MINE CLOSURE PLAN

Document No: ARMS-0000-O-PLN-O-0002 Rev 2

Project Name: Nolans Rare Earths

REVISION HISTORY

Date	Rev	Description	Prepared	Reviewed	Approved
08/09/2022	Rev 2	Issue for Final	M Robinson ESG Manager	M Robinson ESG Manager	S. Watkins, General Manager Projects
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MINE CLOSURE PLAN

Operator Name:	Arafura Nolans Project Pty Ltd
Project Name:	Nolans Rare Earth
Tenements:	ML 26659 ML 30702 ML 30703 ML 30704 ML 32411 ML 32412 ML 32413 ML 32414 ML 32415 ML 32416
Tenement Holder:	Arafura Resources Limited OR Arafura Rare Earths Pty Ltd
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1.0 PROJECT SUMMARY

1.1 Location

The Nolans Project site is located 10 km west of the Stuart Highway, 65 km west of the Darwin to Adelaide railway, and 135 km by road from the major Central Australian town of Alice Springs (Figure 1-1). The Stuart Highway is the main highway from Adelaide to Darwin with the access to the site via a proposed new sealed road. This road will intersect with the Stuart Highway about 5km south of the Aileron Roadhouse Stuart Highway access intersection.

The majority of the Project site is situated on the Aileron Perpetual Pastoral Lease (PPL 1097), with the exception of the western part of the planned borefield area, which is situated on the Napperby Perpetual Pastoral Lease (PPL 1178).

The Adelaide to Darwin railway corridor is located approximately 40 km east of the Project at the closest point.

The nearest paved and gravel airstrip to the Project is at Ti Tree and Aileron Station respectively. The latter may be suitable for use by emergency aircraft following some upgrade.

The Amadeus Basin to Darwin natural gas pipeline passes directly adjacent to the processing site and within five kilometres of the mine site.

Numerous small communities and family outstations in the surrounding area are listed in Table 1-1.

The Project area is located within the traditional country of the Anmatyerr people and lies within the general area referred to by the Anmatyerr as Apmere Alkelirrlpe (two hills immediately west of the proposed mine site).

Figure 1-1 Site Location

Table 1-1 Nearby Communities

LOCATION	DETAILS
Aileron Roadhouse	A stop-over for travellers on the Stuart Highway, 12 km east of the Project
Aileron Station	4,078 km^2 cattle station within which nearly the entire footprint of the Project area is contained (except for the western extent of the borefield and the Woodforde carbonate quarry). The property was acquired in July 2015 by Melbourne-based Aileron Pastoral Holdings Pty Ltd.
Alyuen (Aileron)	Family outstation 130 km north of Alice Springs and 2 km west of the Stuart Highway (population is ~20). It is located about 15 km south east of the Project site.
Alkuptija (Gillians Bore)	Family outstation 3 kilometres west of Stuart Highway and 70 km south east of Project (population is ~20).
Burt Creek (Rice's Camp)	Family outstation close to Stuart Highway and 93 km south east of Project (population is ~15).
Injulkama (Amburla)	Family outstation 56 km south of the Project and 100 km to the north west of Alice Springs (population is ~10).
Laramba	Key community due to its relative proximity to the Project and borefield. Located approximately 50 km west of the Project, access is by the Napperby

LOCATION	DETAILS
	station road, which runs west from the Stuart Highway. Laramba is a large community of mostly Aboriginal people (population is ~300) including some of the traditional owners of the area. It has a school, community health centre and other facilities.
Napperby Station	5,356 km^2 cattle station, 50 km to the west of the Project. It has been owned and operated by the Chisholm family since 1948. This includes a shared borefield area and Laramba community living area.
Pine Hill Station	2,686 km^2 cattle station bordering Aileron Station to the north.
Pine Hill (Anyumgyumba)	Small family outstation located near the Pine Hill Station homestead, 35 km west of the Stuart Highway and approximately 29 km north of the Project. It has a small transient population.
Pmara Jutunta (Six Mile)	Major community of about 190 people 46 km to the north east of the Project and close to the Stuart Highway and Ti Tree community.
Ti Tree	Community located 170 km north of Alice Springs and 53 km north of the Project, along the Stuart Highway. It is a large community with facilities including a school, health centre, library, police station and airstrip. Population is ~280. Ti Tree serves as the operational centre for the Anmatjere Community Government Council.
Nturiya (Ti Tree Station)	17 km to the west of Ti Tree. Population is ~100

1.2 Tenure

Aileron Pastoral Holdings Pty Ltd hold background land tenure to the mine site and processing site under Aileron Perpetual Pastoral Lease (PPL 1097). The predominant land use on the pastoral lease is cattle grazing. The pastoral leaseholders or other occupiers for the Nolans site are provided in Table 1-2.

Table 1-2 Land Tenure

Project Component	Parcel Name	Parcel No	Owner
Mining, processing, infrastructure, administration and accommodation	Aileron	NT POR 703	Aileron Pastoral Holdings Pty Ltd
Borefield	Aileron	NT POR 703	Aileron Pastoral Holdings Pty Ltd
	Napperby Station	NT POR 747	Napperby Station – Hale River Pastoral Company

Table 1-3 provides a register of ownership for the mining interests associated with the project including the title numbers, title holders and status.

Table 1-3 Mineral Titles

Title Number	Title Holder	Grant Date	Expiry Date
ML 26659	Arafura Rare Earths Pty Ltd – primary mineral lease	July 2020	July 2045
ML 30702	Arafura Rare Earths Pty Ltd - camp	July 2020	July 2045
ML 30703	Arafura Rare Earths Pty Ltd - RSF	July 2020	July 2045
ML 30704	Arafura Rare Earths Pty Ltd – processing plant	July 2020	July 2045
ML 32411	Arafura Rare Earths Pty Ltd – Borefield E1 & E2	February 2021	January 2046
ML 32412	Arafura Rare Earths Pty Ltd – Borefield C & D	February 2021	January 2046
ML 32413	Arafura Rare Earths Pty Ltd – Borefield A & B	February 2021	January 2046
ML 32414	Arafura Rare Earths Pty Ltd – Borefield F & G	February 2021	January 2046
ML 32415	Arafura Rare Earths Pty Ltd – Borefield H & I	February 2021	January 2046
ML 32416	Arafura Rare Earths Pty Ltd – creek diversion	February 2021	January 2046

1.3 Project Description

The Project is targeting a fluorapatite mineral deposit containing rare earths, Neodymium-Praseodymium (NdPr), at Nolans Bore.

The Project comprises:

- the mine site (open pits);
- Run-of-Mine (ROM) pad and ore stockpiles
- a processing site (comprising beneficiation, extraction and separation plants)
- Residue and Tailing Storage Facilities (RSF)
- waste rock dumps
- a borefield area
- accommodation village site; and
- interconnecting access roads and utility service corridors.

The initial Mining Management Plan Authorisation application for the Project covers the construction phase (26 months), the commissioning phase (2 years) and two years of steady-state operations (6 years in total).

The mining inventory production schedule results in a LOM of 38 years consisting of the two-year commissioning period and a five-year period of processing stockpiled material of low-grade stockpiles at the end of the mining period.

Mining is completed over 28 years with two up-front mining campaigns prior to commencing full-time mining in year nine (Figure 1-2). Processing of stockpiles continues for another 10 years after the cessation of mining as indicated in the production schedule (Figure 1-3).

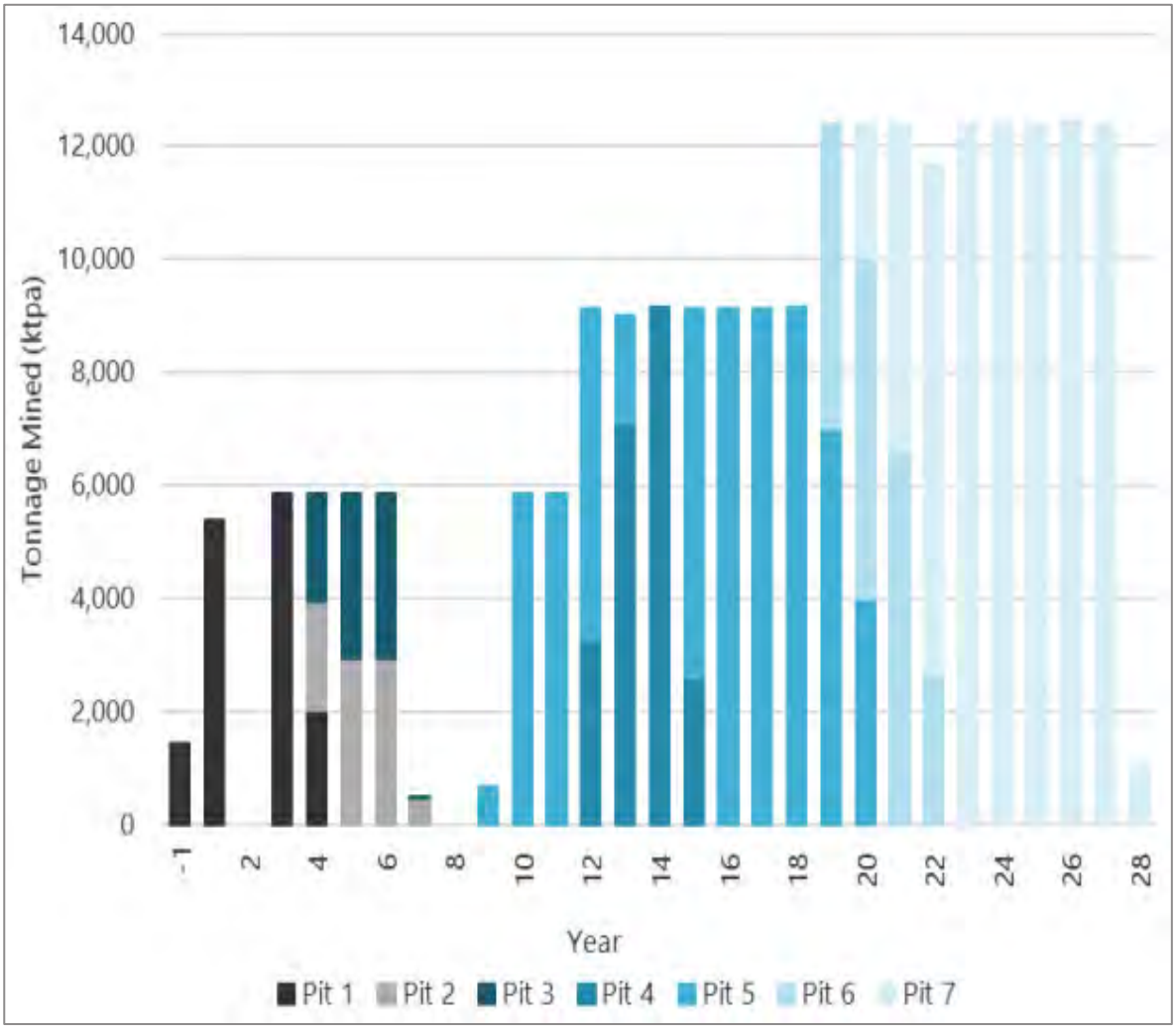

Figure 1-2 Mining Schedule (Mining Inventory)

Figure 1-3 Production Schedule (Mining Inventory)

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3.0 ABBREVIATIONS AND DEFINITIONS

Abbreviation	Meaning
ARI	Average Reoccurrence Interval
AEP	Annual exceedance probability
Arafura / ARU	Arafura Resources Limited
AGP	Amadeus Gas Pipeline
AMD	Acid and metalliferous drainage
ANESA	Ammonium nitrate explosives storage area
CLC	Central Land Corporation
DITT	Department of Industry, Tourism and Trade (Northern Territory)
ERG	Emergency Response Group
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
FEED	Front-end engineering and design
GDE	Groundwater dependent ecosystem
GTSMR	Generalised Tropical Storm Method Revised
HDPE	High density polyethylene
IFRS	International Financial Reporting Standards
ILUA	Indigenous land use agreement
LCRS	Leak collection and recovery system
LOM	Life of mine
ML	Mineral lease
MMP	Mine Management Plan
MIA	Mine infrastructure area
NTA	Native title agreement
NTG	Northern Territory Government
NORM	Naturally occurring radioactive material
NPI	Non-process infrastructure
PMP	Probable maximum precipitation
RL	Relative level
ROM	Run of Mine
RSF	Residue storage facility

Abbreviation	Meaning
SAP	Sulphuric acid plant
SAR	Site Access Road
SEG/HRE	Samarium, Europium, Gadolinium (Middle Rare Earths)/Heavy Rare Earths
SMU	Soil mapping units
SPC	Soil profile class
TARP	Trigger, Action and Response Plan
TBP	Territory Benefits Plan
WAMP	Water Abstraction Management Plan
WRD	Waste rock dump
WWTP	Waste water treatment plant

4.0 IDENTIFICATION OF CLOSURE OBLIGATIONS AND COMMITMENTS

4.1 Relevant Legislation and Guidelines

A summary of relevant key legislation for the Project is provided in Section 3.1 of the Project's 2021 Mining Management Plan (MMP) (Arafura, 2021) and are listed below:

Commonwealth Legislation:

- Aboriginal & Torres Strait Islander Heritage Protection Act 1986
- Aboriginal Land Rights (Northern Territory) Act 1976
- Environment Protection and Biodiversity Conservation Act 1999
- Native Title Act 1993
- National Environment Protection (Air Toxics) Measure
- National Environment Protection (Ambient Air Quality) Measure
- National Greenhouse and Energy Reporting Act 2007

Northern Territory Legislation:

- Bushfires Management Act 2016
- Environmental Offences and Penalties Act 1998
- Fire and Emergency Act 1996
- Fire and Emergency Regulations 1996
- Dangerous Goods Act 1998
- Heritage Act 2011
- Mining Management Act 2001
- Northern Territory Aboriginal Sacred Sites Act 1989
- Northern Territory Environment Protection Authority Act 2012
- Planning Act 1999
- Soil Conservation and Land Utilisation Act 1969
- Territory Parks and Wildlife Conservation Act 1976
- Ti-Tree Water Allocation Plan 2019-2020 (Draft)
- Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010
- Water Act 1992
- Waste Management and Pollution Control Act 1998
- Weeds Management Act 2001
- Work Health and Safety (National Uniform Legislation) Act 2011

In addition to the legislation, various industry and regulatory guidelines are applicable to mine closure planning and implementation (Table 4-1). Once the project is approved, specific legal obligations relating to mine closure will be imposed through instruments such as tenement conditions and operating licences. These obligations will be recorded within a Commitments and Obligations Register for the Project, which will be updated as the operation and associated legal requirements change over time.

Table 4-1 Guidelines

Guidelines
ARPANSA, Radiation Protection Series 9 - Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing
Dept of Industry Tourism and Resources, Leading Practice Sustainable Development Program in the Mining Industry: Mine Closure and Completion 2006
MCA & ANZMEC, Strategic Framework for Mine Closure 2000
NT Dept of Mines and Energy, Mine Close-out Objectives, Life of Mine Planning Objectives 2006
NT Dept of Mines and Energy, Rehabilitation and Closure Requirements for the Extractive Industry 2015
NT Minerals Council and the Mines & Petroleum Management Division, NT Govt - TEAM NT: Technologies for Environmental Advancement of Mining in the Northern Territory: Toolkit 2004
WA DMPE, Environmental Notes on Mining – Care and Maintenance, (updated September 2009)
WA DMPE, Guidelines for Preparing Mine Closure Plans - Has been updated to Version 3.0 (3 March 2020), including Statutory Guidelines

4.2 Other Commitments

Commitments made by Arafura within the Environmental Impact Statement (EIS) and Mining Management Plan (MMP) for the Project are considered binding commitments. Some of these commitments are preliminary in nature and will be subject to refinement as further information becomes available and technical investigations continue through the Project's commissioning and operational phases. This is the case for some commitments relating to mine closure, where closure strategies will continually be assessed and refined as more information becomes available in the lead-up to closure.

Also, commitments made within this Mine Closure Plan (once approved) will be included within the Project's Commitments and Obligations Register.

5.0 STAKEHOLDER ENGAGEMENT

5.1 Stakeholder Identification

Key stakeholders and interested parties in the mine closure planning and implementation for the Project are listed in Table 5-1 and Table 5-2.

