulus is completed (expected to be the end of year one of operations) the external face of the WRD will be re-profiled (as required), ripped, covered with topsoil & seeded.

The progressive rehabilitation will also act as rehabilitation trial, the information from which will help inform final rehabilitation. The rehabilitation trials will assess:

- Bulk density and water holding capacity.
- Nutrient concentrations in soil immediately prior to rehabilitation.
- Appropriate plant selection to maximise rehabilitation success in soils from site.
- Stability and erosion of soil when applied to final landform.
- Effect of soil amelioration, through application of gypsum, on rehabilitation success.

Aspects that are to be monitored during rehabilitation include the behaviour of the rehabilitated surface with regard to sodicity and slaking (the potential deterioration of the physical condition of the soils and particularly hard setting and erosion which limits infiltration, drainage and plant growth).

Following the rehabilitation of the outer walls of the WRD, rehabilitation monitoring will be undertaken annually (Section 10.2). This monitoring will help determine the likely success of rehabilitation. This information will be used to review the MCP for the subsequent period, and the rehabilitation strategy will be updated if required. If the rehabilitation shows considerable failure, the rehabilitation strategy and permanent stabilisation actions specified in this plan will be adjusted and submitted to DPIR for review and approval.

9.2.3 Removal of stockpiles and infrastructure

All of the infrastructure will be removed from site, including:

- Product and reject stockpiles on ROM pad
- Crushing and processing infrastructure
- Magazine
- MOC infrastructure
- Sewage treatment facilities
- Above ground water pumps and standpipes
- Concrete pads
- Demobilisation of remaining plant

If there is remaining product stockpile, this will be incorporated into the WRD along with any stockpile remaining on the ROM pad and any material remaining in the rejects stockpile. Crushing and processing infrastructure will be shut down, disassembled as required, and removed from site.

Any remaining explosives will be removed from site and disposed of correctly. The magazine structure will be disassembled as required and removed from site.

MOC infrastructure (offices, wash-downs, refuelling station and HV workshop) will likely remain on site until domains have been re-profiled to the final landforms to provide administration space and vehicle service capabilities. Once MOC facilities are no longer required, all above ground infrastructure will be decommissioned and removed from site. Infrastructure will be re-used if practicable or disposed of appropriately.

Above ground water pumps and standpipes will be removed from site once dust management is no longer required. Connected buried pipelines will be capped below ground and covered. Any above ground pipelines will be removed from site. Where possible concrete pads will be removed from site. If this is not practicable, the pads will be buried.

Plant will be required for re-profiling activities. Once these activities are complete all plant will be removed from site.

9.2.4 Pit void and bund

The open pit will be stabilised and secured and left to form a pit lake. The inundation bund will form the post closure abandonment bund around the northern and eastern portion of the pit. The bund will be located 10 m from the zone of instability (shown as potentially unstable pit edge zone in Figure 5-5) in accordance with the *Western Australian Safety Bund Walls Around Abandoned Open Pit Mines* (DoIR, 1997). The WRD will form the abandonment bund on the western and southern sections of the pit. 'Gaps' in the inundation bund will be 'filled' to form an abandonment bund surrounding the pit.

9.2.5 Tailings storage facilities

The TSF will be progressively capped as they are filled and no longer required to receive tailings. Once no longer required and tailings have consolidated, an initial 0.5 m cover layer will spread across each cell. A second layer of 1.0 m thick waste rock will be placed and spread across each cell. The coverage of tailings cells will occur in the dry season. Once covered with initial layers, remaining waste rock will be placed on top of TSF up to final height of WRD.

Operational procedures, as well as tailings and water management processes, as outlined in the *Preliminary Design of TSF and Water Storages Design Report* (GHD 2018), are critical in preparing for closure of the TSF. Operational controls for tailings strength improvement include the following:

- Thicken tailings at the plant to maximum practicable;
- Sub-aerial, perimeter spigot deposition to facilitate drainage, promote desiccation and associated consolidation and strength improvement;
- Decant structures designed to maximise water return to the plant and therefore reduce water storage at the TSF;
- Tailings footprint maximised (within bound of WRD footprint) to reduce rate of rise;
- 2 x cells allows flexibility in deposition cycles and staged construction if required; and
- Underdrains to further help facilitate tailings drainage and strength improvement.

Buttressing of the TSF embankments would occur during the operational phase, as waste rock is mined from the pit.

During the life of the TSF testing will be carried out in both cells, to determine minimum drying time when the tailings consolidate to a constant density. The testing will include:

- Visual assessments of desiccation progress (monitoring for desiccation cracking occurring).
- Shear vane testing to check material strength at various stages of the deposition cycle;
- Field density tests / undisturbed sampling at various stages of the deposition cycle;

Cone penetration testing (CPTu) testing will be undertaken in the tailings, to determine strength properties, pore pressure dissipation, and potential for liquefaction. This data will be used in the final closure stability and landform design. Regular surveys of the tailings beach will be undertaken, to complete density reconciliations, calculate beaching angles, and determine remaining storage availability. This will be used to refine the Tailings Management Plan.

Wet season run off directly on the TSF will need to be effectively managed. This may be through transferring water to MWD2, or by transferring water between active and inactive cells at the TSF.

The staged closing of the TSF cells is described below, and presented diagrammatically in Figure 9-1, Figure 9-2 and Figure 9-3.

Stage 1: July 2021

The first stage of TSF closure would consist of preparing Cell 1 for closure. This would involve ceasing deposition at Cell 1, with the final two months of production placed in Cell 2. This would allow the final Cell 1 surface to desiccate and strengthen, to provide a trafficable surface. The decant pond would be dewatered where tailings will be of lowest strength. Initial testing of the beach would be undertaken (including shear vane testing) to inform on the bearing capacity and acceptable thickness of initial cover layer.

Stage 2: August 2021 – October 2021

Once materials reach adequate shear strength in Cell 1, an initial 500 mm (nominal) cover layer of waste rock will be placed on top of the tailings surface. The cover would be progressed from the external embankments inwards, using articulated dump trucks (ADTs) to transport the material and a D6 dozer to push and spread. During this process, the tailings will need to be monitored using shear vane testing to test

the bearing strength of the material, and push in piezometers to monitor the pore pressure build-up from the rapid loading of the material.

At this stage, this is considered a conservative approach. With effective management during operations, and testing of the tailings, it may be shown that the initial cover layer can be pushed through thicker, and heavier (i.e. mining fleet) equipment can be used. The final stage of deposition would be completed in August, giving Cell 2 a nominal 2-month period for final consolidation, strengthening and dewatering. This stage would need to be completed during the dry season. Therefore, changes in the mining schedule may have impacts on the construction staging.

Stage 3: October 2021 – December 2021

Stage 3 of closure would consist of completing the initial cover layer for Cell 2, as per the approach outlined for Cell 1 in Section 9.2.3. Whilst Cell 2 is undergoing the initial cover, the second layer of the Cell 1 cover will commence construction. This would consist of a (nominal) 1 m thick layer of waste rock, transported with mining fleet (777s), pushed and spread using a D11 dozer. As per Stage 2, this stage would need to be completed in the dry season. Layer thicknesses will be further refined with investigations and testing during operations.

Stage 4: December 2021 – April 2022

Once the secondary layer has been constructed on Cell 1, the same process will be completed on Cell 2.

Stage 4 would consist of tipping and placing waste rock above the TSF, to meet the overall WRD landform profile objectives. The thicknesses of these layers (nominally 2 – 5 m) would be driven by safety requirements in construction. This process would continue until the final landform reaches RL 42 m.

Stage 5: April 2022 onwards

The final stage would consist of shaping of the final waste dump surface to provide a nominal 1% water shedding profile. Geotechnical data obtained during operations would inform on the additional requirements for predicted post-construction settlement of the tailings. The final profile would be covered with a growth medium (0.5 m nominal thickness) and a rock mulch layer (0.3 m nominal thickness) for erosional stability whilst vegetation is established. The growth medium would be won from topsoil / overburden material, and re-seeded with local species.

Due to the expected geochemical stability of the waste materials, restricting percolation through the dump has not been considered as a design requirement. Therefore, the final cover layer would not include an engineered low permeability layer.