Table 5-1 Key Stakeholders

Key Stakeholders	Titles
Lease Owner:	Aileron Pastoral Holdings
Land Owner:	NTG
Land/pastoral Manager	Craig and Sarah Cook
Land claimants (Native Title)	Various prescribed body corporates (names can be provided.
Land Council representing the Traditional Owners for the country:	Central Land Council (CLC)
Neighbours and communities	Alyuen, Aileron, Laramba, Ti Tree, Parma Jutunta
Tenement manager	AMETS
Government Departments	DITT, DEPWS, NT EPA, DTFH&C

Table 5-2 Interested Parties

Interested Parties
Central Desert Regional Council
Alice Springs Town Council
Arid Lands Environment Centre
Non-Government organisations such as NT Shelter, Waltja Tjutangku Palyapayi and the Multicultural Community Services of Central Australia
Aileron Roadhouse
Various business entities including Chamber of Commerce, local businesses, other mining companies, employment and training services providers
Environmental groups in Darwin and Alice Springs.
Tourism and recreation stakeholders
Shareholders.
Employees (internal)

5.2 Stakeholder Engagement Strategy

A stakeholder consultation and communication strategy was prepared to guide the environmental impact assessment process and provide a means for stakeholder feedback to be addressed in the EIS.

The information and feedback collated during the consultation process has fed into the social impact assessment (described in GHD, 2016e) and the Social Impact Management Plan (SIMP).

The SIMP outlines strategies for ongoing community engagement and communication to maintain relationships and keep the community informed, particularly once the company decides to proceed with the project. A key element of this strategy will be the formation of a Community Reference Group.

As part of the mine closure planning for the Project, the strategy involves consultation with key stakeholders in relation to aspects such as:

- Agreement on the nominated post-closure land uses;
- Nominated mine closure strategies for closure domains;
- Mine closure objectives and draft completion criteria;
- Socio-economic aspects associated with eventual transitioning from operational to closure and post-closure phases; and
- Potential retention of mine infrastructure or services for the use by post-closure land users (e.g. buildings, borefields, fresh water dams, roads).

A Stakeholder Engagement Register is maintained by Arafura to record various instances of formal and informal consultation with various stakeholders. An extract of the register is provided as APPENDIX A with details of consultation relating to mine closure or environmental/social aspects of the Project.

The EIS describes the initial stakeholder consultation process and key themes raised during consultation in Chapter 6: Consultation

https://www.arultd.com/images/EIS/DOCUMENTS/Volume1/NolansEIS_Chapter_6_LOW_RES_web.pdf

Additional information is presented in EIS Volume 2 Appendix H: Community Consultation Report

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_H_web.pdf

6.0 BASELINE CLOSURE DATA AND ANALYSIS

6.1 Land Use and Tenure

An image of the Project area (from the EIS) is provided in Figure 6-1. The local area around the Project area has been used for rangeland cattle grazing using extracted groundwater from local bores on the pastoral tenure of the Aileron, Napperby and Pine Hill stations over many years. There is evidence of clearing and disturbance associated with livestock primarily in the vicinity of Nolans Bore. This bore, including cattle yards, was for a long time the only stock watering point in a 15 km2 area. Consequently, vegetation in and around the bore has suffered significant long-term degradation. Previous vegetation clearing within and surrounding the Project area has been associated with construction of a gas pipeline, the development of the Stuart Highway and a range of other roads and tracks. Mineral exploration activity has also contributed to localised losses of native vegetation, in association with drilling and vehicle access on the Nolans deposit area.

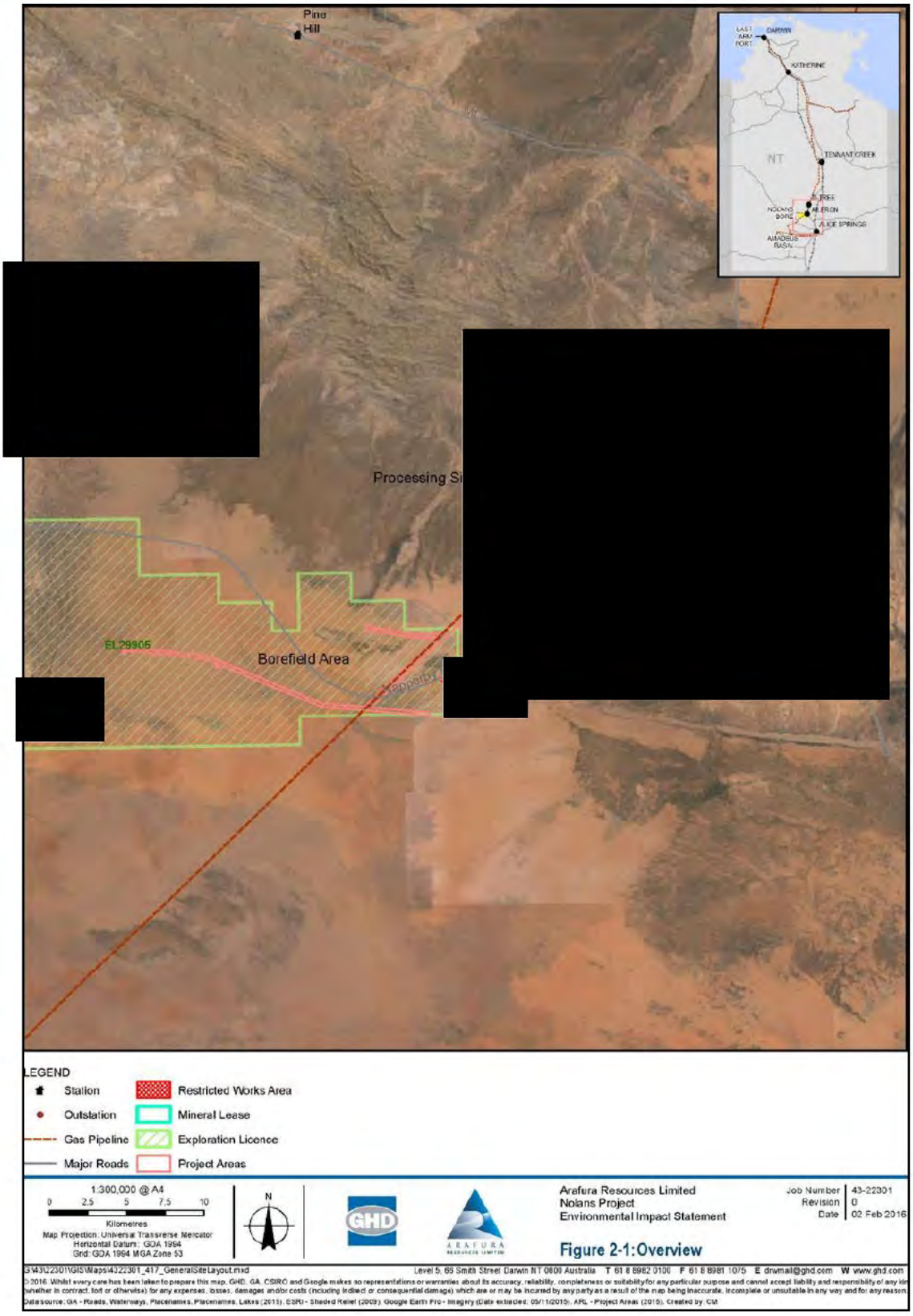

Figure 6-1 Project Site Overview

6.2 Physical Environment

The physical environment of the project setting has been assessed as part of the following bodies of work:

- GHD, 2016, Nolans Project, Environmental Impact Statement (EIS), Arafura Resource Ltd, February 2016.
- GHD, 2017, Nolans Project, Environmental Impact Statement (EIS) – Supplementary Report, October 2017.
- GHD, 2019, Arafura Resources Ltd, Nolans Project Section 14A Significant Variation Notification, June 2019.

6.2.1 Climate

Details of climatic factors, including rainfall, evaporation, wind and seismic activity are provided in Section 2.1.1 of the Project's 2021 MMP (Arafura, 2021).

6.2.2 Land Systems

Details of land systems, including soils, geology and topography are provided in Section 2.1.2 of the Project's 2021 MMP (Arafura, 2021).

6.2.3 Surface Water

Details of surface water, including drainage features, surface water quality and the Diversion Management Plan are provided in Section 6.1.1 of the Project's 2021 MMP (Arafura, 2021).

6.2.4 Groundwater

Details of groundwater, including the regional hydrogeological setting, local baseline groundwater quality, hydrological modelling results, and borefield aquifer performance predictions are provided in Section 6.1.2 of the Project's 2021 MMP (Arafura, 2021).

6.2.5 Geochemistry

Both ore and host rocks are extremely low in sulphides. Waste rock characterisation is addressed in the EIS, Volume 2 Appendix L: Acid, Metalliferous Drainage Report.

Further details of the geochemistry associated with ore and waste rock are provided in Section 4.2.1.1 of the Project's 2021 MMP (Arafura, 2021).

Details of the geochemistry associated with residue/tailings material are provided in Section 4.4.1 of the Project's 2021 MMP (Arafura, 2021).

6.2.6 Radioactivity

The most abundant rare earth-bearing minerals at Nolans Bore are apatite, monazite (both phosphate minerals) and allanite (a silicate mineral). These mineral species present a highly desirable rare earth mix at Nolans Bore, with 26.4% of the mix represented by NdPr oxides. The mineralised material also contains radioactive minerals of uranium and thorium, along with their decay chain daughters in equilibrium and is considered a naturally occurring radioactive material (NORM).

The host rocks are predominantly a mixture of gneisses and granites with the mineralogy of these rock units is typically dominated by quartz, feldspar and biotite. A portion of the host rocks are also NORM.

Details of the waste radiation classification are provided in Section 4.4.1.1 of the Project's 2021 MMP (Arafura, 2021).

6.3 Biological Environment

6.3.1 Biodiversity

Details of biodiversity, including flora and fauna associated with the project, vegetation communities, fauna habitat types, stygofauna and the presence of threatened species are provided in Section 2.1.3 of the Project's 2021 MMP (Arafura, 2021).

6.4 Socio-Economic and Cultural Environment

Details of the socio-economic and cultural environment, including the existing socio-economic conditions and details of the social impact assessment and management plan are provided in Section 2.2 of the Project's 2021 MMP (Arafura, 2021).

Details of sacred sites, sites of archaeological or heritage significance and their proposed management are provided in Section 3.3 of the Project's 2021 MMP (Arafura, 2021) and in the Cultural Heritage Management Plan (Appendix G of the MMP).

7.0 MINE CLOSURE RISK ASSESSMENT

7.1 Risk Assessment Methodology

The risks associated with closure, rehabilitation and post mining land use were examined as part of a high-level risk assessment undertaken for the Project (further detail in Section 5 of the EIS (GHD, 2016)).

The risk assessment considered each domain individually with the inherent risks and hazards arising from the event identified by an assembled group of technical and mining specialists. This was later reviewed and edited by key technical specialists before issue and approval by Arafura.

This process was completed in accordance with the requirements outlined in Australian Standard AS ISO 31000:2009 Risk Management - Guidelines and SA/SNZ HB 436:2013 Risk Management Guidelines – Companion to AS/NZS ISO 31000. Following the identification of measures to eliminate or mitigate the risks, the assessment was repeated for each risk to determine the 'residual' or 'mitigated' risk. Likelihood and consequence are determined and compared using a risk matrix outlined in APPENDIX B to determine risk scores.

The resulting risk register (for mine closure-related risks only) is presented in APPENDIX C.

7.2 Key Closure Risks and Issues

A summary of the key closure related risks identified by the Project risk assessment (APPENDIX C) are presented in the sections below. These risks were identified as having either a medium (or higher) level initial or residual risk.

7.2.1 Diversion of Kerosene Camp Creek

Surface Water	
Risk Event	Altered and unsustainable hydrological regime associated with Kerosene Camp Creek
Impacts and Pathways	Altered hydrological regime (increase in flows) in the western arm of Kerosene Camp Creek, downstream of the diversion channel outlet resulting in channel adjustments (widening) along this section of creek. Long term localised increased velocity and erosion downstream of the diversion during infrequent rainfall event. Loss of water (40% reduction in flows) to catchment downstream from the original creek alignment including loss of water to the diversion and to sediment basins on the mine site
Planned controls	Design of diversion to be peer reviewed by appropriately qualified independent professional to ensure it is likely to meet the requirements of: Diversion has been planned by highly qualified and experienced engineering firm who have read all available information in EIS and other data on the requirements of the diversion before completing design. Maintaining the existing regional hydrologic regime;

Surface Water	
	Preventing surface and sub-surface flows into the pit, even in a 1,000-year average recurrence interval (ARI) flood event; Maintaining sediment transport and water quality regimes that allow the diversion to be self-sustaining. Implement a Diversion Management Plan, including: Collation of baseline water quality Hydraulic modelling of design Performance criteria for water quality, ecology and geomorphology Implement a Biodiversity Management Plan (BMP), including: Site planning to minimise vegetation clearing where possible Implementation of a Water Management Plan, including: Runoff from disturbed areas (from rainfall events within the design criteria) will be diverted into sediment ponds and not discharged into the natural environment. Design outlet to have similar gradient to existing and reduce angle at which the diversion enters the natural channel Maintain installed rising stage samplers and gauging stations in creeks in and around Nolans to monitor surface flows and water quality in creeks.
Additional controls proposed	Engineered design of the outlet to the diversion to minimise change in velocity and associated scouring including to have similar gradient as downstream. Monitor diversion outlet and repair/ make design changes to outlet if damage / scouring exceeds expectations, including installation of rip-rap

7.2.2 Groundwater Table Drawdown and Recovery

Groundwater	
Risk Event	Decline in availability of water to existing and/or future users within the Southern basin
Impacts and Pathways	Progressive water table drawdown from groundwater extraction rates from the Southern basins borefield. Decline in availability of water to existing and/or future users within the Southern basin (i.e. bore water for communities of Alyuen, Laramba / Napperby). Less groundwater availability to surrounding landholders' bores.
Planned controls	Undertake hydrogeological investigations and predictive groundwater flow modelling. Identify current and potential future users. Monitoring program, including bores to assess impacts on water table. Install groundwater monitoring bores and provide substitute water source from elsewhere for existing stock bores if required. The Water Abstraction Management Plan will include assessment and

Groundwater	
	management of any stock or drinking water bores that could be impacted by the Project, in agreement with the owners and/or operators of those bores. This is to include: conducting a hydro-census (condition) survey of local groundwater users prior to construction to establish baseline conditions a program to monitor water levels at those bores to detect whether levels are within observed baseline conditions measures to ensure identified groundwater user bores remain operational or provide an alternative water bore or supplies if required.
Additional controls proposed	Future recalibration of groundwater model, informed by historical operational data after several years of Project operations. Alternative water supplies to supplement demand for directly impacted users or change to borefield management if water table drawdown is demonstrated to be unacceptable. Development and implementation of additional groundwater and surface water management strategies. A Water Abstraction Management Plan will be developed, which provides: ▪ a full description of the groundwater model, assumptions and parameters ▪ further information to validate the existing class 1 groundwater model, ▪ revised model outputs for estimated groundwater drawdown, and recovery of groundwater levels post-closure (including 50, 100 and 1000 years), at the borefield and mine site ▪ a framework identifying timing, methods and parameters for the collection of further information on baseline groundwater levels, flow directions and flow rates to understand natural variance and hydrological conditions in the borefield and mine site ▪ details of all monitoring bores, ▪ confirmation that all bores and bore meters would be constructed, operated and registered in accordance with the 'Minimum construction requirements for water bores in Australia' ▪ measures to quantify and record the volume of water abstracted from the borefield and mine site ▪ a framework, including timeframes, for progressing to a Class 2 numerical groundwater model ▪ an independent peer review of the updated Water Abstraction Management Plan by a suitably qualified independent professional

7.2.3 Seepage from Residue Storage Facility

RSF Seepage	
Risk Event	Seepage of poor-quality leachate from RSF
Impacts and Pathways	Seepage of tailings water containing metals, high salinity or radiation at levels exceeding guideline thresholds, with localised contamination of groundwater and/or discharge to surface water. Failure of liner systems Failure of RSF cover strategy to prevent minimise leachate through the facility.
Planned controls	GHD (2016) investigated geochemistry and concluded that risk of acid, metalliferous, or saline drainage is low. Investigations to continue. RSF design work conducted by independent engineers (Knight Piesold) for Definitive Feasibility Study (March 2019) includes the following design features to mitigate the risk of seepage: ▪ Site geotechnical investigations ▪ Hazard assessment ▪ Design and construction methods in accordance with industry and regulatory standards ▪ HDPE and compacted soil liner systems ▪ Underdrainage and water collection/return systems ▪ Consideration of available construction materials ▪ Conceptual cover design Other measures proposed include: ▪ Seepage detection ▪ Groundwater monitoring program; ▪ Thickener on benefactor to reduce volume of entrained water entering the TSF; ▪ Supernatant reclaim; ▪ Ongoing testing on production tailings and residues to confirm chemical properties; ▪ Tailings storage facility management and water discharge; ▪ Ongoing AMD sampling and analysis; ▪ Mine Management Plan; ▪ Sediment and Erosion Control Plan; ▪ Controlled and managed site drainage and release to adequately dilute fluoride; ▪ Water cover to minimise dust generation until capped.
Additional controls proposed	Avoid placement of future stock bores within close proximity. Continued investigation of closure strategies for the RSF, including: ▪ Geochemical characterisation and potential to generate poor

RSF Seepage	
	quality leachate ▪ Hydrogeological modelling to improve understanding of risks associated with seepage on local groundwater systems and potential post-closure land users. ▪ Continued cover modelling and design to ensure closure objectives can be achieved.