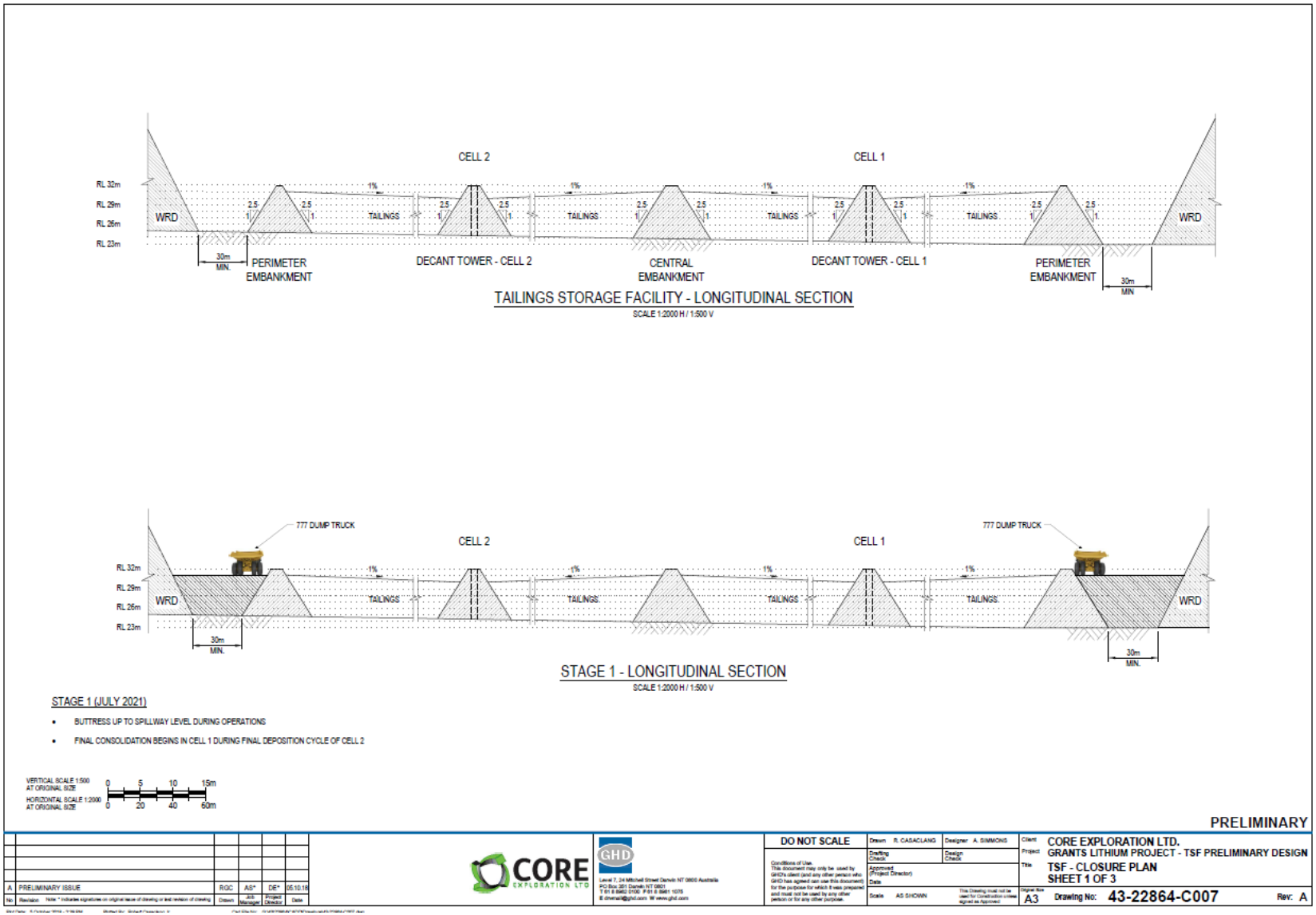


Figure 9-1. TSF design longitudinal section and stage 1 (July 2021)

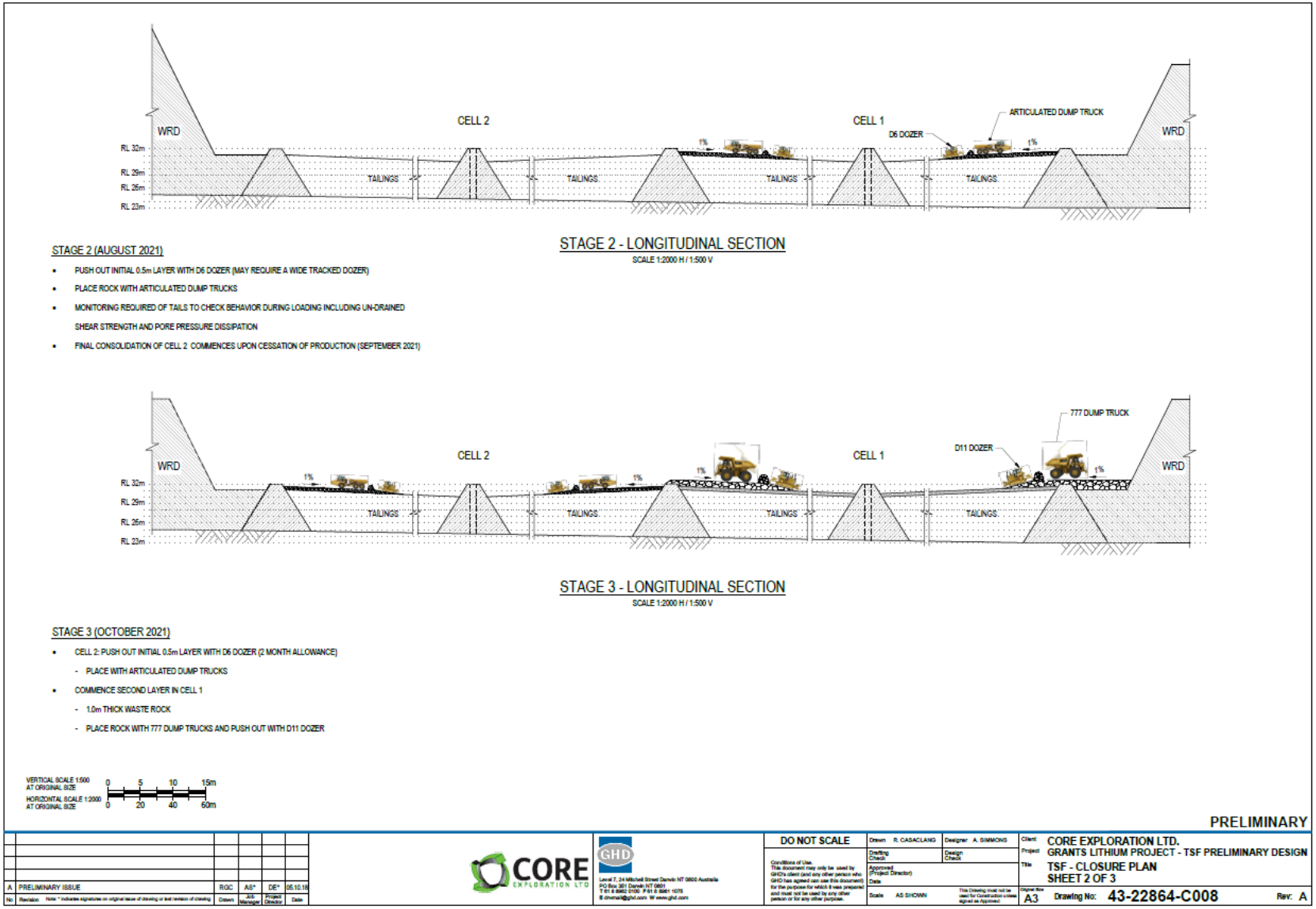


Figure 9-2. TSF closure stage 2 (August 2021) and stage 3 (October 2021)

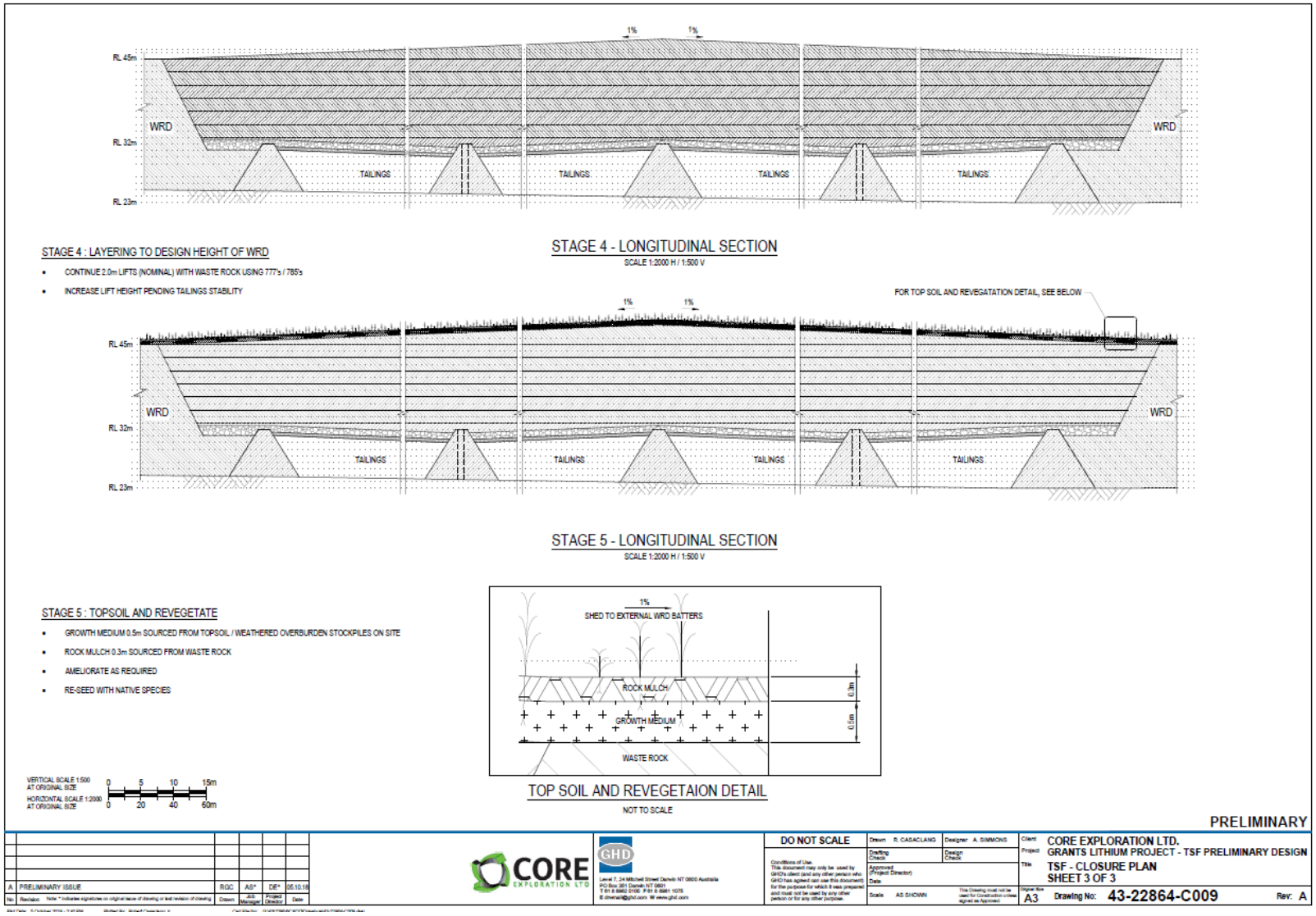


Figure 9-3. TSF closure - Stage 5 final WRD design

9.2.6 Waste rock dump

Re-profiling of the WRD outer walls is described in Section 9.2.2. Once the final waste is placed on the WRD, it will be profiled as per the final landform designs (section 5.4). This will produce a top surface with a nominal 1 % water shedding profile to help ameliorate water sheeting. The access ramp will be removed re-profiled to match the outer wall profile. The WRD will be ripped, covered in topsoil and rock mulch (excluding those areas already covered) and seeded.

9.2.7 Other landforms

The ROM pad, access roads, raw water dam, mine water dams and MOC base (all constructed from overburden material) will be removed and the material incorporated into the WRD. These areas will be re-profiled to pre-mining landform which matches the surrounding areas. They will be ripped and covered in topsoil. The storm-water drains and sediment dams will remain until determined to no longer be required.

9.2.8 Temporary stabilisation

The final landforms will be temporarily stabilised through erosion and sediment control measures. The measures utilised will be specified in a closure Erosion and Sediment Control Plan (ESCP) prepared by a Certified Practitioner in Erosion and Sediment Control (CPESC).

The Closure ESCP will be prepared prior to completion of mining operations. The Closure ESCP will be approved by the DPIR through the mining authorisation process and the measures specified therein will form part of the closure commitments of this plan.

9.2.9 Permanent stabilisation

Once the final landforms have been covered in topsoil and temporarily stabilised, all areas to be rehabilitated will be reseeded with a mix of local species. Rehabilitation monitoring will be undertaken as detailed in Section 10.2. Permanent stabilisation will not be deemed to have occurred until rehabilitation criteria specified in Section 6 are achieved. If rehabilitation monitoring identifies areas where rehabilitation has failed, then additional corrective actions may be undertaken (to be determined following monitoring).

9.2.10 Options for backfilling

The key factor that has influenced Cores decision to not backfill the pit is that it would make future underground mining of the already define ore resource beneath the pit unviable. If the pit is backfilled, the only way the resource can be accessed is from the surface, either by a surface decline or via a shaft. If a decline option is considered compared to a portal access from deep within the pit void, the additional cost to establish a twin decline would be $22.2 M, which in Core's view would be considered unviable.

Other key findings of the sterilisation report that are relevant to decision making about the feasibility and benefits of back-filing the pit are summarised below.

- The total time to safely backfill the pit, considering climate conditions, will be up to 6.5 years post the end of processing. A reasonable amount of site infrastructure post production and mining will be required to support a pit backfilling operation including on site offices, road access, services, pit dewatering pumps and water storages for dust suppression. Dewatering will be required for the duration of the backfill operation.
- Estimates of materials volumes indicate there is potential for there to be a deficit in the material available to completely backfill the pit to achieve a stable water-shedding structure. This means that it is possible pit lake will still remain post-closure. Whilst theoretically a surplus of material would be expected, based on material swell factors, at Grants a large portion of the waste material will be used

for construction of site infrastructure and for construction and capping of the TSF, which will remain in place post-closure. Because the flood diversion bund, dams and roads would need to remain in place in order to facilitate the backfilling operation, placing this material back into the pit this is likely to be difficult to achieve in practice.

- In order to back-fill the pit, a new TSF will need to be designed as an alternative to the proposed WRD encapsulated option. This would increase the mine disturbance area by up to 25 ha. A stand-alone TSF will also increase operational risks associated with water management and rehabilitation/closure will be more complex.

The main reasons for backfilling the pit are to return the area to the pre-mining land-use and provide for increased public safety. In the case of Grants, the indicative estimates prepared by Innicon (2018) indicate that backfilling may not achieve these outcomes due to a materials deficit.

9.3 Temporary suspension and unforeseen closure

Circumstances may eventuate that require a temporary suspension of mine operations, and require entry into a “Care and Maintenance” period. A detailed care and maintenance program would be developed within one month of temporary suspension of operations. Generally, a care and maintenance plan would:

- Ensure Grants Lithium Project is safe
- Maintain the structure and function of all sediment and water management controls
- Stabilise all landforms particularly the WRD and TSFs
- Remove all stockpiles from the ROM pad
- Shut down and secure all infrastructure

If an unforeseen closure occurs Core will notify DPIR of the closure before any action is taken. This MCPwill be reviewed and a detailed decommissioning plan will be developed and implemented. In the event of unplanned closure, Core will work to achieve the same goals as for temporary closure (listed above).

When notifying DPIR, the following information will be provided:

- The reason for the closure or suspension
- The current status of operations and all landforms within the project
- The closure activities to be undertaken and the status of those activities
- Progress on development of the relevant plans.

10 CLOSURE MONITORING AND MAINTENANCE

This section outlines the monitoring to be undertaken to assess the progression towards and success in meeting the completion criteria and site-specific closure objectives. The identification of closure issues (Section 8) was used to determine the monitoring effort applied to each risk, with more monitoring effort applied to higher risk impacts.

10.1 Monitoring summary

Table 10-1 summarises the monitoring to be undertaken to assess the success of mine closure; further detail on monitoring is provided in the following sections.

Table 10-1. Summary or closure related monitoring

Monitoring	Frequency	Duration	Responsibility[9]
Vegetation	Yearly (undertaken post wet season)	Until completion criteria are met and relinquishment of security by DPIR.	Project manager
Surface water	Three occasions during wet and once during dry		
Groundwater	Quarterly sampling for water quality and levels		
Erosion	Annually and following significant rainfall events if practical		
Post closure inspections	On completion of closure works	Until sign off the relevant works have been completed	Project engineer

10.2 Vegetation monitoring

This section provides detail on the vegetation monitoring that will be used to assess the progress towards and successful obtainment (or otherwise) or rehabilitation completion criteria. Information on vegetation communities within the project footprint is provided in Section 7.6.1. Assessment of vegetation will be conducted by a suitably qualified person.

10.2.1 Survey timing

Due to the highly seasonal nature of the environment in northern Australia – particularly rainfall (Section 7.1), all rehabilitation surveys will be conducted in the early dry season (between March and June) when the sites can be accessed and while many plants (particularly grasses) have reproductive material to aid in identification (Neldner et al. 2004).

10.2.2 Transitional vegetation monitoring

Although it is anticipated that revegetation will occur quickly following the reinstatement of top-soil, it is not anticipated that rehabilitation completion criteria will be met in the first two years. Transitional vegetation

[9] Responsibility refers to the person with overall responsibility for ensuring for the monitoring – monitoring will be undertaken by other staff or consultants.

monitoring will be undertaken during this period and will continue until there are no rehabilitation risk areas identified in monitoring

Transitional vegetation monitoring will be conducted by drone. Drones with attached cameras will be used to capture high resolution imagery of the entire project area (aerial survey). Imagery will be created yearly in the early dry season and comparisons between years will be made to identify any rehabilitation risk areas: areas where ground-cover vegetation has not established, areas of erosion and any patches of listed weed species (not all species will be able to be identified through this method, but both Gamba Grass (*Andropogon gayanus*) and Mission Grass (*Cenchrus polystachios*) should be identifiable when in large patches).

Where aerial surveys detect a rehabilitation risk area, early intervention management actions will be implemented as appropriate. This may include follow-up assessment of risk are through on-ground assessment. Early implementation measures will be determined on a case-by-case basis but may include:

- Reseeding particular areas
- Installation of additional erosion management structures
- Sourcing and spreading of additional topsoil
- Direct planting.

Vegetation assessment will not start until the entire area is free of rehabilitation risk areas, as due to the relatively small site, it is likely that rehabilitation risk area in one domain will affect rehabilitation success in other domains.

10.2.3 Vegetation assessment

Vegetation assessment will only commence once there are no rehabilitation risk areas identified in the transitional vegetation assessment. Vegetation assessment will compare reference sites to vegetation monitoring sites to determine progress towards and the ultimate success of rehabilitation against established criteria.

Site selection

Three reference sites will be established in each of the vegetation communities equivalent to those mapped in pre-mining project footprint (see Chapter 5). Location of the centre of the reference sites will be recorded on GPS and marked with a star picket.

Vegetation monitoring sites will be selected within each domain of the project footprint. The minimum number of sites located within each domain is shown in Table 10-2. Monitoring sites will also be established where corrective actions have occurred to ensure effectiveness of the corrective actions – these will be added to the MCP.

Table 10-2. Vegetation monitoring sites within each domain.

Domain	Rehabilitation risk	Approximate rehabilitation area (ha)	Primary vegetation community	Minimum number of monitoring sites
Waste Rock Dump	High	55	Eucalyptus miniata +/- E. tetrodonta, Corymbia bleeseri Mid Woodland	10
Tailings Storage Facilities	Low			
Run of Mine Pad	Low	12		3
Pit Void	Moderate	7		4
Support infrastructure	Low	47		12

Domain	Rehabilitation risk	Approximate rehabilitation area (ha)	Primary vegetation community	Minimum number of monitoring sites
Flood diversion bund	High	9		6
Observation Hill Dam wall	Moderate	< 1	Pandanus spiralis, Lophostemon lactifluus, Livistona humilis Low isolated trees	2
Mine Site Dam wall	Moderate	< 1		2

Data collection methods

Broad scale monitoring using aerial footage from drones (as per transitional vegetation monitoring) will continue once vegetation assessment has begun to ensure the project area remains free of rehabilitation risk areas. The following method will be used to collect data at each of the reference and monitoring sites.