7.2.4 Physical Stability of Containment Facilities

Physical Stability of Landforms	
Risk Event	Excessive erosion of waste dumps or RSF
Impacts and Pathways	Potential impacts to surface water, groundwater, flora, fauna and public safety. Potential embankment failure of RSF. Contamination of surrounding land, vegetation, surface water and groundwater systems Unable to achieve revegetation success or closure objectives. Soils in the project area are likely to be highly erodible.
Planned controls	Current mine schedule includes waste dumps up to 60m high and RSF to 14m high. Conceptual designs have been prepared by Landloch (2021b) based on existing information on anticipated material types (physical and chemical properties), climatic information, erosion modelling results and preliminary closure objectives. Conceptual design features for the proposed landforms include: ▪ Armouring the outer embankments of the landforms with competent waste rock or a soil/rock mix to minimise erosion. ▪ Concave slope profile from 18 degrees at the upper sections, to 6 degrees at the lower sections. ▪ Consideration of a cross-batter berm ▪ Crest bunds around the upper perimeter of the landforms to prevent run-off from the upper surface (a water harvesting landform) ▪ Toe drains/bunds at the base of the embankments to limit the impact of sediment movement. ▪ Flood protection/armouring for any embankments located in areas susceptible to flood waters
Additional controls proposed	Continued assessment of material volumes and physical/chemical characteristics and refining of landform designs. Stakeholder consultation to confirm design aspects, completion criteria.

7.2.5 Radioactivity

Arafura Resources will aim to ensure that radiation levels post closure are consistent with pre-operational levels. This will be achieved by covering any remnant radioactive materials with sufficient inert material to result in negligible risk, reflecting the pre-operational conditions. A post closure radiological risk assessment was conducted which demonstrated that in worst case failure scenarios, radiological impacts to people and the environment would be negligible.

Based on characterisation and modelling, it is anticipated that wastes contained within the RSF and TSF will contain elevated concentrations of radionuclides (GHD, 2016h).

A Radiation Management Plan (RMP) will be implemented to ensure that radiological impacts to workers, the public and the environment are minimised during operations and post closure.

Waste management activities are to comply with commitments in the approved Environmental Impact Assessment, relevant Territory legislative requirements and in accordance with legislation including the guidance provided in ARPANSA, Radiation Protection Series 9 - Code of Practice and Safety Guide for Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing, 2005.

At closure radioactive material will be contained with the RSF and TSF and be in a condition for appropriate capping/closure as described in Section 6.2.6.

Radioactivity	
Risk Event	Radiation exposure to humans, plants or animals or build-up of radionuclides within sediments
Impacts and Pathways	Potential exposure to public located at nearby off-site receptor, that exceeds 1mSv/y (above natural background). Post closure, potential exposures are unlikely. Post closure scenario modelling by Arafura Resources indicates that in the worst-case failure scenario exposures would be low (mainly due to the low radionuclide content of the waste materials). In this scenario, the main potential exposure pathway is through uptake of radionuclides int foods, leading to ingestion doses. However, the potential exposure is estimated to be low. Post closure exposure to non-human biota (including domestic stock) is expected to be negligible. In the worst-case scenario, there is the potential exposure to non-human biota through ingestion of plants. It is noted that this is not expected to occur because in the worst-case scenario, other contaminants would make food stocks inedible.
Planned controls	The controls for radioactive materials that impact final closure are outlined in the project radioactive waste Management Plan. The key control measures include: – Design and construction of waste rock facility and tailings

Radioactivity	
	facility in approved manner – Placement of mined radioactive material at the centre of the waste rock facility – Placement of tailings in a specially designed facility – Lined tailings facility with underdrainage – Assessments to determine optimal cover depth to ensure that post closure radiological emissions are consistent with pre-operational levels. ▪ Compliance with relevant legislative requirements including the guidance in the Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing, 2005; ▪ Radiation monitoring program (Occupational and environmental) during operations and post closure.
Additional controls proposed	Monitoring program will identify any changes from original assumptions, with review and implementation of additional suitable planned controls. Periodic review of the Radiation Management Plan. Continued optimization of the closure strategy for the tailings facility and waste rock facility.

7.2.6 Materials Balance

The main categories of closure material anticipated are as follows:

- Topsoil is required as a growing medium on post-closure landforms. This will be sourced mainly from onsite topsoil storages close to the mining area, RSF and other Project infrastructure areas;
- Clean waste rock is required for a variety of uses including cover system capillary break/capping, erosion protection, final land-form profiling. This is to be sourced from a designated area of the WRDs where rock meeting geochemical and geotechnical specifications will be stored; and
- Low Permeability Soil / Clay (permeability <10-8 m/s) will be required for lining capping of RSFs, and, if necessary, PAF cells in WRDs.

Clean inert waste rock will be available in significant volumes for closure works, however the topsoil and low permeability clay for lining and cover systems will be less abundant. During the first year of mining, conceptual closure designs are to be developed to determine material volume requirements for closure. The required closure materials are to be reconciled with the site available materials within actual and planned stockpiles in a mass balance. These closure volumes and mass balance should be refined throughout the mine life based on:

- Cover material investigations;
- The evolution of the MCP and closure designs; and

- Ongoing monitoring of the properties of waste materials generated during the mine life.

Detailed specifications for closure materials are to be developed in the detailed MCP during the first year of operation.

Materials Balance	
Risk Event	Inadequate volumes or inappropriate physical/chemical properties of materials required for rehabilitation strategies (e.g. topsoil, rock armour, capillary break material, RPL cover material).
Impacts and Pathways	Inadequate planning of closure strategies and identification/stockpiling of materials required. Inadequate waste characterisation to determine physical and chemical properties and implications for rehabilitation.
Planned controls	Geochemical and geotechnical characterisation of soils and waste rock materials has commenced and will continue as further waste materials become available for testing. Closure strategies for RSF and WRD landforms continue to be developed (currently conceptual) and consider the properties and volumes of materials required.
Additional controls proposed	Material characterisation and landform closure strategies continue to progress through the construction and operational phases of mining.

7.2.7 Unexpected Mine Closure

Unexpected or Sudden Closure	
Risk Event	Unexpected early closure of the Project, including due to delays or falling commodity prices.
Impacts and Pathways	Delays to effective rehabilitation by Project proponent, including through erosion or contaminated seepage resulting in non-sustainable ecosystems and downstream effects. Potentially exacerbated by closure designs not yet developed in detail at time of early closure.
Planned controls	Long term offtake arrangements for clients; Strategic long-term investors; Preliminary closure plan; Commit to developing/refining closure designs through operations; Topsoil collected in accordance to MMP commitments and materials balance properly surveyed, calculated and accounted for; WRD/RSF designs are staged and conservative and limited impact should result if they enter early closure as closure concept does not significantly change; Progressive rehabilitation of WRDs and other post-closure landforms to reduce the requirement for closure and rehabilitation activities in the event of a sudden closure; Bonds/security held by NT Government are based on estimated closure

Unexpected or Sudden Closure	
	costs. These costs are reviewed regularly as part of the Mining Management Plan and Operational Performance Reporting processes. A Conceptual Care and Maintenance Plan is in place and will be refined in parallel with the MCP. This will provide for making the site secure and safe and implementing an accelerated closure process based on the plans within the MCP based on returning it to the proposed post-closure land use and target ecosystem as defined in Section 8.2.
Additional controls proposed	Develop detailed closure designs; Update closure costs estimate every 3 years - Prepare decommissioning and rehabilitation plan; WRD/TSF constructed in stages with progressive rehabilitation where appropriate; Refine the Care and Maintenance Plan, for short term stop to operations

7.2.8 Contaminated Site Remediation

Contaminated Sites	
Risk Event	Contaminated sites not adequately remediated, including Water Leach, Neutralisation and Residue Storage Facilities (RSFs) or Excess Process Liquor Evaporation Ponds, Mill, fuel farms or consumable storage areas.
Impacts and Pathways	Soil or water contamination Delays to effective rehabilitation by Project proponent, including through erosion, or contaminated seepage resulting in non-sustainable ecosystems and downstream effects. Delays associated with cost overruns could be period of several years. Inability to relinquish, leading to damage to reputation, not able to get bond, ongoing environmental damage.
Planned controls	Reporting of spills; Contaminated sites register; Contaminated sites reporting procedures; Contaminated sites rehabilitation designs; Closure plan. Operator is responsible for site until demonstration that able to meet agreed closure objectives and criteria
Additional controls proposed	Undertake further sampling/monitoring to accurately define level and extent of any ground contamination and improve volumetric estimates.

The following measures are to be employed to limit residual contamination following closure:

- Operational environmental management should aim to limit the creation of contaminated land, although some areas (e.g. the ROM pad) will handle potentially hazardous materials and may at closure exhibit levels of contaminants in excess of baseline. It should be noted however that these stockpile areas will be on compacted hardstand materials and within the

contaminated water catchment area. They have all been designed to be adjacent to WRD 1 to allow easy and efficient closure if required;

- Contaminated land must be identified during the pre-closure phase;
- Appropriate pre-closure contaminated land sampling/monitoring to accurately define level and extent of any ground contamination and improve volumetric estimates;
- All contaminated soils are to be excavated down to extent of contaminated soil horizon. Materials are to be disposed of within the RSF;
- Prepare a pre-remediation contaminated sites register and use it to audit completed remediation works;
- Incorporate contaminated sites remediation programme into MCP prior to closure; and
- Commission an independent audit of the remediated site to demonstrate completion.

7.2.9 Post-Closure Safety

Safety of Public and Fauna	
Risk Event	The closed site is left in a way that presents unacceptable safety risks to people or animals.
Impacts and Pathways	Safety issues could be associated with: ▪ Steep pit walls ▪ inadequate disposal of infrastructure demolition waste ▪ soil or water contamination ▪ erosion gullies on RSF or WRD's. ▪ (radiation risks addressed in separate risk) ▪ Animals chasing water into the pit and unable to escape ▪ Animals fall down failed plugs in exploration drill holes
Planned controls	Pit bund proposed - location and dimensions in accordance with WA Guidelines (step back from zone of potential subsidence) Blocking of ramp into pit. Signage to warn of safety risks Infrastructure demolition and disposal practices to consider safety risks (e.g. suitable burial cover) Contaminated sites assessment, remediation and validation of clean-up. Exploration rehabilitation involves plugging of drill holes to industry standards. Note: 1,237 holes drilled and only 14 remain accessible. Two for calibration purposes and 12 for monitoring. All closed holes have been rehabilitated in accordance with DITT guidelines.
Additional controls proposed	Risk mitigation controls during the active closure phase: ▪ The Health, Safety and Environmental management systems employed during operation must be reviewed and updated prior to closure and rehabilitation and are to remain in force whilst activities continue at the site. ▪ Security arrangements during active closure should comprise of: – Security, fencing, signage will be maintained as during operation; – Measures (e.g. safety berms) incorporated into closure designs will be constructed; – Public access will be restricted as it was during operation; – Post closure access arrangements will be discussed with stakeholders.

7.3 Knowledge Gaps, Trials and Investigations

The risk assessment process has identified a number of knowledge gaps that will be addressed through the initiation of technical investigations and rehabilitation trials.

A number of trials and investigations are to be carried out during the operational life of the mine. The results of these trials will be used to inform final landform design and rehabilitation proposals. Table 7-1 summarises the currently envisaged programme. This is to be reviewed and updated during the operational phase.

Table 7-1 Pre-Closure Trials and Investigations

Topic	Information Gap/Uncertainty	Description
Vegetation trials	Optimum seed planting mixes for rapid establishment under local climatic and soil conditions and on post-closure landforms.	Undertake trials of soil covers and vegetation recruitment on WRDs and other disturbed surfaces. Undertake topsoil stockpile seedbank trials.
Progressive Rehabilitation trials	Optimum WRD cover design for maximum stability and vegetation establishment success.	Large scale field trials of soil profile, erosion and vegetation recruitment.
Rehabilitation and closure materials	Availability of suitable cover material for closure.	Cover materials resource assessment: Undertake further detailed geotechnical and geochemical studies to locate and characterise sufficient quantities of rehabilitation cover materials. This should include timing of material availability in relation to progressive rehabilitation.
Residue Storage Facility Covers and Rehabilitation	Stable covering for RSF appropriate to determine appropriate capping design.	Trials of rehabilitation vegetation and soil types on capped and covered surfaces.
Waste	Opportunities for material and equipment re-use.	Investigate the potential for sale and/or transfer of plant and equipment.
Geochemical studies	Ongoing sampling and NAPP/NAG testing of tailings and process residues and selected waste rock lithologies.	Ongoing kinetic leach tests of waste products in WRD and RSF. Ongoing NAF/PAF and compositional analyses.
Radiological testing	Suitability of encapsulation design of radioactive materials in the long term.	Operational phase monitoring associated with radiation, which can be applied to closure designs. Monitoring will include gamma shine and inhalation as per type and frequency listed in the Radiation Management Plan (RMP).

Topic	Information Gap/Uncertainty	Description
Groundwater Resources	Impact on groundwater levels and chemistry.	Ongoing monitoring of groundwater levels and chemistry and reviewing of model predictions over time.
Long Term Pit Lake Behaviour	Overall water balance.	Ongoing review of predicted pit lake levels to address any modification of rehabilitation options.
Ecology and Weeds	Assess quality of remaining vegetation communities and fauna habitat in and around site to target ecological rehabilitation.	Conduct pre-closure ecology condition survey. Assess analogue sites for post-closure rehabilitation monitoring and assessment. Conduct detailed assessment of weeds in all domains. Planned periodic surveys of site fauna to assess project impacts.
Soil Contamination	The extent of soil contamination and remediation will only be apparent close to closure.	Conduct contaminated soil investigation of all domains where potentially contaminative activities have taken place.
Kerosene Camp Creek Diversion	Performance and impacts of the diversion in relation to hydrology, erosion/sedimentation processes and long-term stability.	Hydrological assessment of diversion performance informed by planned monitoring of water and stream bed load behaviour. Planned periodic surveys of site fauna to assess project impacts

8.0 POST-MINING LAND USE

8.1 Approach

The Northern Territory Department of Industry Tourism and Trade, Mines Division (DITT) requires that a post mining land use is 'discussed with all stakeholders and agreed to by the stakeholders and the DITT, and that 'this should be recorded in the earliest planning documentation for the site'.

The final, post-closure land use is to be developed and refined through the operating life of the mine. Various factors will influence its development:

- Consultation with stakeholders
- A Post-closure Land-use Alternatives Assessment undertaken in parallel with ongoing consultation
- Emerging knowledge of the nature of the deposits, and the composition and quantity of waste products
- Any future changes to mine design.