Each site will consist of a 100 m transect marked with a star picket at each end (each end also to be recorded on GPS). A digital photograph in portrait orientation will be taken from each star picket at 1.5 m height looking along the transect. The photograph will be focused on a labelled (site code and date) marker board approximately 3 m towards along the transect from the star picket. The transect will be walked by surveyors who will use a point intersect method to determine ground cover (plant species, soil, rock, litter) at every 1 m interval along the transect. The results from this method will be used to determine percentage groundcover and groundcover species richness.

Along the transect, three 10 m x 10 m quadrats will be established and each corner marked with star pickets (corners also marked with GPS). The quadrats will be evenly spaced along the transect (17.5 m between quadrats).

Ecologically dominant layer/emergent layer species

In each plot all seedlings (woody plants under 1 m in height), saplings (woody plants between 1 m and 3 m high and < 2 cm DBH) and trees (woody plants with stems ≥ 2 cm DBH and greater than 3 m high) will be identified and counted. For each individual the height will be estimated and DBH measured.

Weeds

The percentage cover of weed species (declared as weeds under the *Northern Territory Weeds Management Act*) within each 10 m x 10 m quadrat will be visually estimated for each weed species as follows:

- < 3 isolated small plants = 0.01 %
- > 3 isolated small plants = 0.1 %
- or a visual estimate of the % cover of plot area

Fire

At each plot an estimate of the timing of the last fire (this year, last year, more than 3 years ago) and for recently burnt sites the severity was scored from 1 to 4. Categories for characterisation of fire are:

1. No evidence of fire
2. Evidence of groundcover fire only
3. Evidence of burnt saplings

4. Evidence of fire in canopy layer

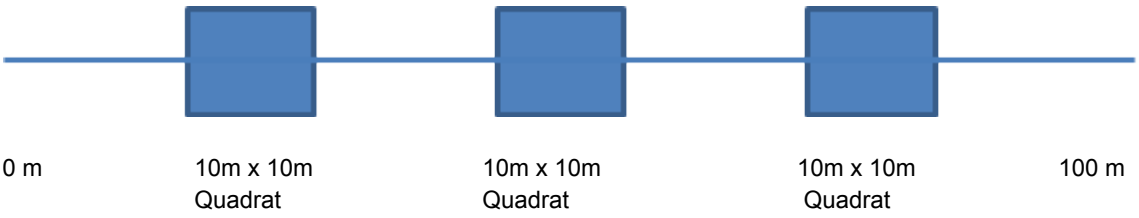


Figure 10-1. Diagrammatic representation of each site

The monitoring sites will be established as rehabilitation work is completed (for the WRD annulus this is anticipated to be whilst project operations are still in progress). Monitoring will be undertaken yearly until the rehabilitation criteria are met. Monitoring may not continue in those domains where the completion criteria is met, and rehabilitation is determined as complete.

10.2.4 Justification of monitoring methods

The vegetation monitoring program specified within this plan have been designed to be practicable, repeatable, be able to identify the potential cause of any rehabilitation failure and measure the success of rehabilitation against the rehabilitation completion criteria.

Established field guidelines for vegetation surveying and mapping (*Northern Territory Guidelines and field methodology for vegetation survey and mapping* (Brocklehurst et al 2007) and *Queensland Bio-condition assessment manual* (Eyre et al. 2015) have been referenced in creation of these monitoring methods. Similar monitoring methodologies have been utilised in the assessment of rehabilitation in the NT and Qld.

The monitoring methods specified collect more information that is required for the assessment of rehabilitation against the completion criteria. This additional data is collected so that relevant information is available is the site specific closure objectives and/or completion criteria are adjusted in future iterations of this Mine Closure Plan.

10.2.5 Data management

Data management procedures are described in Section 11.

10.2.6 Contingency measures and adaptive management

Events or circumstances may pose a risk to the attainment of completion criteria an assessment of those risks are provided in Table 10-3.

Table 10-3. Contingency measures

Event or circumstance	Trigger for Contingency Action	Contingency Action
Introduction of new weed species	Identification of previously unrecorded weed species within project footprint	Undertake targeted eradication program suitable for the weed species
Increase in percentage weed cover	Increase of 20% weed cover from previous assessment.	Undertake appropriate control (e.g. spraying, physical removal) at site(s) of increased weed cover.
Erosion affects rehabilitated areas	Evidence of erosion of moderate or above on severity scale (Table 10-4)	CPESC to specify site specific erosion control strategies as required. Earthworks and reseeding as required.
Flood impacts rehabilitation	Flooding of rehabilitation area	Undertake assessment of rehabilitation sites and analogue sites post weather event. CPESC to specify site specific erosion control strategies as required[9].
Unplanned/ uncontrolled fire	Fire burns rehabilitation area	Assess impact of fire at rehabilitation and analogue sites. Implement soil stabilisation methods as required. Undertake seeding if fire occurs after germination of vegetation from the seed bank. Review fire management practices.
No or little plant growth	Percentage groundcover is less than 50 % of reference sites at any monitoring site after 2 years of vegetation monitoring	Implement additional soil stabilisation controls as required. Investigate soil quality in areas of low percentage cover and address as required. Undertake additional seeding of groundcover species as required.
Lack of diversity in groundcover species richness	Groundcover is less than 50 % of reference sites' after 5 years of monitoring	Determine extent of areas with low species diversity and likelihood that this will result in rehabilitation failure. Undertake targeted seeding or planting of groundcover species to increase diversity.
Little or no recruitment of species of the ecologically dominant layer	No saplings present at monitoring site after 5 years of monitoring	Undertake targeted planting of ecologically dominant layer species. Investigate cause of lack of recruitment and adjust management as appropriate.

10.2.7 Review

Five years after the commencement of vegetation assessment (and then each five years following), progress towards achieving the rehabilitation criteria will be assessed. The review will be undertaken by a suitably qualified person and will include consideration of:

- Results of rehabilitation monitoring
- The effectiveness of rehabilitation actions
- New advice, literature and/or guidelines relating to the rehabilitation
- Realisation of identified impacts and/or risks to rehabilitation success.

Where the review identifies vegetation is not progressing towards achieving the rehabilitation criteria recommendations will be made on additional management actions/monitoring to be implemented. This plan will be revised to include the outcomes of any such review.

10.3 Erosion monitoring

This section provides detail on the erosion monitoring that will be used to assess the progress towards and successful obtainment (or otherwise) of completion criteria.

10.3.1 Survey timing

As highly seasonal rainfall is the greatest contributor to erosion in the NT tropical north, erosion monitoring will be undertaken annually at the end of the wet season. During the first two years of monitoring, additional monitoring will be undertaken and following significant rainfall events. Erosion monitoring will be undertaken until completion criteria relating to percent groundcover are met (i.e. permanent stabilisation is achieved).

10.3.2 Site selection and monitoring procedure

During the first years post closure, erosion monitoring will be undertaken as per transitional rehabilitation monitoring (i.e. using a drone to take aerial imagery of the site from which any erosion patches can be identified). Where erosion patches are identified, on-ground assessment will be undertaken to determine the severity of erosion (see section 10.3.3).

Additionally, all erosion and sediment control structures required as per the progressive ESCP will be inspected as long as they are required to be maintained. During monitoring, each erosion and sediment control structure will be visually inspected by a suitably qualified person who will note if the structure is working correctly or whether works need to be undertaken.

10.3.3 Erosion severity scale

If the presence of erosion is identified at the erosion monitoring locations, the erosion will be categorised as per the erosion severity scale detailed in Table 10-4. The erosion severity scale used in this MCP is informed by the final landform design (section 5.4), particularly the depth of growth medium and rock mulch which will be applied to the WRD surface on closure.

Table 10-4. Erosion severity scale

Scale	Severity	Description	Area affected		Gully depth
1	Minor	Surface rilling	5 m^2		< 2 cm
2	Moderate	Localised erosion leading to shallow gully	10 m^2	**and/or**	2 – 10 cm
3	Significant	Moderate gully formation	20 m^2		10 – 29 cm
4	Major	Major gullies, tunnel erosion over large area	50 m^2		≥ 30 cm

10.3.4 Data management and reporting

Each record of erosion will be stored in an erosion monitoring database and mapped on suitable GIS software. Erosion mapping will be updated following each erosion monitoring event. Details of erosion management actions will also be added to both the database and the mapping.

10.3.5 Contingency measures and adaptive management

If erosion, that is rated significant or higher on the severity scale, is detected anywhere within the project footprint, a suitably qualified person will advise on the appropriate control actions to manage the erosion. The primary objectives of contingency measures will be to:

- Stabilise the landform
- Minimise impact of sediment laden water to surface watercourses.

To achieve these objectives it is likely that on ground remediation works will be undertaken[10]; specific works will be determined by a CPESC and additional erosion and sediment control structures will be installed as required. The ESCP will be updated to incorporate any new erosion and sediment control structures, these structures will be incorporated into future monitoring events.

10.3.6 Review

Erosion management actions and monitoring program will be reviewed after the first two years of monitoring and then on each review of the rehabilitation monitoring program (so as to align reviews). The review will be undertaken by a suitably qualified person and will include consideration of:

- Results of erosion monitoring
- The effectiveness of erosion management actions
- New advice, literature and/or guidelines relating to the erosion management
- Realisation of identified impacts and/or risks to erosion control.

This plan will be revised to include the outcomes of any such review.

10.4 Water monitoring

Water monitoring will be conducted as per the approved site Water Management Plan until rehabilitation completion criteria are achieved. The plan specifies locations of monitoring sites, frequency of monitoring and parameters to be assessed. A draft Water Management Plan was submitted with the draft EIS. This plan will be independently reviewed and submitted to DPIR as part of the MMP.

Additional monitoring sites, events or parameters may be added to the water monitoring program in the event of a rehabilitation issue which may affect water quality. If this occurs the Water Management Plan will be updated as part of the MMP review process.