8.2 Preliminary Post-Closure Land Uses and Target Ecosystems

Table 8-1 presents the preliminary post-closure land uses for each of the domains. Post closure land uses have been balanced against the target ecosystems and pre-mining land use identified in the EIS flora and fauna technical reports (GHD, 2016a and GHD, 2016f).

Targets for ecological rehabilitation will be native flora species with a preference for local providence flora species.

The target ecosystems will evolve with the post-closure rehabilitation planning and the results of re-vegetation trials.

Table 8-1 Preliminary Post-Closure Rehabilitation Land Uses and Target Ecosystems

Domain	Current Land Use	Proposed Closure Land Use	Target Ecosystem
Pit and haul Road	Cattle grazing	Open pit and pit lake. No viable use. Pit access to remain restricted.	N/A
Run of Mine (ROM) stockpiles	Cattle grazing	Livestock grazing.	Vegetation communities as mapped in EIS flora and fauna technical reports (GHD, 2016a and GHD, 2016f) as far as practicable.
WRDs	Cattle grazing	Livestock grazing.	Optimum native vegetation community to secure slope stability and prevent erosion.

Domain	Current Land Use	Proposed Closure Land Use	Target Ecosystem
Processing Plant, power plant	Cattle grazing	Livestock grazing.	Vegetation communities as mapped in EIS flora and fauna technical reports (GHD, 2016a and GHD, 2016f) as far as practicable.
Residual storage facilities (RSFs) and evaporation pond	Cattle grazing	Native grassland habitat. To minimise erosion of the cover systems livestock will be prevented from grazing on the RSF.	Optimum native vegetation community to secure slope stability, prevent erosion and preserve integrity of cover system.
Administration offices and maintenance	Cattle grazing	Cattle grazing	Vegetation communities as mapped in EIS flora and fauna technical reports (GHD, 2016a and GHD, 2016f) as far as practicable.
Infrastructure	Cattle grazing	Cattle grazing. Roads and fences retained if agreed through stakeholder consultation.	
Accommodation village	Cattle grazing	Cattle grazing	
Exploration tracks and holes	Cattle grazing	Cattle grazing	

9.0 CLOSURE OBJECTIVES AND COMPLETION CRITERIA

9.1 Closure Objectives

The principle aims of mine closure and rehabilitation for the Nolans project are:

- To establish a safe and stable post-mining land surface which supports vegetation growth over the long-term;
- To return the land, as close is reasonably practical, to its pre-disturbance land use; and
- To make the site suitable for future leaseholders likely uses for the site.

With these principle aims in mind, the following mine closure objectives have been identified:

- **Legal compliance** - to meet all legal obligations and commitments
- **Meet stakeholder expectations** - to meet stakeholder expectations for the closed site
- **Public safety** - to provide a closed site with no unacceptable safety risks or hazards to people and animals
- **Long-term stability** - to achieve physical, chemical and biological stability of rehabilitated areas
- **Minimise impacts to groundwater or surface waters** so that the nominated post-closure land uses are not affected.

9.2 Completion Criteria

The completion criteria provide a means of evaluating the successful achievement of the closure objectives.

Ideally these should be SMART (specific, measurable, attainable, relevant and timely) and, once agreed, set the conditions on which the relinquishment of the Project site can take place.

The level of detail of completion criteria should be appropriate to the stage of development. This conceptual closure plan is submitted pre-approval and further detail and definition will be added to the criteria during Project design, construction and during operations.

In agreement with the regulators, the criteria may be reviewed and amended in response to operational and post-closure management and monitoring programmes.

The preliminary Completion Criteria are listed in Table 9-1.

Table 9-1 Closure Objectives and Completion Criteria

OBJECTIVE	CRITERIA	MEASUREMENT
Compliance		
Project meets all binding conditions and commitments relevant to rehabilitation and closure.	Register of compliance with legal requirements is prepared and updated annually and records no non-compliances.	Audit of compliance with legal requirements.
Stakeholder Expectations		
Post-mining land use is agreed with stakeholders.	Closure design employs agreed landforms, land- uses and closure performance criteria.	Stakeholder engagement records.
Post-mining land use corresponds to that agreed with stakeholders.	Final rehabilitated land use conforms to that agreed with stakeholders.	As built plans; and Stakeholder engagement records.
Condition of heritage and archaeological sites meets the requirements of relevant authorities.	The agreed heritage or archaeological features that are not removed as part of construction or operation phases remain undisturbed.	Cultural Heritage survey on closure.
Safety		
A safe workplace is provided for all personnel engaged in decommissioning, closure and rehabilitation activities.	A safety management system covers all activities associated with decommissioning, closure and rehabilitation and records no non-conformances.	Safety Management System Audit.
Risk of impacts to human health, livestock and ecosystems on the site from closure activities are reduced to an acceptable level.	A safety management system covers all activities associated with decommissioning, closure and rehabilitation and records no non-conformances.	Safety Management System Audit.
	All waste materials (including litter) are either disposed off-site at a licenced facility or securely managed on-site according to	Waste tracking documentation for regulated wastes removed from site

OBJECTIVE	CRITERIA	MEASUREMENT
	the Waste Management Plan.	Audit of on-site waste management.
	All drill holes, shafts, open pits and other openings are securely capped, filled or otherwise made safe.	Final inspection by regulator.
	Hazardous sites (e.g. the pit, and RSF) are either fenced, clearly signposted or bunded where appropriate.	As built fencing or bunding plans.
	All slopes and rock faces are stable.	Geotechnical stability assessment.
	All contamination is identified and contained or remediated as agreed with the authorities.	Post remediation soil survey Final inspection by regulator.
	Radiation levels are such that they are consistent with pre-operational levels. All sources of radioactivity are decontaminated, removed or encapsulated such that levels of radioactivity on-site are consistent with pre-mining natural site levels.	Post remediation radiation survey; and Final inspection by regulator.
	All facilities and equipment are safely decommissioned, demolished and removed unless they are to remain for an agreed future use.	Final site inspection by regulator.
Waste disposed on-site is securely contained to prevent impacts on human health and ecology.	Waste rock, tailings and residues, and any other waste storage facilities (e.g. solid waste landfills) with potential for environmental impact have been managed appropriately.	Inspection and audit of environmental performance throughout operation.
	Design and performance of systems to prevent air and water ingress/egress and to contain hazardous materials are approved by regulators.	Written approval of waste storage designs from regulator Audit of approved designs and specifications.
	As built containment systems conform to approved designs.	Inspection and audit of rehabilitation works during and

OBJECTIVE	CRITERIA	MEASUREMENT
		after construction As built drawings.
The pit lake (if it occurs) does not present an unacceptable hazard to human or ecological health.	Wildlife and livestock are prevented / deterred from using the pit lake as a water source.	Pit abandonment bund Visual wildlife monitoring.
Radioactive and chemically hazardous material pose no long-term threat to human or ecological health.	Containment of all waste stored on-site has long term resilience to erosion.	Regular monitoring: Performance of capping/cover materials and depth of topsoil cover (i.e. evidence of topsoil erosion and loss) Vegetation cover species Resilience integrity of constructed drainage Erosion and silt accumulation in constructed drainages Net sediment loss rates tonnes/ha/year Sediment quality Runoff quality.
	Design life of containment for radioactive contaminants is appropriate to decay of the material.	Radioactive Waste Management Plan (RWMP) will be prepared prior to mining which will cover decommissioning Modelling of the cover systems and waste contaminant levels.
	The location and details of any buried hazards remain clearly defined and marked in the long term.	Clear marking signage and record keeping lodged with authorities.
Physical Stability of Rehabilitated Areas		
All final landforms are safe and stable	Landform designs to provide long-term geotechnical stability and safety and are approved by regulators.	Written approval of landform designs from regulator

OBJECTIVE	CRITERIA	MEASUREMENT
		Audit of approved designs and specifications.
	As built landforms conform to approved designs.	Inspection and audit of rehabilitation works during and after construction As built drawings. Audit landform performance.
Rehabilitated landforms minimise visual impact.	Landforms are visually compatible with surrounding natural landforms, in terms of form, gradient, soil and vegetation cover.	Visually consistent with surrounding topography.
	WRDs have a maximum height of 60 m.	Inspection and audit of rehabilitation works during and after construction As built drawings.
Landform surfaces are stable.	Landform height, gradient and slope length are designed to minimise potential for erosion and final surface materials and treatments match the characteristics of the slope.	Erosion modelling Drainage design Audit of approved designs and specifications for final surface profiles and surface treatments.
	Post closure wind and water erosion rates are at least comparable with background levels of the area.	Regular monitoring of: Topsoil depth Vegetation cover, Drainage performance and Water erosion (rill and gully assessment) Visual assessment of sediment and dust deposition.
Chemical Stability of Rehabilitated Areas		
Surface material properties will not inhibit the development of the target ecosystem.	Landform designs include a suitable growth medium or surface cover.	Audit of approved designs and specifications.
	Chemical properties of soil do not limit revegetation success.	Rehabilitation vegetation monitoring and assessment

OBJECTIVE	CRITERIA	MEASUREMENT
		Chemical soil testing.
	Rehabilitated ecosystem is able retain water and nutrient resources.	Rehabilitation monitoring and assessment.
Containment of waste materials left on-site prevents release of contaminants such that there is no deleterious effect on local land uses.	Dust composition downwind of Nolans site reflects background levels of radionuclides and other contaminants.	Dust quality and composition monitoring.
Biological Stability of Rehabilitated Areas		
Rehabilitated ecosystem has equivalent values, functions and resilience as the target ecosystem.	Nolans site recolonised by previously existing fauna communities.	Camera surveys of fauna populations.
	Revegetation uses locally sourced seeds at the optimum mix for successful establishment and representativeness of target ecosystem.	Records of seeding trials Audit seed list.
	Self-sustaining vegetation cover is successfully re-established on disturbed areas.	Rehabilitation vegetation monitoring and assessment.
	Rehabilitated vegetation community species composition and diversity, density and structure are representative of the target ecosystem.	Rehabilitation vegetation monitoring and assessment.
	Weed populations do not restrict establishment of target ecosystem.	Weed surveys.
The rehabilitated landscape is compatible with the agreed final post-closure use.	As far as possible, post-closure watercourses have geomorphology and riparian communities consistent with those on site prior to development. Post-closure drainage does not lead to flooding of pit or	Flood modelling Flow monitoring Audit of approved designs and specifications for drainage pathways and outflows including design flows.

OBJECTIVE	CRITERIA	MEASUREMENT
	erosion of waste landforms during storm events. Drainage can accommodate a 1 in 1000-year ARI wet year rainfall.	
	Landforms, including surface covers, designed with drainage pathways and outflows that manage surface drainage, including extreme rainfall events, erosion and sedimentation have been agreed with relevant stakeholders.	Record of consultation with stakeholders representing future land users.
	Permanently altered land is limited to the WRDs, TSF, RSF and mine pit footprints and agreed infrastructure.	As built fencing/bunding plans.
The landscape and integrity of waste storage landforms is retained through extreme future events such as flooding, bushfires and drought.	Research trials demonstrate the potential of the rehabilitation to regenerate following fire.	Success of post-fire regeneration.
	Monitoring has confirmed the rehabilitation can survive one or more seasons of drought.	Qualitative assessment of vegetation health.
Disturbed areas will be progressively rehabilitated during operation.	Operational areas on site will be progressively rehabilitated.	Mining programme rehabilitation reports.
Groundwater and Surface Water		
Water quality leaving the site is generally consistent with pre-mining quality causing limited impact to the downstream beneficial use(s).	Sediment deposition downstream of the site consistent with baseline conditions. Groundwater down gradient of the sites consistent with baseline conditions and groundwater site specific trigger values.	Annual sediment sampling Water erosion (rill and gully assessment) Groundwater sampling.
	Levels of dissolved contaminants in runoff from Nolans site consistent with local background levels.	Surface water quality monitoring Flood modelling Flow monitoring.

OBJECTIVE	CRITERIA	MEASUREMENT
	Water levels in the pit always remain below surrounding groundwater levels, such that groundwater entering the pit only exits the pit lake through evaporation (groundwater sink).	Groundwater monitoring including bore and pit level monitoring Groundwater model validations Visual observations.
There is no long-term reduction in the availability of water to meet local environmental values or human uses, other than immediately adjacent to the pit.	Quality and availability of water in pastoral bores not reduced in long term.	Groundwater monitoring.
The site does not require continuing active management	No additional site surface water management required.	Monitoring of water course condition Erosion rates Sediment quality.
	Groundwater movements and dewatering will not impact on the potential post-mining land use and will pose no risk to livestock, irrigation or ecology following rehabilitation. Post mining groundwater quality is to be consistent with baseline conditions.	Groundwater monitoring Fauna monitoring at pit lake.
	No additional land management is required to that of surrounding land uses.	Site inspection and audit of monitoring and management records to determine land management requirements.

10.0 CLOSURE IMPLEMENTATION

10.1 Closure Schedule

10.1.1 Organisational Structure and Responsibility

Table 10-1 provides an indicative timeline of the phases of closure and rehabilitation planning, implementation and monitoring.

The programme is provisional and may be subject to change resulting from a wide range of potential factors. The programme is to be reviewed and updated regularly during the life of the Project.

Table 10-1 Closure Implementation Timetable

PHASE	TIMETABLE	SUMMARY OF ACTIVITIES	CLOSURE PLAN	CLOSURE AND REHAB DESIGNS	CLOSURE COSTS
Approvals	Pre-operation	Initial Closure Planning and Design.	Preliminary MCP (this plan) Initial stakeholder engagement and Post-closure Land-use Alternatives Assessment.	Closure Concept.	
Operation	1st-2nd year of operation	Detailed Closure Planning and Design.	First Draft detailed MCP First Draft detailed Care and Maintenance Plan Stakeholder agreed post-closure land uses.	Outline closure design Conservative waste storage to cope with early closure.	Prepare robust closure costs estimate in the first year of operation.
	Current LOM	Progressive rehab of RSF, WRD Vegetation and cover trials.	Annual review of MCP Trials, investigations and monitoring Regular review of risk assessment and MCP.	Annual review of closure and rehab designs Progressive rehabilitation Iterations to designs with new innovations in closure design emerging data and amendments to mining plans and activities.	Annual review of costs in response to updated designs and MCP.
Pre-Closure	5 years pre-closure	Seeding of closure vegetation Develop tender documents and procure contractors for closure activities Pre closure surveys	Final detailed closure plan; Pre-closure surveys; and Closure Waste Management Plan.	Finalised closure design.	Finalised costs.
Decommissioning and Closure	2 years post-closure	Capping / covering final areas of RSF, WRDs (areas not completed	Full implementation of MCP	Designs implemented	

PHASE	TIMETABLE	SUMMARY OF ACTIVITIES	CLOSURE PLAN	CLOSURE AND REHAB DESIGNS	CLOSURE COSTS
		under progressive rehabilitation program) Removal of ponds Removal of project components Remediation of contaminated land Creation of closure landforms Decommission / closure of borefield	Annual review of MCP Audit of closure completion.	Audit of design implementation.	
Rehabilitation	5 years post-closure	Soil conditioning and planting Weed and fire control.			
Post-closure	10 years post-closure (estimated)	Weed and fire control Monitoring and maintenance of rehabilitation areas.			

10.2 Project Domains

The description of closure strategies at the Project is segregated into 'domains' that represent areas of disturbance that are related either geographically or by disturbance type. The domains are:

1. Open Pit & Creek Diversion
2. WRD's, Stockpiles and ROM Pad
3. Residue Storage Facility
4. Roads & Service Corridors
5. Infrastructure Decommissioning & Demolition
6. Dams & Ponds

The following sections provide information on each domain. The structure of the sections is consistent for each domain and includes:

- Description – describes the domain, including the history and key aspects that relate to or may affect closure.
- Closure strategy – describes the key elements of the proposed closure strategy for the domain.
- Planning schedule table – describes the work and investigations proposed to address identified knowledge gaps, with a proposed schedule for when the work will be conducted.
- Implementation schedule table – describes the proposed schedule for implementing the closure strategy associated with the domain.

10.3 Domain 1 – Open Pits & Creek Diversion

10.3.1 Description

The extent and boundaries of this domain are shown in Figure 10-1.