10.5 Reporting

The results of all monitoring will be reported on annually and will be submitted to DPIR. Once Core is satisfied that the rehabilitation criteria are met, a final rehabilitation report will be prepared and submitted to DPIR detailing the results of rehabilitation monitoring and how each of the rehabilitation criteria is met.

[10] Examples of actions which may be undertaken following the assessment of a flood event are: stabilisation control using CPESC approved method such as laying geofabric covered with appropriately sized rock mulch, use of ground stabilisation method approved by CPESC such as jut or coir matting, direct seeding of area effected by erosion with selected species. These examples are not a commitment to undertake particular management actions post assessment, but serve as an indication. The management actions which will be implemented will be site specific and determined post assessment.

11 MANAGEMENT OF INFORMATION AND DATA

Project information and monitoring data are valuable to provide:

- A register of environmental commitments and obligations
- A history of mine development and operations
- A history of closure implementation
- Monitoring results over time
- A way to determine continuous improvement actions and adaptive management.

The sections below outline how information and data will be managed.

11.1 Availability of information

Key project information will be contained with the following documents:

- Environmental Impact Statement, including:
    - Commitments Register
    - Environmental Management Plan
- Mining Management Plan
- Mine Closure Plan
- Water Management Plan
- Weed Management Plan

These documents will be stored on the Core server and retained within the administrative centre for the project throughout mining operations and until closure is complete.

11.2 Data collection and management

A dedicated database will be established for each environmental monitoring area, namely:

- Closure inspections
- Rehabilitation monitoring
- Erosion monitoring
- Water monitoring

Each database will be fit-for-purpose databases to enable analysis and interpretation of data trends, and graphic reporting for annual reports.

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Appendix A. Closure environmental risk register

Risk ID	Environmental Factor	Closure Domain	Incident/event	Description of Impact	Assumptions	L*	C*	IR*	Summary of Controls	L*	C*	RR*	Cumulative impacts	Certainty - Info Gaps
1	**01 Terrestrial Flora and Fauna**	001 Waste Rock Dump	Native vegetation does not re-establish and/or final landform becomes infested with weeds	Fauna do not move back into area due to reduced habitat value and/or frequent bushfires	• Rehabilitation failure could be caused by insufficient volumes/quantities of topsoil and/or poor landform/drainage design. • Project footprint does not provide habitat for any range restricted species. • Surrounding vegetation similar in composition and habitat quality. • If weeds are allowed to establish and spread this could have an impact on a wider area over the longer term.	**4**	**3**	**3 - High**	• Top 20cm of topsoil to be stored in designated stockpile. • Seed selection will be representative of local species. • Progressive rehabilitation of the WRD annulus during operations to commence year 1. • Early rehabilitation works on WRD to be used as a trial for remainder of site. • Rehabilitation success to be monitored and supplementary work undertaken as required. • Implementation of a Weed Management Plan.	**3**	**2**	**2 - Medium**	Possible. There is some potential for cumulative impacts associated with proliferation of weed infestations and increase bushfires associated with future lithium mining proposals on Core's EL's.	High. Current weed status of project area confirmed by field survey. Weeds still a moderate risk based on experience at other mine sites in the NT.
2	**01 Terrestrial Flora and Fauna**	002 Tailings Storage Facility	Unexpected early closure	Fauna interaction with tailings in open TSF cells	• Tailings characterisation indicates the material is inert with no chemical contaminants or NORMs.	**2**	**1**	**1 - Low**	• Low inherent risk. TSF cells will be monitored as part of operational requirements. If fauna are found to be attracted to area, measures to address this new risk would be developed in future revisions of the MMP. • The deposited tailings will be covered with competent material from the surrounding WRD • Cost of closing open TSF cells to be included in security cost estimates. • Care and maintenance plan will be developed and implemented in the event of early closure and will focus on making the site safe, stable and non-polluting.	**1**	**1**	**1 - Low**	Unlikely. Minimal existing disturbance. Minimal existing or future potential disturbance in catchment.	High. Inherent risk is low due to inert nature of tailings.
3	**01 Terrestrial Flora and Fauna**	003 ROM pad and stockpiles	Native vegetation does not re-establish and/or final landform becomes infested with weeds	Fauna do not move back into area due to reduced habitat value and/or frequent bushfires	• Affected area is small • Rehabilitation failure could be caused by inappropriate rehabilitation methods and/or poor drainage design • Project footprint is Eucalyptus woodland, which does not provide habitat for range restricted species. • Surrounding vegetation similar in composition and habitat quality.	**3**	**1**	**1 - Low**	• Top 20cm of topsoil to be stored in designated stockpile. • Seed selection will be representative of local species. • ROM pad to be reprofiled to surrounding landform, ripped, topsoiled and seeded on completion of operations. • Rehabilitation success to be monitored and supplementary work undertaken as required. • Implementation of a Weed Management Plan.	**3**	**2**	**2 - Medium**	Possible. There is some potential for cumulative impacts associated with proliferation of weed infestations and increase bushfires associated with future lithium mining proposals on Core's EL's.	High. Current weed status of project area confirmed by field survey. Weeds still a moderate risk based on experience at other mine sites in the NT.
4	**01 Terrestrial Flora and Fauna**	006 Support infrastructure	Native vegetation does not re-establish and/or final landform becomes infested with weeds	Fauna do not move back into area due to reduced habitat value and/or frequent bushfires	• Affected area is small • Rehabilitation failure could be caused by inappropriate rehabilitation methods and/or poor drainage design • Project footprint is Eucalyptus woodland, which does not provide habitat for range restricted species. • Surrounding vegetation similar in composition and habitat quality.	**3**	**1**	**1 - Low**	• Top 20cm of topsoil to be stored in designated stockpile. • Seed selection will be representative of local species. • Infrastructure to be removed and areareprofiled to surrounding landform, ripped, topsoiled and seeded on completion of operations. • Rehabilitation success to be monitored and supplementary work undertaken as required. • Implementation of a Weed Management Plan.	**3**	**2**	**2 - Medium**	Possible. There is some potential for cumulative impacts associated with proliferation of weed infestations and increase bushfires associated with future lithium mining proposals on Core's EL's.	High. Current weed status of project area confirmed by field survey. Weeds still a moderate risk based on experience at other mine sites in the NT.
5	**01 Terrestrial Flora and Fauna**	007 Observation Hill Dam	Dam wall failure	Downstream flooding inundates terrestrial habitats, including mangroves around Bynoe Harbour	• Population At Risk (PAR) has been assessed as 1 – 10. • Consequence Category as 'Significant'. • Spillway has been designed to pass a 0.1% AEP flood event. • No significant terrestrial or aquatic habitats in flood footprint. • Flood water impact over short period of time. Habitats expected to recover quickly.	**3**	**3**	**3 - High**	• Dam design in accordance with ANCOLD Guidelines	**1**	**3**	**1 - Low**	Unlikely. Impact would be a single event - not sustained.	Moderate. Final designs pending.
6	**01 Terrestrial Flora and Fauna**	008 Mine Site Dam	Dam wall failure	Downstream flooding inundates terrestrial habitats, including mangroves around West Arm.	• Due to the proximity of the dam to the Cox Peninsula Road, the Population At Risk (PAR) has been assessed as 1 – 10. • Consequence Category as 'Significant'. • Spillway has been designed to pass a 0.1% AEP flood event. • No significant terrestrial or aquatic habitats in flood footprint. • Flood water impact over short period of time. Habitats expected to recover quickly.	**3**	**3**	**3 - High**	• Dam design in accordance with ANCOLD Guidelines	**1**	**3**	**1 - Low**	Unlikely. Impact would be a single event - not sustained.	Moderate. Final designs pending.
7	**02 Terrestrial Environmental Quality**	001 Waste Rock Dump	Acid Mine Drainage from WRD/TSF	Contamination of land and soils	• Materials characterisation (EcOz/Pendragon 2018) indicates waste rock and tailings is geochemically benign - AMD is unlikely	**1**	**3**	**1 - Low**	• On-going operational waste and tailings characterisation to confirm material characteristics. • WRD/TSF is lined with low permeability material that will minimise infiltration and release of contaminants.	**1**	**2**	**1 - Low**	Unlikely. Low RR.	Moderate. Operational waste characterisation to address knowledge gaps in pit shell.
8	**02 Terrestrial Environmental Quality**	001 Waste Rock Dump	WRD unstable, subsidence/slumping leads to erosion	Landform instability leads to erosion of surface over time	• Sources of instability are inappropriate materials placement in WRD annulus, unconsolidated tailings in TSF, pit wall failure and rehabilitation failure. • WRD/TSF landform are located outside the area that would be impacted in the event of pit wall failure - area calculated in accordance with *WA Guidelines - Safety bunds around abandoned open pit mines (1997).*	**4**	**3**	**3 - High**	• Geotechnical testing program to be undertaken to define materials characteristics, sources and treatments for WRD and TSF construction and rehabilitation. • WRD annulus to be constructed from structuraly stable non-dispersive materials. • Vegetation clearing and topsoil removal in accordanec with Vegetation Clearing Procedure. • Topsoil storage in accordance with ESCP. • The requirement for soil improvement and relevant ratios of additives, will be determined during rehabilitation trials • WRD Annulus to be rehabilitated in year 1. Rehabilitation trials and monitoring with remedial works as required. • Staged TSF closure in accordance with Mine Closure Plan. Monitoring of tailings consolidation ahead of cover placement. • Pit wall stability monitored throughout mining operations in accordance with Mine Risk Management Plan approved by NT Work	**3**	**3**	**3 - High**	Unlikely. Soil erosion impacts are localised. Minimal existing disturbance. Minimal existing or future potential disturbance in catchment.	Low. Final landform/drainage design and ESCP to be developed. RR dependent of rehabilitation success.

Risk ID	Environmental Factor	Closure Domain	Incident/event	Description of Impact	Assumptions	L*	C*	IR*	Summary of Controls	L*	C*	RR*	Cumulative impacts	Certainty - Info Gaps
	3 Terrestrial Environmental Quality	001 Waste Rock Dump	Unexpected early closure	Landform instability leads to erosion of surface over time	• Due to the short mine life and the economics underpinning the project, the likelihood of early closure is considered low. • Early closure is likely to pose an increased risk of erosion as landforms will not be stabilised or rehabilitated. • The level of risk will depend on the timing and current status of the site when closure occurs. • Closure early during the life of mine and/or during the Wet season poses the greatest risk of more severe erosion that could lead to off-site impacts.	**5**	**3**	**3 - High**	• Risk assessment and mitigation addressed in a Care and Maintenance Plan, which is a legal requirement under the Mining Management Act. • Closure works would then either be undertaken by Core or by DPIR using the security bond.	**4**	**3**	**3 - High**	Unlikely. Soil erosion impacts are localised. Minimal existing disturbance. Minimal existing or future potential disturbance in catchment.	Moderate. Dependent on current status and stability of as constructed WRD/TSF. Care and maintenance plan will assess risk.
	3 Terrestrial Environmental Quality	002 Tailings Storage Facility	Uneven tailings consolidation	Landform instability leads to erosion of surface over time	• TSF integrated with WRD landform. • Instability wihtin TSF could lead to instability in WRD.	**3**	**3**	**3 - High**	• Staged closure in accordance with Mine Closure Plan. Monitoring of the pore pressure build up from rapid loading (with push in piezometers) and monitoring bearing strength of the tailings (with shear vane testing equipment). • Monitoring of tailings during cover construction may indicate a change to the construction method is required, for example slowing the placement to allow pore pressure dissipation, or ability to increase cover layer thickness if tailings strength is sufficient to support this. • Prior to commencement of TSF closure works, the mine closure plan will be updated to reflect the program of works required to close the as constructed facilities. This plan will be subject to review and approval by DPIR.	**2**	**2**	**1 - Low**	Unlikely. Low RR.	High. Conceptual closure plan includes detailed monitoring program that is adequate to address risk.
	02 Terrestrial Environmental Quality	001 Waste Rock Dump	Loss of soil structure and seedbank	Rehabilitation failure exposes landform to erosion	• Rehabilitation failure could be caused by insufficient volumes/quantities of topsoil and/or poor landform/drainage design.	**4**	**3**	**3 - High**	• Vegetation clearing and topsoil removal in accordanec with Vegetation Clearing Procedure. • Topsoil storage in accordance with ESCP. • The requirement for soil improvement and relevant ratios of additives, will be determined during rehabilitation trials	**3**	**3**	**3 - High**	Unlikely. Soil erosion impacts are localised. Minimal existing disturbance. Minimal existing or future potential disturbance in catchment.	Moderate. RR dependent on rehbailitaiton success. To be informed by rehabilitation trials.
9	**02 Terrestrial Environmental Quality**	003 ROM pad and stockpiles	Unexpected early closure	Stockpiles left in-situ leach contaminants to surrounding land/soils	• ROM material contains some fines. • Stockpiled product and rejects material is geochemically benign and gravelly (fines removed during processing). • No pathway for movement of material to the surrounding environment as stockpiles are located in abandonment bund.	**2**	**2**	**1 - Low**	• Care and maintenance plan to be developed and implemented in the event of early closure. • Stockpiles will either be stabilised as per WRD criteria or moved to WRD • Post-closure ESCP to be developed and implemented. • Post-closure erosion monitoring and implementation of remedial works as required. • Post-closure water quality monitoring program to inform remedial rehabilitation works.	**1**	**1**	**1 - Low**	Unlikely. Low RR.	High. Limited contaminant sources and pathways to receiving environment.
10	**02 Terrestrial Environmental Quality**	005 Inundation bund	Vegetation cover does not establish on the bund	Landform instability leads to erosion of surface over time	• Rehabilitation failure could be caused by poor growth medium, inappropriate landform and drainage design. • Inundation bund to be maintained as closure bund.	**3**	**3**	**3 - High**	• Stabilisation of surface in accordance with ESCP. • Rehabilitation success to be monitored during site operations and supplementary work undertaken as required prior to closure.	**3**	**2**	**2 - Medium**	Unlikely. Soil erosion impacts are localised. Minimal existing disturbance. Minimal existing or future potential disturbance in catchment.	Moderate. Bund will be rehabilitated during operations. RR dependent of rehabilitation success.
11	**03 Inland Water Environmental Quality**	001 Waste Rock Dump	WRD unstable, subsidence/slumping leads to erosion	Increased turbidity in surface water coursses that flow into West Arm	• Sources of instability are inappropriate materials placement in WRD annulus, unconsolidated tailings in TSF, pit wall failure. • WRD/TSF landform are located outside the area that would be impacted in the event of pit wall failure - area calculated in accordance with *WA Guidelines - Safety bunds around abandoned open pit mines (1997).* • Release to surface water only possible if failure occurs on north-west side of WRD landform, on south side of landform there is no pathway to surface water - flow would be into open pit void.	**3**	**3**	**3 - High**	• WRD landform design and rehabilitation in accordance with Mine Closure Plan. • Rehabilitation success to be monitored during site operations and supplementary work undertaken as required prior to closure. • Post-closure ESCP to be developed and implemented. • Post-closure erosion monitoring and implementation of remedial works as required. • Post-closure water quality monitoring program to inform remedial rehabilitation works.	**2**	**3**	**2 - Medium**	Unlikely. Exceedances likely to be sporadic - not sustained.Minimal existing disturbance. Minimal existing or future potential disturbance in catchment.	Low. Final landform/drainage design and ESCP to be developed. RR dependent of rehabilitation success.

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12	**03 Inland Water Environmental Quality**	001 Waste Rock Dump	Acid Mine Drainage from WRD/TSF	Poor water quality in surface watercourses that flow into West Arm affects environmental values	• Tailings and waste rock characterisation indicates the material is inert with no chemical contaminants. Fine sediments is the only contaminant of concern.	2	3	2 - Medium	• On-going operational materials characterisation program. • Tailings to be placed in TSF constructed in centre of the WRD and will be surrounded by competent waste rock. • TSF foundation to be constructed from low permeability material, rolled and compacted. • TSF design incorporates underdrainage system. • TSF to be capped at closure and encased within WRD. • Post-closure surface water monitoring program to detect water quality issues (refer Mine Closure Plan). • Final version of MCP (completed during ops) will assess risk associated with as-built structures.	2	3	2 - Medium	Unlikely. No other land use in catchment.	Moderate.Characterisation work indicates no source of chemical contaminants. TSF designs available to inform risk assessment.
13	**03 Inland Water Environmental Quality**	001 Waste Rock Dump	Seepage of water from WRD to groundwater aquifer	Poor water quality in groundwater aquifer affects environmental values and/or other users	• Waste characterisation (EcOz/Pendragon 2018) does not identify any AMD potential. • Groundwater flow direction under TSF is towards the pit. • Pit void is classified as a groundwater sink, so movement of contaminants into groundwater not expected to occur. • No groundwater users within 12km of site.	2	3	2 - Medium	• On-going operational materials and tailings characterisation program. •WRD foundation to be constructed from low permeability material, • Post-closure monitoring of water quality in pit and monitoring bores with corrective action implemented as required.	2	2	1 - Low	Unlikely. Low RR.	Moderate. Characterisation work indicates no source of chemical contaminants. TSF designs available to inform risk assessment. No sensitive receptors.
14	**03 Inland Water Environmental Quality**	002 Tailings Storage Facility	Unexpected early closure	Release of tailings from open TSF cells leads to increased turbidity in surface watercourses	• Tailings may not be sufficiently desiccated to allow for placement of final cover. • Uncapped TSF cells will fill with rainwater and could overtop. • Any release would be contained within the WRD annulus. • No chemical contaminants	2	3	2 - Medium	• Care and maintenance plan will be developed and implemented in the event of early closure and will focus on making the site safe, stable and non-polluting. • TSFs will be stabilised and made safe/non-polluting by covering with competent material from surrounding WRD.	2	2	1 - Low	Unlikely. Low RR.	Moderate. Dependent on stability of as constructed WRD/TSF. Care and maintenance plan will assess risk associated with as-built structures.
15	**03 Inland Water Environmental Quality**	002 Tailings Storage Facility	Seepage of contaminants from TSF cells to groundwater aquifer	Poor water quality in groundwater aquifer affects environmental values and/or other users	• Tailings characterisation indicates the material is inert with no chemical contaminants. Fine sediments is the only contaminant of concern. • Groundwater flow direction under TSF is towards the pit. • Pit void is classified as a groundwater sink, so movement of contaminants into groundwater not expected to occur. • No groundwater users within 12km of site.	2	3	2 - Medium	• On-going operational materials and tailings characterisation program. • TSF foundation to be constructed from low permeability material, rolled and compacted. • TSF design incorporates underdrainage system. • TSF to be capped at closure and encased within WRD. • Post-closure monitoring of water quality in pit and monitoring bores with corrective action implemented as required.	2	2	1 - Low	Unlikely. Low RR.	Moderate. Characterisation work indicates no source of chemical contaminants. TSF designs available to inform risk assessment. No sensitive receptors.
16	**03 Inland Water Environmental Quality**	003 ROM pad and stockpiles	Unexpected early closure	Fuel storages leak hydrocarbons leading to poor water quality in surface water and/or groundwater aquifer	• Fuel storages are above-ground and located in bunded areas. • Fuel storages will comply with relevant Australian standards	3	2	2 - Medium	• Care and maintenance plan will be developed and implemented in the event of early closure and will focus on making the site safe, stable and non-polluting. • Fuel tanks to be emptied, chemicals and explosive removed from site.	2	1	1 - Low	Unlikely. Low RR.	High. Materials have value and therefore removal in best-interest of company.
17	**03 Inland Water Environmental Quality**	003 ROM pad and stockpiles	Landform instability leads to erosion	Increased turbidity in surface water coursses that flow into West Arm	• Sources of instability is ineffective implementation of rehabilitation works and poor drainage design. • No pathway for movement of material to the surrounding environment as stockpiles are located within abandonment bund.	2	3	2 - Medium	• Stockpiles to be removed from ROM pad. • ROM pad to be reprofiled to surrounding landform, ripped, topsoiled and seeded on completion of operations. • Post-closure drainage to pit. • Rehabilitation success to be monitored and supplementary work undertaken as required. • Closure Erosion and Sediment Control Plan to be developed and implemented.	2	2	1 - Low	Unlikely. Low RR.	High. No pathway for sediment transport to watercourses.
18	**03 Inland Water Environmental Quality**	004 Pit void	Acid rock drainage and leachate production from exposed pit walls	Contamination of groundwater aquifer making it unfit for human consumption and/or other land uses	• Pit wall lithologies assumed to be geochemically benign based on waste rock characterisation (EcOz/Pendragon 2018) • Mass balance modelling (Knapton and Fulton 2018) predicts that 70 years post-closure EC will be between 50-300 µS/cm in final pit lake. • Pit lake modelled to be a groundwater sink - no flow of contaminants to aquifer. • No groundwater users within 12km.	2	2	1 - Low	• Geochemical testing of pit wall lithologies during mining operations to confirm initial AMD risk assessment. • Monitoring groundwater quality in the pit and down-gradient of the mine site during operations and post-closure. • Investigate and rectify contamination sources if detected. • Refer Water Management Plan and Mine Closure Plan.	2	2	1 - Low	Unlikely. Low RR.	High. Contaminant sources and pathways based on technical studies and modelling.
19	**03 Inland Water Environmental Quality**	005 Inundation bund	Landform instability leads to erosion	Increased turbidity in surface water coursses that flow into West Arm	• Sources of instability are poor design and/or ineffective implementation of rehabilitation works • Inundation bund adjacent to ephemeral streams flowing to West Arm. • Inundation bund to be maintained as closure bund.	2	3	2 - Medium	• Stabilisation of surface in year 1 of operations in accordance with ESCP. • Rehabilitation success to be monitored during site operations and supplementary work undertaken as required prior to closure. • Post-closure ESCP to be developed and implemented. • Post-closure erosion monitoring and implementation of remedial works as required. • Post-closure water quality monitoring program to inform remedial rehabilitation works.	1	2	1 - Low	Unlikely. Low RR.	Moderate. Bund will be rehabilitated during operations. RR dependent of rehabilitation success.
20	**03 Inland Water Environmental Quality**	006 Support infrastructure	Contaminated sites around fuel storages not remediated	Poor water quality in surface water and/or groundwater aquifer	• Fuel storage in above-ground tanks, so leaks during operations would be readily detected and remediated. • Limited pathways for movement to surface water as area surrounded by abandonment bund. • Groundwater movement in area will be toward pit, so any contamination would end up diluted in pit lake.	3	1	1 - Low	• Operation controls will minimise risk of residual soil contamination. • Fuel storages to be removed post-closure.	1	1	1 - Low	Unlikely. Low RR.	High. Risk is inherently low due to relatively small volumes of storage and short operational phase.