The open pit mine design is shown in Figure 10-2. The LOM open pit is currently planned to reach a depth of about 220 m with a surface area of approximately 100 ha. The final pit dimensions are 1.6 km long, 1 km wide at its widest point and extending to a depth of approximately 220 m. The final pit is the results of merging individual pit stages and final pit wall cutbacks.

Prior to the merging of the pits, the first three Pit stages are independent of each other with the Pit stage 1 being in the western portion of the deposit and centred on the measured mineral resources. Pit stages 2 and 3 are in the eastern region of the deposit – as indicated in Figure 10-3.

Kerosene Camp Creek currently flows through the site of the pit stage 1. An interim creek diversion will be constructed to allow surface water from this drainage line to be diverted around the initial pit stage 1 and other mine infrastructure. This will be designed and constructed as a permanent drainage feature, which will prevent surface water flows into the pit during the operational phase but also beyond mine closure.

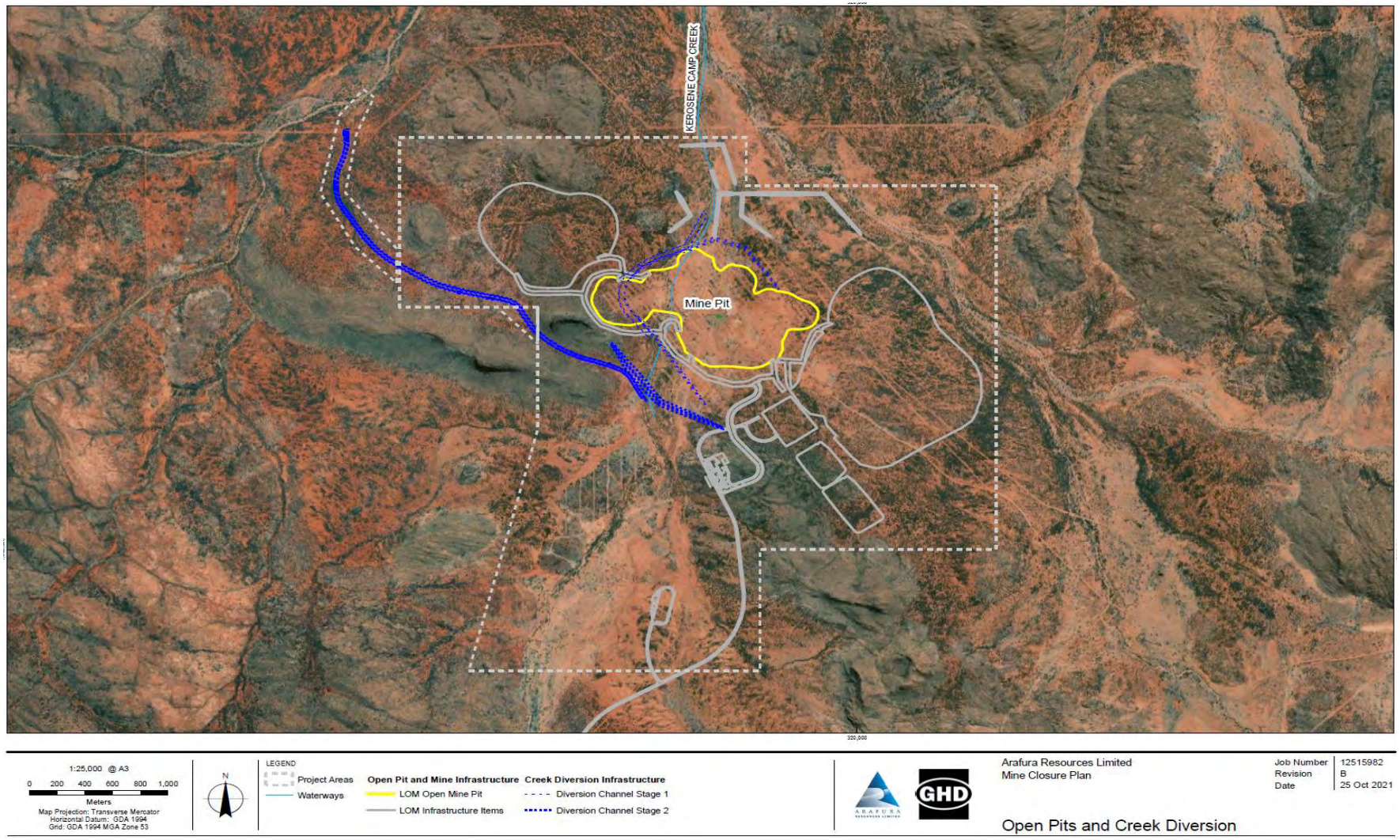

Figure 10-1 Open Pit & Creek Diversion Domain

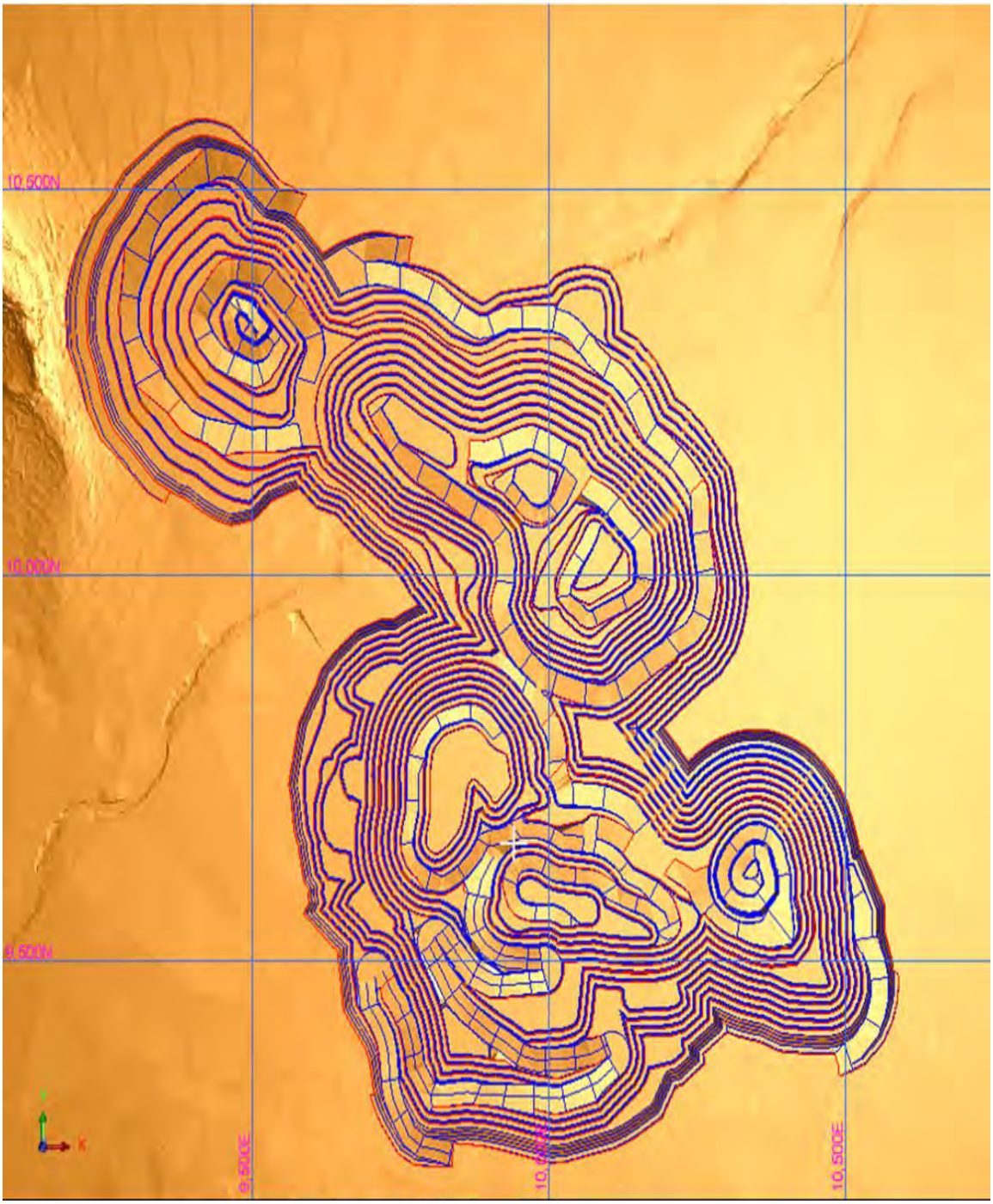

Figure 10-2 Final Pit Design

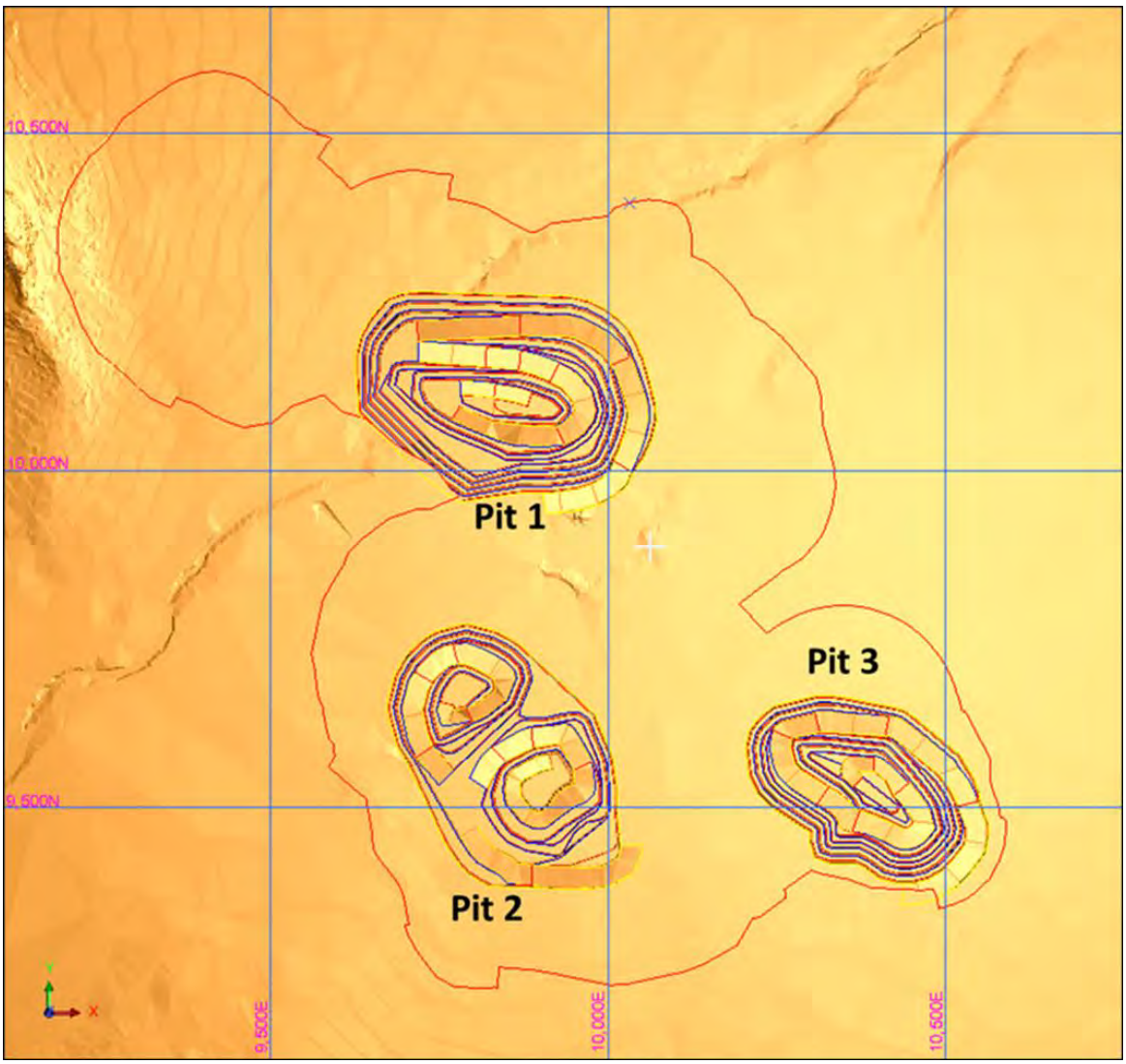

Figure 10-3 Staged Pit Design

10.3.2 Closure Strategy

The current closure strategy for the open pit domain includes:

- Pit walls will be retained at the final batter angles, provided these are geo-technically stable.
- Installation of pit abandonment bunds in accordance with WA Department of Industry and Resources Guidelines "Safety Bund Walls around Abandoned Open Pit Mines". This involves positioning the abandonment bund beyond the zone of potential geotechnical instability to ensure that any subsidence of the pit walls does not affect the integrity or effectiveness of the bund. The bund will also be constructed of competent rock that can withstand the long-term effects of erosion and weathering.
- Groundwater inflow from the pit walls will be allowed to collect within the pit and evaporate. It is anticipated that a small pit lake will develop, but the depth, quality and rate of filling is yet to be scientifically modelled. Water quality is expected to deteriorate over time due to the evapo-concentration of salts and other elements. If trigger levels are exceeded, a hierarchy

of investigations and management will be initiated, including additional monitoring, modelling and risk assessment with appropriately qualified technical experts.

- In addition to the abandonment bund, road access into the pit will be blocked by placing rock windrows at the tops of the original ramps.
- Signage will be installed to warn people of the risks associated with the open pit void and unstable pit walls. The need for signage will be discussed with stakeholders (post-closure land users and regulators)
- Stakeholder engagement will also continue during the operational phase regarding future access to and quality of water.

10.3.3 Planning & Implementation Schedule

Open Pit Closure & Rehabilitation Planning & Implementation Schedule			
Item	Planning schedule to address knowledge gaps	Schedule	Responsibility
1.1	Conduct/Continue pit hydrogeological modelling and assessment to determine: ▪ Groundwater inflow rates, pit lake recovery rate and equilibrium water level. ▪ Pit lake water quality and rate of degradation over time. ▪ Long-term groundwater contours (e.g. cone of depression) around the pit and potential for pit water to impact on surrounding groundwater.	Construction phase on ongoing refinement during operations.	Environmental Coordinator
1.2	Geotechnical engineering assessment of the pit to determine the location of abandonment bunding, in accordance with WA Guidelines.	Operations phase	Environmental Coordinator
1.3	Stakeholder engagement regarding abandonment bund location and design. For example, potential to link up WRD's or locate between WRD's and pit crest.	Operations phase	Environmental Coordinator
1.4	Engineering design of abandonment bund for any sections that are predicted to have water ponding against it.	Operations phase	Environmental Coordinator
Item	Implementation Schedule	Schedule	Responsibility
1.5	Complete pit abandonment bund and associated surface drainage works at closure	Operations phase (late stages)	Mining Manager
1.6	Survey of completed abandonment bund to confirm compliance with WA Guidelines.	Operations phase (late stages)	Chief Surveyor
1.7	Install signage to warn public of safety risks	At closure	Environmental Coordinator
18	Block vehicle access to pit via ramp	At closure	Environmental

Open Pit Closure & Rehabilitation Planning & Implementation Schedule			
			Coordinator
1.9	Monitoring of pit water quality and levels – compare against model predictions	Post-closure	Environmental Coordinator

10.4 Domain 2 – Waste Rock Dumps, Stockpiles and ROM Pad

10.4.1 Description

The extent and boundaries of this domain are shown in Figure 10-4.

Overburden and waste rock will be deposited in two WRDs over the LOM, with a final waste rock quantity of 304 Mt. The two WRDs will hold waste volumes built to a relative level (RL) 320 m, with a height of 60 m above natural surface and consistent with local topography. The waste rock dumps when completed will have a combined footprint of approx. 220 ha. The design concept is concave slope with no berms. The initial waste rock dump designs are shown in Figure 10-5 and Figure 10-6.

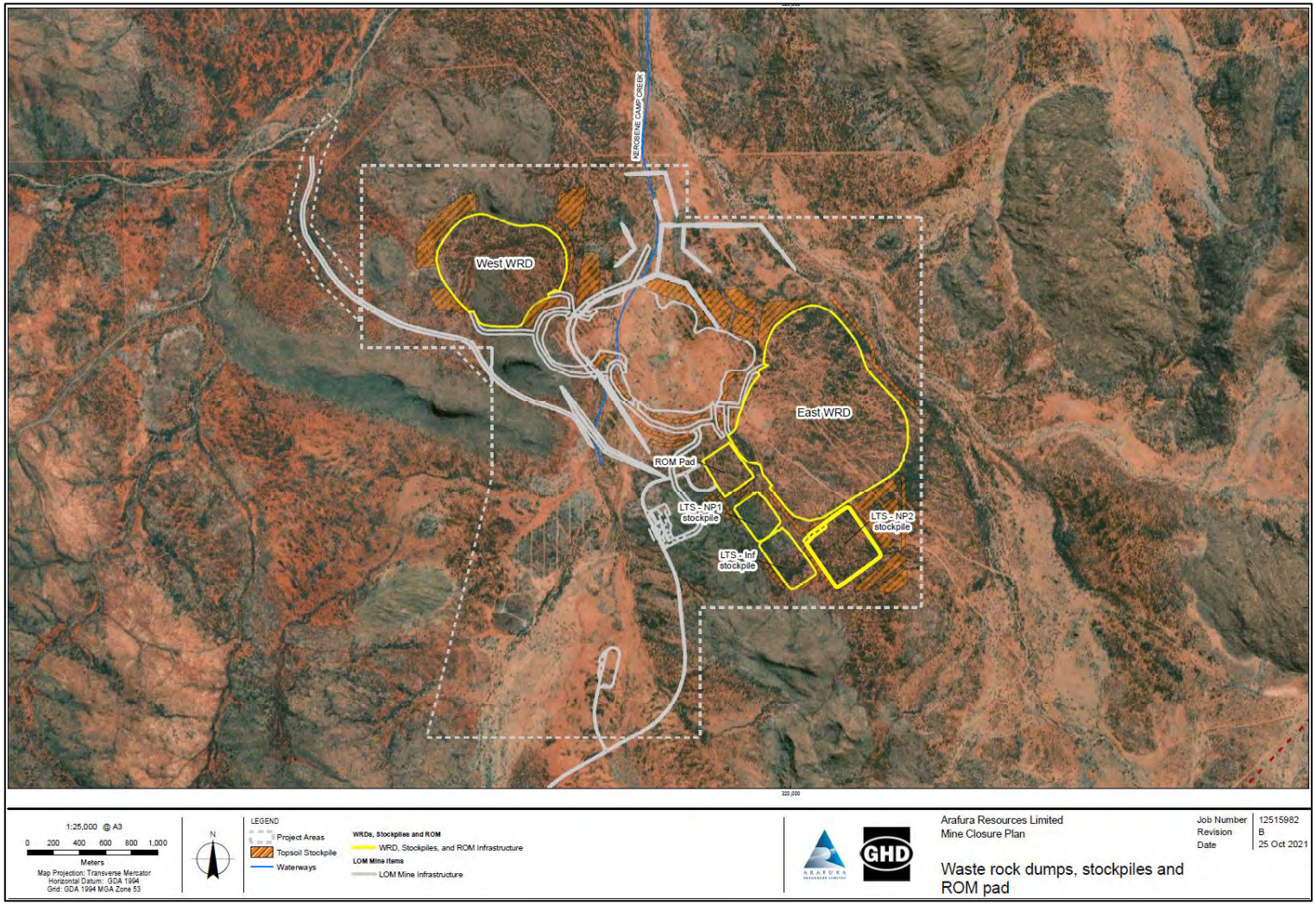

Figure 10-4 WRD Domain

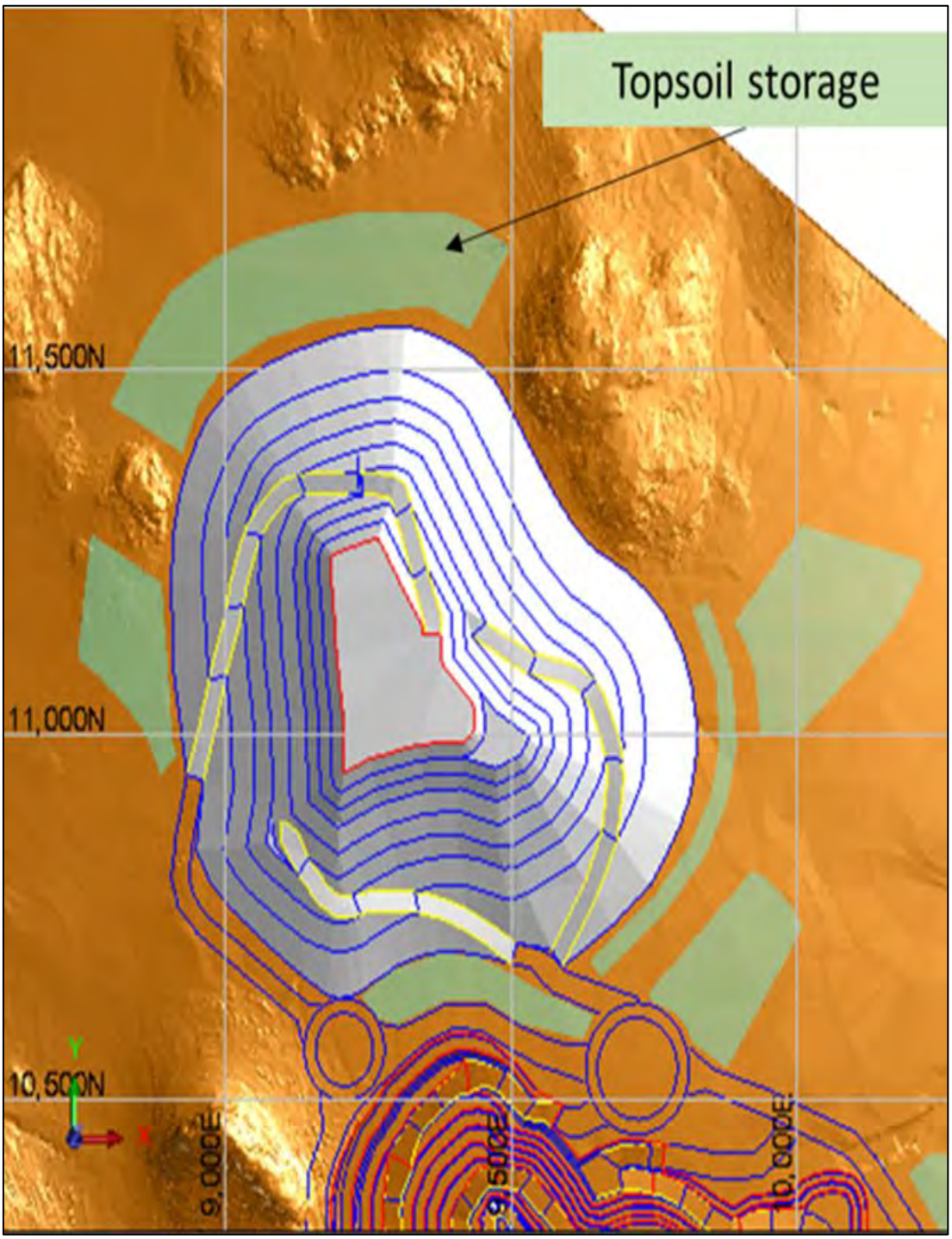

Figure 10-5 Western WRD

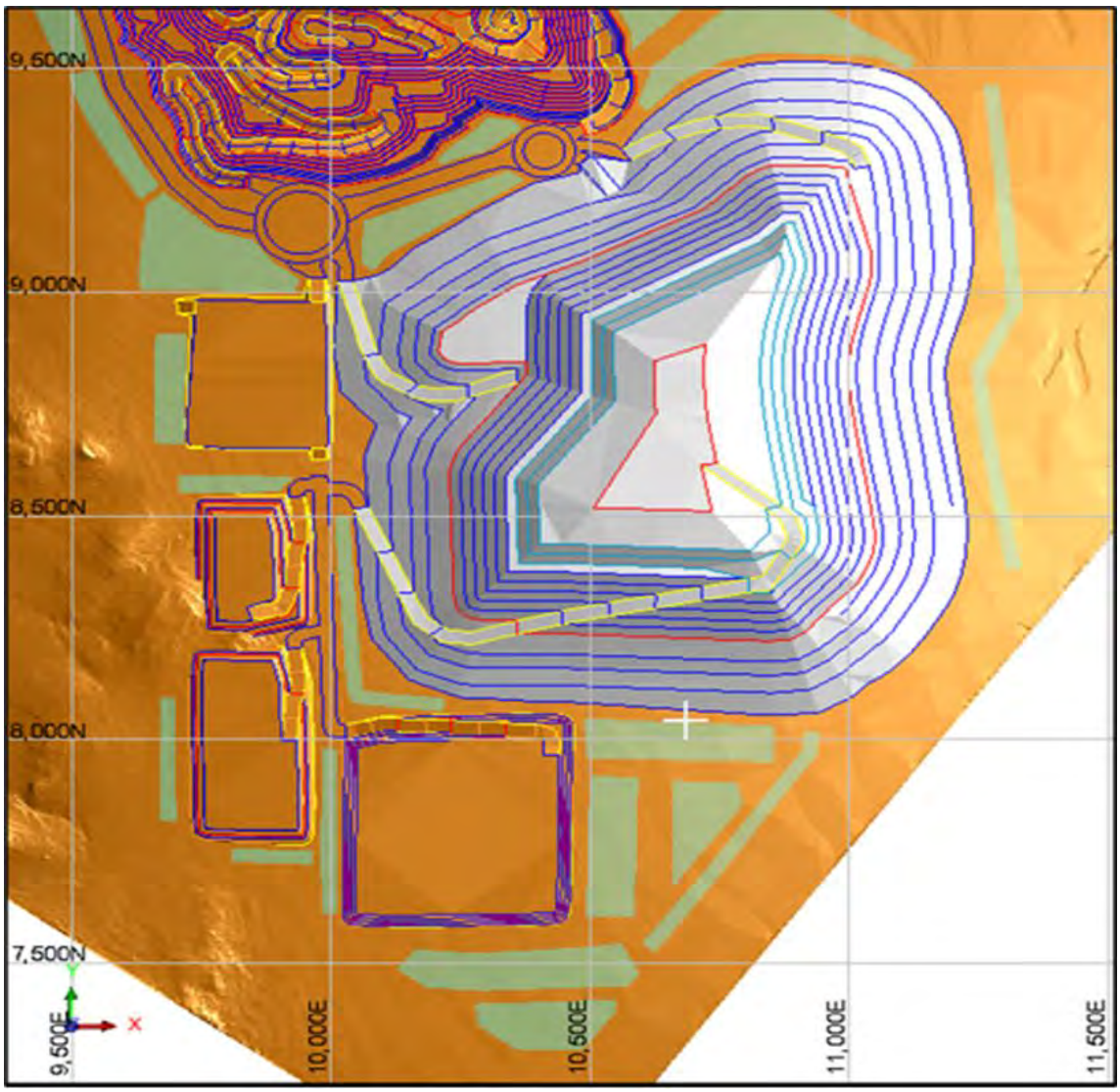

Figure 10-6 Eastern WRD

Preliminary geochemical characterisation of waste rock materials has indicated a low risk of encountering potentially acid forming (PAF) material. However, characterisation work will continue during the development and operational phases and any PAF materials can be encapsulated within the waste dumps to prevent acid rock drainage.

Similarly, the WRD's will be used to encapsulate any naturally occurring radioactive material (NORM).

Topsoil stripped prior to the construction of the WRD's and the pit will be stored in low stockpiles for eventual re-use in rehabilitation. Low grade ore/mineralised waste will be stockpiled and may or may not require rehabilitation depending on future economics of the project.

10.4.2 Closure Strategy

Conceptual WRD designs have been prepared by Landloch (2021b) based on existing information on anticipated material types (physical and chemical properties), climatic information, erosion modelling results and preliminary closure objectives.

Soils samples were assessed by Landloch and included:

- Particle size distribution and soil classification (e.g. loam, clay content)
- Rock fragment abundance
- Salinity
- Sodicity and dispersiveness
- Organic carbon content
- Likely permeability

Mineral waste (waste rock) samples were sourced from drill core samples and assessment included:

- Lithology
- Extent of oxidation/weathering
- Density
- Water absorption
- Hardness
- Slake durability
- Chemical and nutrient status for plant growth potential (pH, Salinity, exchangeable cations, total N & P, plant-available S)

Using the above material characteristics and numerous climatic variables (precipitation duration/intensity, temperature, solar radiation and wind speed/direction), erosion modelling was conducted by Landloch using the WEPP erosion model (Water Erosion Prediction Project). WEPP modelling was conducted for landforms of various outer material properties (e.g. soil only, waste rock only, soil/rock mix), different batter profiles (e.g. uniform single gradient or concave slopes from 12-18 degrees or 6-18 degrees) and various batter heights (15m – 60m height).

The results of the WEPP erosion modelling were used to develop the conceptual design features for the proposed landforms so as to minimise erosion rates and areas of disturbance. These design features include:

- Armouring the outer embankments of the landforms with competent waste rock or a soil/rock mix to minimise erosion.
- Concave slope profile from 18 degrees at the upper sections, to 6 degrees at the lower sections.
- Consideration of a cross-batter berm

- Crest bunds around the upper perimeter of the landforms to prevent run-off from the upper surface (a water harvesting landform)
- Toe drains/bunds at the base of the embankments to limit the impact of sediment movement.
- Flood protection/armouring for any embankments located in areas susceptible to flood waters

Rehabilitation will involve the application of topsoil (thin layer only, 100-200 mm to prevent excessive erosion), ripping on the contour and seeding with native vegetation species.

Progressive rehabilitation is planned, but opportunities for progressive rehabilitation will be limited during the early campaign mining periods due to the overall limited disturbance and mined volumes.

10.4.3 Planning & Implementation Schedule

Waste Rock Dump Closure & Rehabilitation Planning & Implementation Schedule			
Item	Planning schedule to address knowledge gaps	Schedule	Responsibility
2.1	Continue geochemical and physical characterisation of waste rock to ensure that any hostile materials (PAF or NORM) are managed appropriately.	Operations phase	Environmental Coordinator
2.2	Continue erosion modelling and landform design investigations as further information on material volumes and types becomes available.	Operations phase	Environmental Coordinator
2.3	Optimise the run-of mine waste rock preferential placement to maximise efficiencies of constructing the landform to final design profile.	Operations phase	Mining Engineer
2.4	Ensure location of WRD's does not encroach into future possible zones of instability caused by the eventual/potential pit voids. Also consider need for pit abandonment bund.	Operations phase	Geotechnical Engineer, Geologist
2.5	Assess the presence of contamination (e.g. PAF or NORM) on ROM pad prior to rehabilitation	Operations phase	Environmental Coordinator
Item	Implementation Schedule	Schedule	Responsibility
2.6	Progressive rehabilitation of WRD embankments as areas become available: ▪ Re-grade outer slopes to design profile (concave) ▪ Ensure adequate rock mulch on outer slopes – may require application of rock layer. ▪ Apply topsoil, rip and seed ▪ Construct upper surface crest bunds	Operations phase	Mining Manager
2.7	Final rehabilitation of WRD's, stockpiles and ROM pad:	At closure	Environmental Coordinator

Waste Rock Dump Closure & Rehabilitation Planning & Implementation Schedule			
	▪ Re-grade outer slopes to design profile (concave) ▪ Construct upper surface crest bunds ▪ Ensure adequate rock mulch on outer slopes – may require application of rock layer. ▪ Apply topsoil, rip and seed ▪ Construct perimeter toe drain to contain sediment from landform runoff.		
2.8	Re-profile and rehabilitate the access ramps onto the WRD.	At closure	Environmental Coordinator
2.9	Monitoring of rehabilitation success – vegetation success, extent of erosion, build-up of sediment in bunds or drainage structures.	Post-closure	Environmental Coordinator

10.5 Domain 3 – Residue Storage Facility

10.5.1 Description

The process plant will produce three individual residue streams, namely:

- Beneficiation Residue (tailings) (BF Residue) = 26.0 Mt capacity.
- Gypsum Residue (GYP Residue) = 13.8 Mt capacity.
- Water Leach Residue (WL Residue) = 6.2 Mt capacity.