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21	**03 Inland Water Environmental Quality**	006 Support infrastructure	Landform instability leads to erosion	Increased turbidity in surface water courses that flow into West Arm	• Sources of instability is ineffective implementation of rehabilitation works and poor drainage design. • Affected area is small. • No pathway for movement of material to the surrounding environment due to placement of abandonment bund.	**2**	**2**	**1 - Low**	• Rehabilitation success to be monitored and supplementary work undertaken as required. • Post-closure ESCP to be developed and implemented. • Post-closure erosion monitoring and implementation of remedial works as required. cPost-closure water quality monitoring program to inform remedial rehabilitation works.	**1**	**2**	**1 - Low**	Unlikely. Low RR.	High. Risk is inherently low for the support infrastructure area but higher for the WRD, which is assessed separately.
22	**04 Hydrological processes**	001 Waste Rock Dump	Post-closure landform alters surface water flows	Reduced discharge to watercourses in West Arm affects environmental values	• WRD/operational flood bund to be used as abandonment bund. Impact of infrastructure on stream flows slightly greater than during operations due to removal of sediment dams. • No significant or sensitive water dependent environmental values in ephemeral drainages upstream of saltwater influence, where modelled flow reduction is up to 46% during the early wet season. • Combined impact of the mine site and dam could reduce flows into the upper mangroves of West Arm by 16-20 % in the early wet season months Nov-early Jan, dropping to between 1% and 7% for the remainder of the wet season.	**2**	**3**	**2 - Medium**	• Dam sizes will be designed based on the minimum requirement to achieve a sustainable water supply for the project.	**2**	**3**	**2 - Medium**	Unlikely. Site only 1.7km from upper tidal limit. Limited potential for future development in downstream catchment.	Moderate. Modelling based on feasibility stage mine site designs. To be revised for detailed design.
23	**04 Hydrological processes**	002 Tailings Storage Facility	Aquifer recharge from TSF cells	Localised mounding of groundwater	• Groundwater flow direction in area of TSF will be towards the pit void. • Modelled drawdown cone covers area beneath WRD/TSF landform. • Waste rock and tailings characterisation indicates materials are inert.	**2**	**2**	**1 - Low**	• TSF foundation to be constructed from low permeability material, rolled and compacted. • TSF design incorporates underdrainage system. • TSF to be capped at closure and encased within WRD. • TSF to be capped at closure and encased within WRD. • Post-closure groundwater monitoring program to detect changes in groundwater levels around site. • Remedial tailings management works undertaken if contamination is detected.	**1**	**2**	**1 - Low**	Unlikely. No other users and limited potential future development of aquifer.	High. TSF design provided. Based on modelling, informed by baseline groundwater monitoring.
24	**04 Hydrological processes**	004 Pit void	Drawdown of groundwater aquifer due to alteration of the natural groundwater flow directions	Reduced water availability for other users	• Pit void modelled as a groundwater sink. • Void expected to fill with groundwater over a period of 50 years and stabilise at 7-8m below ground surface. • Water table expected to be lowered by 5m at pit edge, reducing to 0.5m at 500m. • No groundwater users within 12km.	**2**	**2**	**1 - Low**	• Post-closure groundwater monitoring program to detect changes in groundwater levels around site.	**2**	**2**	**1 - Low**	Unlikely. No other users and limited potential future development of aquifer.	High. No other users.
25	**04 Hydrological processes**	004 Pit void	Drawdown of groundwater aquifer due to alteration of the natural groundwater flow directions	Reduced discharge to surface waters affects environmental values	• Pit void modelled as a groundwater sink. • Void expected to fill with groundwater over a period of 50 years and stabilise at 7-8m below ground surface. • Water table expected to be lowered by 5m at pit edge, reducing to 0.5m at 500m. • No change in water table surface predicted at the ephemeral watercourses. • Watercourses do receive some groundwater discharge and so could be impacted if levels are lower than predicted.	**2**	**2**	**1 - Low**	• Post-closure groundwater monitoring program to detect changes in groundwater levels around site.	**2**	**2**	**1 - Low**	Unlikely. Limited potential future development of aquifer. No GDE's.	Moderate. Monitoring of groundwater levels during operation to confirm modelled impacts.
26	**04 Hydrological processes**	007 Observation Hill Dam	Harvesting of surface water flows by dam each wet season until overflow	Reduced flows in watercourses that discharge to Bynoe Harbour affects environmental values	• Assume as constructed spillway maximum 31.5mAHD • Impact does not change significantly between operations and closure. • NT Water Allocation Planning Framework contingent allocation for environmental and public benefit is 80%. • No public benefit water uses in catchment. • Riparian rainforest along drainages downstream of dam may be sensitive to reduced flows.	**2**	**3**	**2 - Medium**	• Dam sizes will be designed based on the minimum requirement to achieve a sustainable water supply for the project.	**2**	**3**	**2 - Medium**	Possible. Development of open pit mine at BP33 will also affect flows in the Charlotte River catchment.	High. Based on modelled reduction in flows.
27	**04 Hydrological processes**	008 Mine Site Dam	Harvesting of early season surface water flows by dam each wet season until overflow	Delayed flow in watercourses that discharge to West Arm affects environmental values	• Assume as constructed spillway maximum 16.5mAHD • NT Water Allocation Planning Framework contingent allocation for environmental and public benefit is 80%. • No significant or sensitive water dependent environmental values in ephemeral drainages upstream of saltwater influence, where modelled flow reduction is <45% during the early wet season. • Hinterland mangroves 1.7km downstream closest sensitive receptor. • Combined impact of the mine site and dam could reduce flows into the upper mangroves of West Arm by 16-20 % in the early wet season months Nov-early Jan, dropping to between 1% and 7% for the remainder of the wet season. Does not change between operations and closure.	**2**	**3**	**2 - Medium**	• Dam sizes will be designed based on the minimum requirement to achieve a sustainable water supply for the project.	**2**	**3**	**2 - Medium**	Unlikely. No other users and limited potential future development of downstream catchment.	Moderate. Capacity of dam required for supplementary supply to be confirmed through detailed design. Current predicted reduction in flow is worst-case i.e. risk will decrease.
28	**05 Air quality and GHG**	001 Waste Rock Dump	Unexpected early closure	Wind blown dust emissions from exposed/unvegetated WRD surface	• Annulus constructed of competent material and rehabilitated at end year 1. • All waste rock, tailings and rejects geochemically benign. • No sensitive receptors in proximity to site.	**3**	**2**	**2 - Medium**	• Care and maintenance plan will be developed and implemented in the event of early closure. • WRD will be stabilised by reprofiling and vegetating the annulus.	**2**	**2**	**1 - Low**	Unlikely. Early closure would indicate no other mines to be developed.	Moderate. Final WRD landform design and details of rehabilitation staging pending.