The RSF will be constructed in a series of stages over the 38-year Life of Mine. Each stage will comprise of two individual cells which are constructed and operating concurrently, one cell to store a blend of the Beneficiation and Gypsum Residue streams (BF & GYP Cell) and the second cell the Water Leach Residue (WL Cell).

In total, twelve cells (6 x BF & GYP residue cells, 6 x WL residue cells) will be constructed to store the total Life of Mine (LoM) residue production. Each cell will operate for approximately 7 to 9 years and then will be decommissioned and capped in preparation for rehabilitation, which will occur progressively where possible. The progression of cell construction is shown in Figure 10-7, Figure 10-8, Figure 10-9 and Figure 10-10.

The BF & GYP residue cells will comprise a soil lined basin with a full underdrainage network to provide seepage control and reduce losses. The embankments will have a low permeability soil upstream fill zone and will be built using modified centreline construction techniques. A cut-off trench will be located beneath the entire length of the embankment and will be excavated into a competent foundation layer.

The WL cells will comprise a soil and HDPE lined basin with a full underdrainage network as well as a leakage control and recovery system to provide more stringent seepage control. The embankments will have a low permeable upstream fill zone as well as a HDPE geomembrane liner. A cut-off trench will be located beneath the entire length of the embankment and will be excavated into a competent

foundation layer. To allow for continuous lining of the embankments raises will be constructed using downstream construction techniques.

As discussed in Section 6.2.6, the RSF is classed as a nuclear waste disposal facility for "Very Low-Level Waste". The RSF lining system design and closure strategy accounts for these elevated radiation levels, specifically relating to seepage, dust control and capping requirements.

Each BF/GYP RSF cell will be approximately 50 ha whilst each WL RF cell will be approximately 16 ha each. The entire construction footprint of the first RSF (3 x BF/GYP and 3 x WL) will be approximately 240 ha allowing for vehicle access and a reduced embankment profile at closure. The progressive configuration of this RSF is illustrated in the figures below.

Figure 10-7 RSF – Initial Two Cells

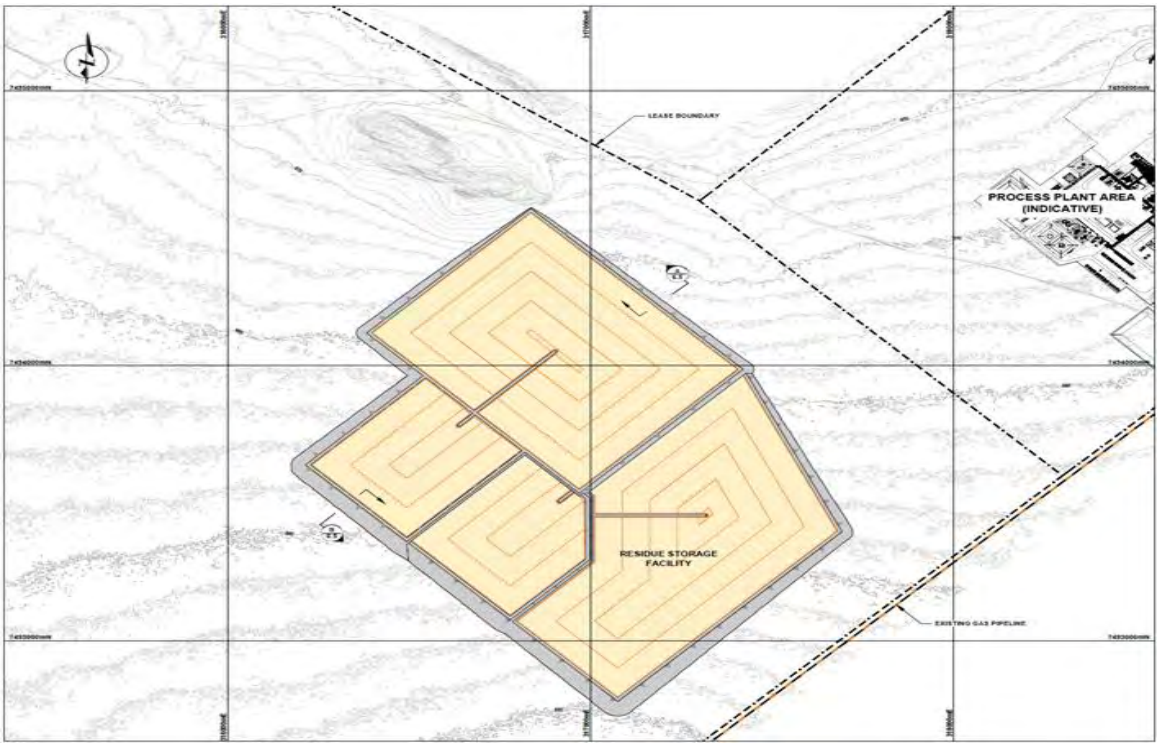

Figure 10-8 RSF - Second Two Cells

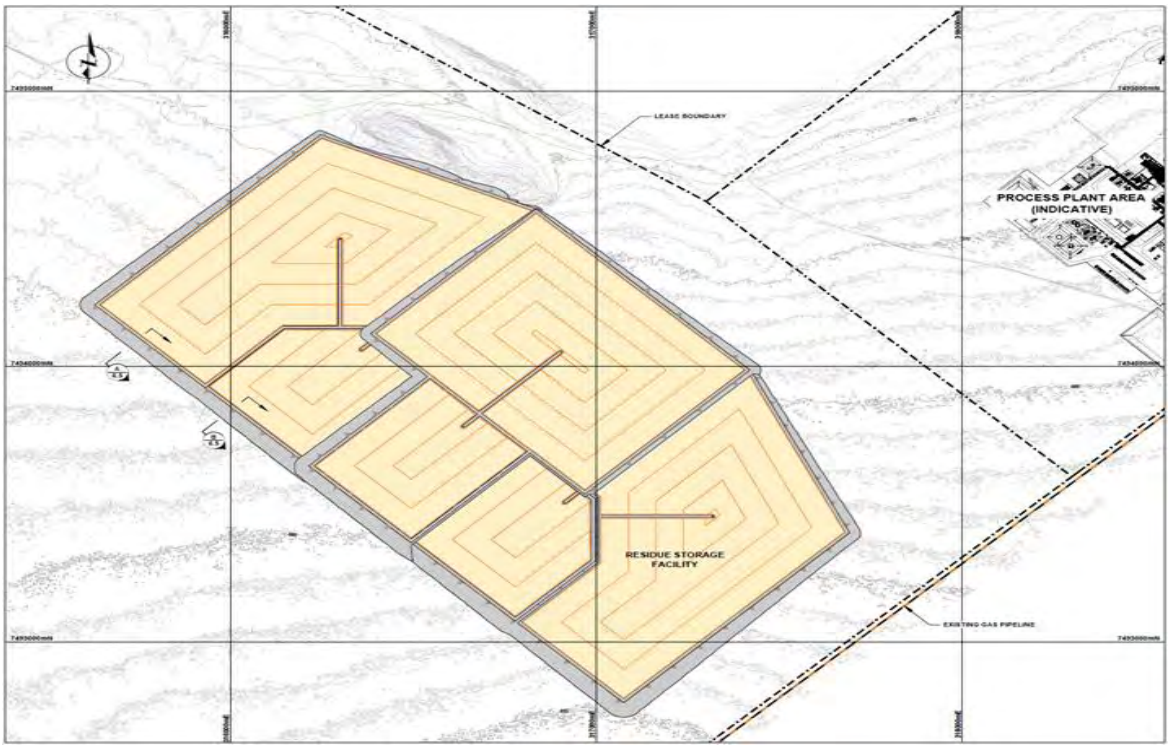

Figure 10-9 RSF – Six Cell Configuration

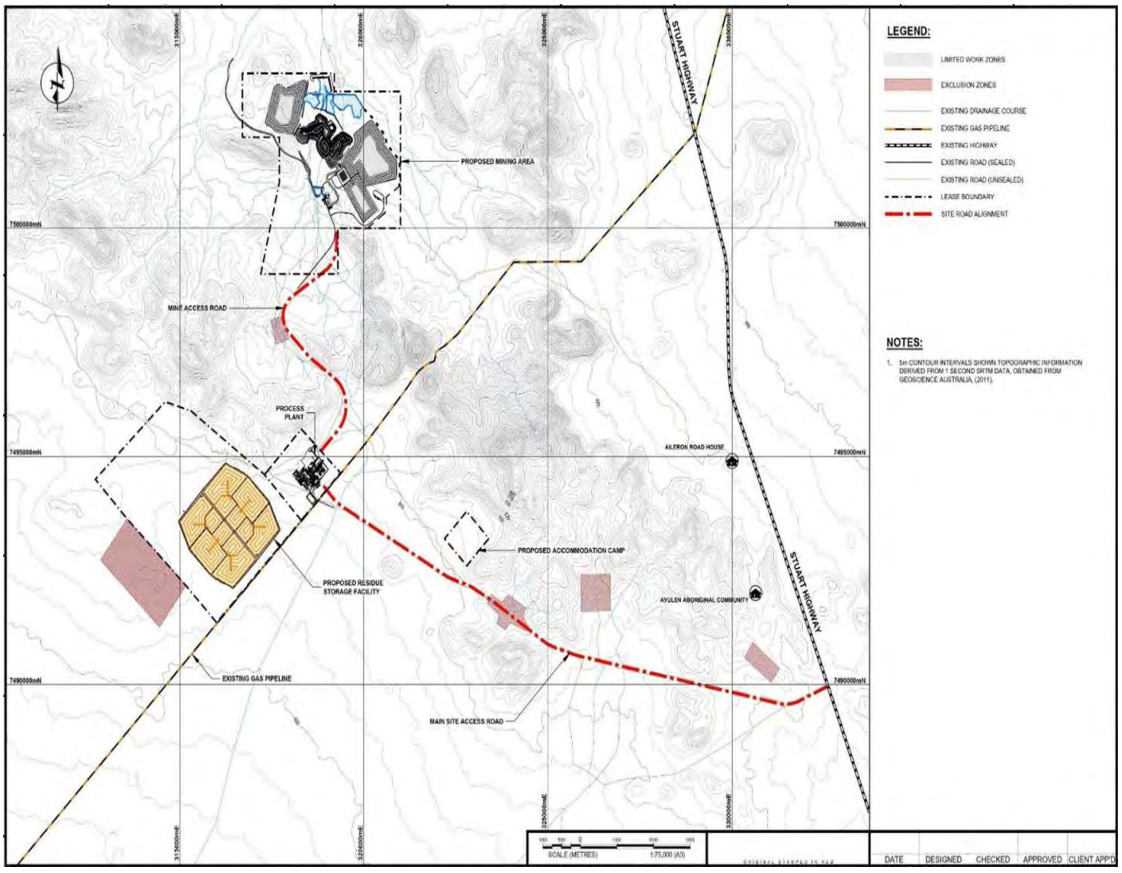

Figure 10-10 RSF – Final Configuration Twelve Cells

10.5.2 Closure Strategy

As for the WRD landforms, conceptual design for the embankments of the RSF has been prepared by Landloch (2021b) based on existing information on anticipated material types (physical and chemical properties), climatic information, erosion modelling results and preliminary closure objectives.

Conceptual design features for the closure of the RSF embankments include:

- Armouring the outer embankments of the landforms with competent waste rock or a soil/rock mix to minimise erosion.
- Concave slope profile from 18 degrees at the upper sections, to 6 degrees at the lower sections.
- Toe drains/bunds at the base of the embankments to limit the impact of sediment movement.
- Flood protection/armouring for any embankments located in areas susceptible to surface flows
- Application of topsoil (thin layer only, 100-200 mm to prevent excessive erosion), ripping on the contour and seeding with native vegetation species.

The cover design for the upper surface of the RSF is conceptual only and will be refined as further information becomes available from current and future technical investigations. After the cessation of processing and residue deposition, the active RSF cells will be allowed to dry and consolidate before a

cover is applied. The timeframe required for this drying and consolidation will be subject to further testwork on the residue materials, but could be in the order of 1-2 years.

The following conceptual cover prescriptions have been applied by Knight Piesold in their RSF design report (Knight Piesold, 2019a):

BF and GYP RSF cells:

- 0.5m mine waste layer
- 0.3m low permeability fill layer
- 1.0m store and release fill layer
- 0.1m topsoil
- Revegetation

WL RSF cells:

- 0.5 BF and GYP Residue
- 0.5m mine waste layer
- 0.3m low permeability fill layer
- 1.5mm HDPE geosynthetic liner
- 0.5m liner protection fill layer
- 1.0m store and release fill layer
- 0.1m topsoil
- Revegetation

A spillway capable of discharging a PMP event is also included within the current conceptual design.

Refinement of the conceptual design will be based on the continuation of further investigations into aspects such as:

- Chemical properties of the residue materials (e.g. ARD or neutral mine drainage potential, salinity, radiation risks) to determine the extent of potentially problematic materials, the associated risk of leaching to the environment. Physical and chemical properties also to assist in understanding the drying and consolidation processes once deposition has ceased.
- Physical and chemical properties of the available cover materials
- Sensitivity of the receiving environment, baseline groundwater levels and quality, beneficial users in the area)
- Cover modelling and seepage modelling to understand the performance of various cover design alternatives
- Surface water drainage from the RSF and integration with natural drainage regimes
- Stakeholder engagement in relation to post-closure land uses, closure objectives and completion criteria

10.5.3 Planning & Implementation Schedule

RSF Closure & Rehabilitation Planning & Implementation Schedule			
Item	Planning schedule to address knowledge gaps	Schedule	Responsibility
3.1	Continue geochemical and physical characterisation of residue materials.	Operations phase	Environmental Coordinator
3.2	Assess physical and chemical properties of the available cover materials	Operations phase	Environmental Coordinator
3.3	Cover modelling and seepage modelling to understand the performance of various cover design alternatives	Operations phase	Environmental Coordinator
3.4	Conduct stakeholder engagement in relation to post-closure land uses, closure objectives and completion criteria	Operations phase	Environmental Coordinator
Item	Implementation Schedule	Schedule	Responsibility
3.5	Progressive rehabilitation of RSF embankments as areas become available: • Re-grade outer slopes to design profile (concave) • Ensure adequate rock mulch on outer slopes – may require application of rock layer. • Apply topsoil, rip and seed	Operations phase	Environmental Coordinator
3.6	Progressive rehabilitation of upper surface of initial cells (once deposition ceases and adequate drying and consolidation) – cover prescription yet to be confirmed.	Operations phase – once deposition ceases into initial cells.	Environmental Coordinator
3.7	Final rehabilitation of RSF embankments as areas become available: • Re-grade outer slopes to design profile (concave) • Ensure adequate rock mulch on outer slopes – may require application of rock layer. • Apply topsoil, rip and seed	Closure	Environmental Coordinator
3.8	Final rehabilitation of upper surface of initial two cells (once deposition ceases and adequate drying and consolidation) – cover prescription yet to be confirmed.	Closure – after drying and consolidation	Environmental Coordinator
3.9	Monitoring of rehabilitation and cover performance – vegetation success, extent of erosion, build-up of sediment in bunds or drainage structures, groundwater quality and levels, seepage interception trenches, phreatic water levels within the RSF.	Post-closure	Environmental Coordinator

10.6 Domain 4 – Roads & Service Corridors

10.6.1 Description

The extent and boundaries of this domain are shown in Figure 10-11.

The Project will include various roads and service corridors including:

- Site access road from the Stuart Highway
- Mine access roads between processing plant, mine sites, accommodation village and the borefields
- Mine haul roads between the pits, waste rock dumps and ROM pad.
- Borefield pipeline corridors
- Residue and return water pipeline corridors between the process plant and RSF
- Natural gas pipeline corridor to the site power station

Some issues that are considered when determining the closure strategies for roads and service corridors include:

- Levels of compaction from traffic
- The potential removal of any bitumen layers from sealed roads
- Impacts on natural surface water flow regimes and the need to reinstate these by removing built-up road sections or installing floodways, if required.
- Impacts from dust suppression via road watering. If the watering is conducted using saline or brackish water, these salts can concentrate on the surface of the road and may inhibit revegetation performance.