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29	**05 Air quality and GHG**	002 Tailings Storage Facility	Unexpected early closure	Wind blown dust emissions from exposed tailings	• Tailings characterisation indicates the material is inert with no chemical contaminants or NORMs. • No sensitive receptors in proximity to site.	**2**	**3**	**2 - Medium**	• Implementation of operational controls for tailings strength improvement. • Care and maintenance plan will be developed and implemented in the event of early closure. • TSFs will be stabilised and made safe/non-polluting by covering with competent material from surrounding WRD.	**1**	**2**	**1 - Low**	Unlikely. Early closure would indicate no other mines to be developed.	High. Risk is low due to inert nature of tailings.
30	**06 Social, Economic and Cultural Surroundings**	001 Waste Rock Dump	Post-closure landform is visible from the Cox Peninsula Rd	Stakeholder concern about loss of visual amenity	• Top of WRD landform may be visible from Cox Peninsula Rd, but the site wont be due to the maintenance of a 500m buffer between the site and the road.	**2**	**3**	**2 - Medium**	• Revegetation of landform with local plant species.	**1**	**3**	**1 - Low**	Unlikely. Low RR.	High. Limited impact due to remoteness.
31	**06 Social, Economic and Cultural Surroundings**	001 Waste Rock Dump	Closure criteria unrealistic and unachievable	Loss of future land-use opportunities	• Existing land use is mining exploration. • WRD/TSF landform will contain benign waste materials. • Key stakeholders are limited to government agencies responsible for land management. • Closure criteria are developed based on baseline information and in reference to relevant guidelines.	**2**	**3**	**2 - Medium**	• Stakeholder consultation to be undertaken as part of finalising closure criteria in Mine Closure Plan • Ongoing rehabilitation, erosion and water monitoring in accordance with Mine Closure Plan.	**1**	**1**	**1 - Low**	Unlikely. Low RR. No indication of future land uses that would be affected. Small area.	High. Small disturbance area, limits extent of impacts irrespective of rehabilitation outcomes
32	**06 Social, Economic and Cultural Surroundings**	001 Waste Rock Dump	Unexpected early closure	WRD landform is unstable and poses a safety hazard to members of the public who enter the area.	• Short mine life of 2-3 years - early closure less likely • WRD annulus constructed in year 1 to operationally safe standard. • Low number of people use the area - some nearby sites/areas of recreational value to small numbers of local people, mainly for wet season swimming/fishing/hunting pursuits but is away from populated areas.	**3**	**4**	**3 - High**	• Cost of stabilisation of WRD landform to be included in security cost estimates. • Care and maintenance plan will be developed and implemented in the event of early closure and will focus on making the site safe, stable and non-polluting. • Danger no-entry signs installed around site boundary.	**3**	**2**	**2 - Medium**	Unlikely. Localisised impact.	Moderate. Dependent on stability of as constructed landform at time of closure. Care and maintenance plan will assess risk associated with as-built structures.
33	**06 Social, Economic and Cultural Surroundings**	002 Tailings Storage Facility	Unexpected early closure	Open TSF cells pose a safety risk to members of the public who enter that area	• Short mine life of 2-3 years - early closure less likely • Tailings characterisation indicates the material is inert with no chemical contaminants or NORMs. • TSF gradual wall slopes limit potential for accidental entry. • TSF is contained within the WRD landform • Low number of people use the area - some nearby sites/areas of recreational value to small numbers of local people, mainly for wet season swimming/fishing/hunting pursuits but is away from populated areas.	**2**	**3**	**2 - Medium**	• Cost of closing open TSF cells to be included in security cost estimates. • Care and maintenance plan will be developed and implemented in the event of early closure and will focus on making the site safe, stable and non-polluting. • Danger no-entry signs installed around site boundary.	**1**	**3**	**1 - Low**	Unlikely. Localisised impact.	Moderate. Dependent on as constructed WRD/TSF. Care and maintenance plan will assess risk associated with as-built structures.
34	**06 Social, Economic and Cultural Surroundings**	003 ROM pad and stockpiles	Unexpected early closure	Processing infrastructure or stockpiles pose a safety risk to members of the public who enter that area	• Short mine life of 2-3 years - early closure less likely • Low number of people use the area - some nearby sites/areas of recreational value to small numbers of local people, mainly for wet season swimming/fishing/hunting pursuits but is away from populated areas.	**3**	**2**	**2 - Medium**	• Care and maintenance plan will be developed and implemented in the event of early closure and will focus on making the site safe, stable and non-polluting. • Processing infrastructure will be made safe. • Danger no-entry signs installed around site boundary.	**1**	**2**	**1 - Low**	Unlikely. Localisised impact.	High. Materials have value and therefore removal in best-interest of company.
35	**06 Social, Economic and Cultural Surroundings**	004 Pit void	Pit not backfilled	Loss of future land-use opportunities	• Back-filling pit has been deemed unfeasible due to sterilisation of future underground options. • Site is surrounded by undeveloped Vacant Crown Land by 7-8km in all directions. • Local community and other stakeholders concerned about closure but not directly affected. • No indication of future land-use that would be constrained by presence of open pit. • Open pit does not pose a risk to environmental values.	**2**	**3**	**2 - Medium**	• Assessment of pit closure options undertaken and communicated to key stakeholders so they understand the decision-making process. • Key stakeholder consultation to be undertaken as part of finalising closure criteria in Mine Closure Plan. • Ongoing rehabilitation, erosion and water monitoring in accordance with Mine Closure Plan.	**2**	**2**	**1 - Low**	Unlikely. Localisised impact.	High. Small disturbance area, limits extent of impacts irrespective of rehabilitation outcomes
36	**06 Social, Economic and Cultural Surroundings**	004 Pit void	Public use of pit lake for swimming	Contact with contaminated water in pit lake adversely affects human health	• Pit wall lithologies assumed to be geochemically benign based on waste rock characterisation (EcOz/Pendragon 2018). • Modelling of pit lake water chemistry indicates no risk to human health.	**2**	**3**	**2 - Medium**	• Abandonment bund installed on closure to minimise risk of accidental entry into pit. Signage around site to inform of danger. • Monitoring of post-closure water quality in pit and implementation of high access restrictions if water quality poses risk to human health. • Refer Mine Closure Plan.	**1**	**3**	**1 - Low**	Unlikely. Localisised impact.	Moderate. Confirmation of pit wall geochemistry and in-flow water quality by monitoring during operations and post-closure.
37	**06 Social, Economic and Cultural Surroundings**	004 Pit void	Public access to pit void/area of instability	Open pit poses a safety risk to members of the public who enter that area	• Pit shell design based on detailed geotechnical assessment (SRK 2018) so is unlikely to fail. • Site is not in an area that is frequented by people; however, people could be attracted by prospect of swimming in pit lake.	**3**	**5**	**4 - Very High**	• Abandonment bund installed on closure to minimise risk of accidental entry into pit. • Signage around site to inform of danger. • Refer Mine Closure Plan.	**2**	**2**	**1 - Low**	Unlikely. Localisised impact.	Moderate. Pit wall works and abandonment bund design pending.
38	**06 Social, Economic and Cultural Surroundings**	006 Support infrastructure	Unexpected closure	Infrastructure left on site poses a safety hazard to members of the public who enter the area.	• Short mine life of 2-3 years - early closure less likely • Low number of people use the area - some nearby sites/areas of recreational value to small numbers of local people, mainly for wet season swimming/fishing/hunting pursuits but is away from populated areas.	**3**	**2**	**2 - Medium**	• Care and maintenance plan will be developed and implemented in the event of early closure and will focus on making the site safe, stable and non-polluting. • Processing infrastructure will be made safe. • Danger no-entry signs installed around site boundary.	**1**	**2**	**1 - Low**	Unlikely. Localisised impact.	High. Materials have value and therefore removal in best-interest of company.
39	**06 Social, Economic and Cultural Surroundings**	007 Observation Hill Dam	Dam wall failure	Downstream flooding leads to loss of life or property	• Population At Risk (PAR) has been assessed as 1 – 10. • Consequence Category as 'Significant'. Property within flood footprint is uninhabited but is accessible to the public. Cox Peninsula Road is within the flood footprint. • Flood water impact over short period of time.	**3**	**4**	**3 - High**	• Dam design in accordance with ANCOLD Guidelines	**1**	**4**	**2 - Medium**	Unlikely. Impact would be a single event - not sustained.	Moderate. Dam design pending.

Risk ID	Environmental Factor	Closure Domain	Incident/event	Description of Impact	Assumptions	L*	C*	IR*	Summary of Controls	L*	C*	RR*	Cumulative impacts	Certainty - Info Gaps
40	**06 Social, Economic and Cultural Surroundings**	008 Mine Site Dam	Dam wall failure	Downstream flooding leads to loss of life or property	• Due to the proximity of the dam to the Cox Peninsula Road, the Population At Risk (PAR) has been assessed as 1 – 10. • Consequence Category as 'Significant'. • Spillway has been designed to pass a 0.1% AEP flood event. • No property or land use within flooded area. • Flood water impact over short period of time.	**3**	**5**	**4 - Very High**	• Dam design in accordance with ANCOLD Guidelines	**1**	**4**	**2 - Medium**	Unlikely. Impact would be a single event - not sustained.	Moderate. Dam design pending.

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