These issues will continue to be investigated and discussed with key stakeholders.

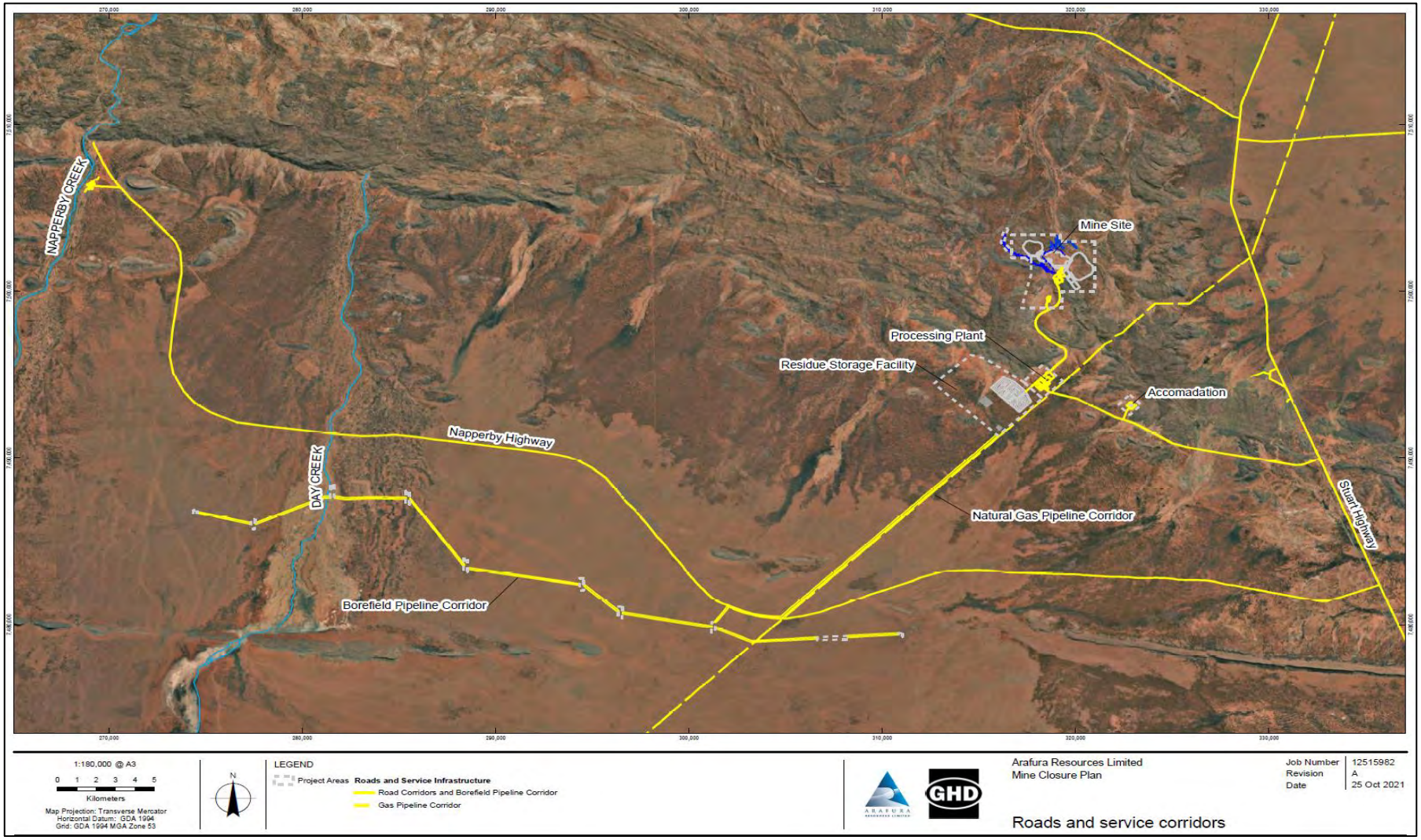

Figure 10-11 Roads and Services Corridor Domain

10.6.2 Closure Strategy

It is possible that some roads and service corridors are preferred to be retained after mine closure for use by post-closure land users (e.g. pastoralists) rather than be removed and rehabilitated. This will be discussed with key stakeholders and post closure land users to determine their preferences and to ensure that any outcome still meets the nominated closure objectives. Until these preferences are confirmed, and for the purposes of mine closure planning, it is assumed that all roads and service corridors will be rehabilitated back to their former status as predominantly pastoral accesses for the main access road and the processing plant- mine haul road.

The closure strategy for roads and service corridors will involve:

- Return main project access road and haul road to a pre-project similar status for ongoing pastoral use
- Removal of signage or associated infrastructure (fences, gates, grids, culverts)
- Re-profile sections of roads that are required to reinstate natural surface water drainage regimes
- Apply topsoil from stockpiles that were created when the roads were cleared for construction
- Deep rip to break up any traffic compaction layer
- Seed with native vegetation species.

10.6.3 Planning & Implementation Schedule

Open Pit Closure & Rehabilitation Planning & Implementation Schedule			
Item	Planning schedule to address knowledge gaps	Schedule	Responsibility
4.1	Stakeholder engagement regarding any preferences for retaining roads or service corridors for post-closure land use.	Operations phase	Environmental Coordinator
4.2	Surface water drainage assessment to consider potential impacts from roads (and other mine landforms and infrastructure)	Operations phase	Environmental Coordinator
4.3	Assess chemical properties of road surfaces to determine levels of salinity and any other potential contaminants.	Operations phase	Environmental Coordinator
Item	Implementation Schedule	Schedule	Responsibility
4.4	Reinstatement of main access road and haul road to a state that is suitable for pastoral use	Closure	Environmental Coordinator
4.5	Removal of signage or associated infrastructure (fences, gates, grids, culverts)	Closure	Environmental Coordinator
4.6	Re-profile sections of roads that are required to reinstate natural surface water drainage regimes	Closure	Environmental Coordinator
4.7	Apply topsoil, rip and seed	Closure	Environmental

Open Pit Closure & Rehabilitation Planning & Implementation Schedule			
			Coordinator
4.8	Monitoring of rehabilitation performance and surface water drainage impacts.	Post-closure	Environmental Coordinator

10.7 Domain 5 - Infrastructure

10.7.1 Description

The extent and boundaries of this domain are shown in Figure 10-12.

The Project will include various infrastructure areas including:

- Mine dewatering pumps and pipelines
- Heavy and light vehicle workshops
- Mine administration office complex
- Processing plant
- Process plant control room, sulphuric acid plant and reagent storage areas
- Process plant administration office complex and change rooms
- Process plant maintenance offices and workshops
- Laboratory
- Warehouse shed and compound
- Fuel and hydrocarbon storage areas
- Washdown bays
- Exploration core shed and yard
- Carparks, laydown yards and hardstand areas
- Explosives magazine
- Accommodation village
- Natural gas-fired power station
- Overhead powerlines between power station and the village
- Back-up diesel generators
- Pipelines – tailings, bore/raw water, process water, RSF return water.
- Waste water treatment plants
- Solar Farm

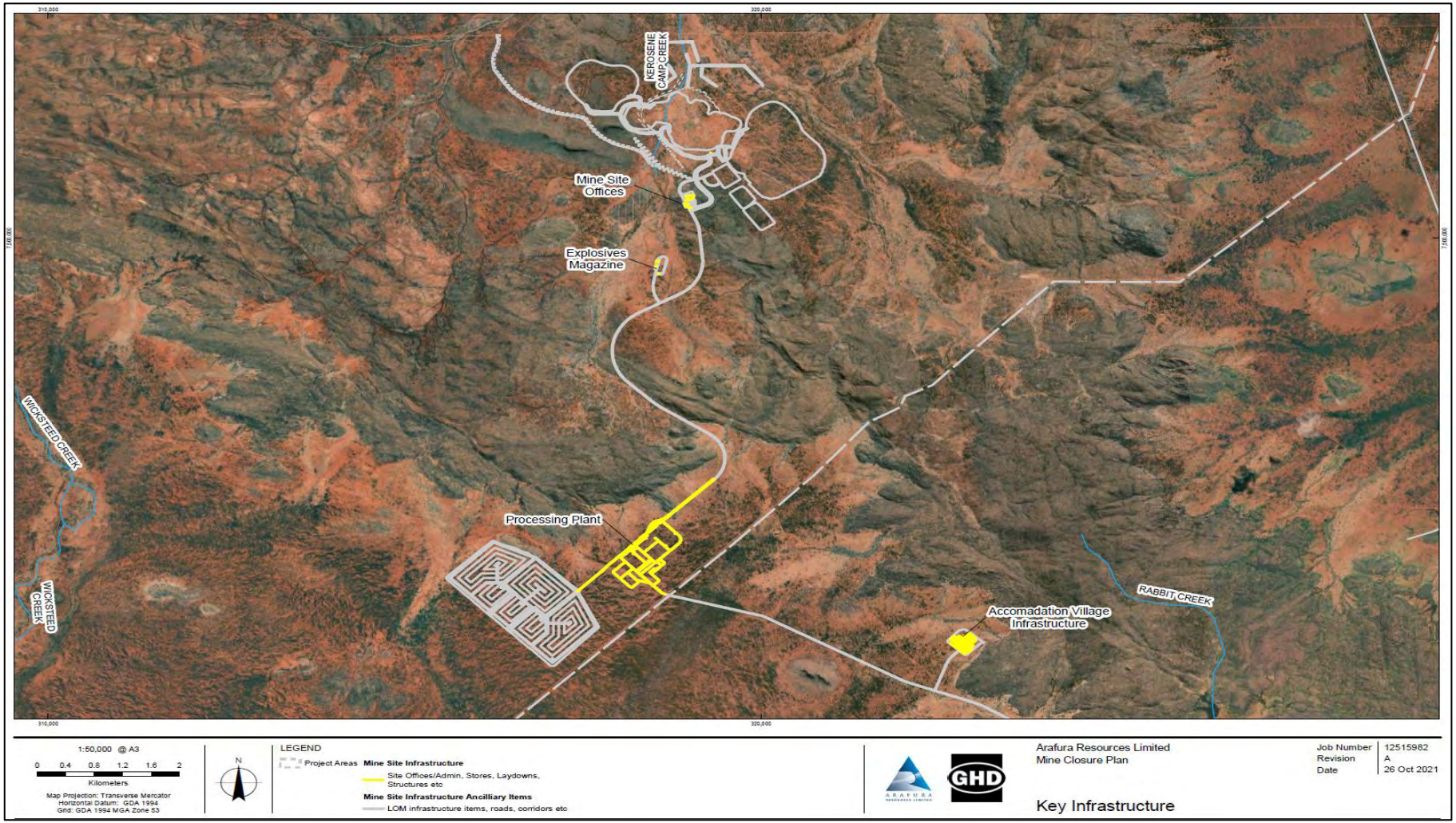

Figure 10-12 Infrastructure Domain

10.7.2 Closure Strategy

As for roads, it is possible that some items of infrastructure are preferred to be retained after mine closure for use by post-closure land users (e.g. pastoralists) rather than be removed (e.g. village buildings, workshops, dams, bores). This will be discussed with key stakeholders and post closure land users to determine their preferences and to ensure that any outcome still meets the nominated closure objectives. Until these preferences are confirmed, and for the purposes of mine closure planning, it is assumed that all infrastructure will be removed and the footprint rehabilitated.

The closure strategy for infrastructure will involve:

- Removal of any salvageable items;
- Remediation of any contaminated sites and de-contamination of infrastructure (e.g. hydrocarbons, reagents or radionuclides within tanks, pipes or equipment);
- Full demolition of infrastructure and disposal onsite. Disposal likely to be within the open pit void or buried within the waste rock dumps – to be confirmed.
- Removal of concrete pads and footings to approximately 1m below ground surface and backfill with waste rock fill.
- Contaminated sites remediation validation assessment.
- Reprofile area to reinstate natural surface water drainage regimes.
- Deep rip to break up any traffic compaction layer
- Seed with native vegetation species.

A specific Waste Management Plan is to be prepared prior to closure for waste generated during the closure phase and is to abide by the following principles:

- Implementation of the Waste Management Hierarchy (reduce > reuse > recycling> disposal);
- Material segregation (waste materials will be segregated to facilitate reuse and recycling); and
- Ecological sustainability (avoiding environmental harm).

The waste stream, proposed treatment and disposal destination are summarised in Table 10-2.

Table 10-2 Closure Waste Streams

Waste Stream	Disposal Destination	Pre-Treatment
Processing plant, equipment, pipes etc.	All plant and equipment removal for off-site recycling or disposal. Opportunities for resale and reuse will be investigated. If equipment or plant cannot be decontaminated then disposal through burial in an approved location on site	Decontaminated in a designated decontamination area on hard standing with isolated drainage leaning. Cut and/or break up demolition debris, piping and liner to suitable size for safe transport.

Waste Stream	Disposal Destination	Pre-Treatment
	e.g. in WRD or pit.	
Unused hazardous materials (process ingredients, explosives)	Return re-useable material to suppliers. Remove off-site for safe disposal at licensed facility.	Securely contained for transport off site.
Oil and oily wastes off-site (from maintenance facilities).	Remove off-site for safe disposal at licensed facility.	Securely contained for transport off site.
Inert soil and rock material	All inert material will be used in landscaping.	Material characterisation, QA and QC.
Contaminated soil, fines removed from stormwater sediment event ponds, etc. removed during remediation.	Disposal on-site in a designated disposal area.	Onsite bioremediation of degradable contaminants such as hydrocarbons.
Evaporation Pond Liners	Where practicable remove off-site for safe disposal at licensed facility or dispose onsite if approved.	Decontaminated in a designated decontamination area on hard standing with isolated drainage. Cut to suitable size for safe transport.
Buildings and structures	Transportable buildings and equipment will be sold. Any remaining structures will be dismantled and buried or removed from the site.	On-site landfilling for inert structures.
Litter	On-site landfill.	Compaction.

10.7.3 Planning & Implementation Schedule

Open Pit Closure & Rehabilitation Planning & Implementation Schedule			
Item	Planning schedule to address knowledge gaps	Schedule	Responsibility
7.1	Stakeholder engagement regarding any preferences for retaining items of infrastructure for post-closure land use	Operations phase	Environmental Coordinator
7.2	Develop and maintain a contaminated sites register. Investigate the requirements for remediation prior to closure – against mine closure objectives and completion criteria	Operations phase	Environmental Coordinator
7.3	Assess options for disposal of infrastructure demolition waste	Operations phase	Environmental Coordinator
7.4	Surface water drainage assessment to consider	Operations phase	Environmental

Open Pit Closure & Rehabilitation Planning & Implementation Schedule			
	potential impacts from roads (and other mine landforms and infrastructure)		Coordinator
Item	Implementation Schedule	Schedule	Responsibility
7.5	Removal of any salvageable items	Closure	Environmental Coordinator
7.6	Remediation of any contaminated sites and de-contamination of infrastructure	Closure	Environmental Coordinator
7.7	Infrastructure demolition and disposal	Closure	Environmental Coordinator
7.8	Removal of concrete pads and footings to approximately 1m below ground surface and backfill with waste rock fill	Closure	Environmental Coordinator
7.9	Contaminated sites remediation validation assessment	Closure	Environmental Coordinator
7.10	Re-profile area to reinstate natural surface water drainage regimes	Closure	Environmental Coordinator
7.11	Apply topsoil, rip and seed	Closure	Environmental Coordinator
7.12	Monitoring of rehabilitation performance	Post-closure	Environmental Coordinator

10.8 Domain 6 – Dams & Ponds

10.8.1 Description

The extent and boundaries of this domain are shown in .

The Project will have a number of dams and ponds, ranging from unlined fresh water ponds, to HDPE-lined ponds for contaminated process water. At closure, some ponds are likely to contain contaminated sediments that will require disposal in a manner that prevents water or soil contamination post-closure. Dams and ponds will be included in the contaminated site assessment to determine the nature of contained materials and the appropriate closure and rehabilitation strategies.

Consultation with post-closure land users will confirm if there are any ponds required to be retained for post-closure land use.

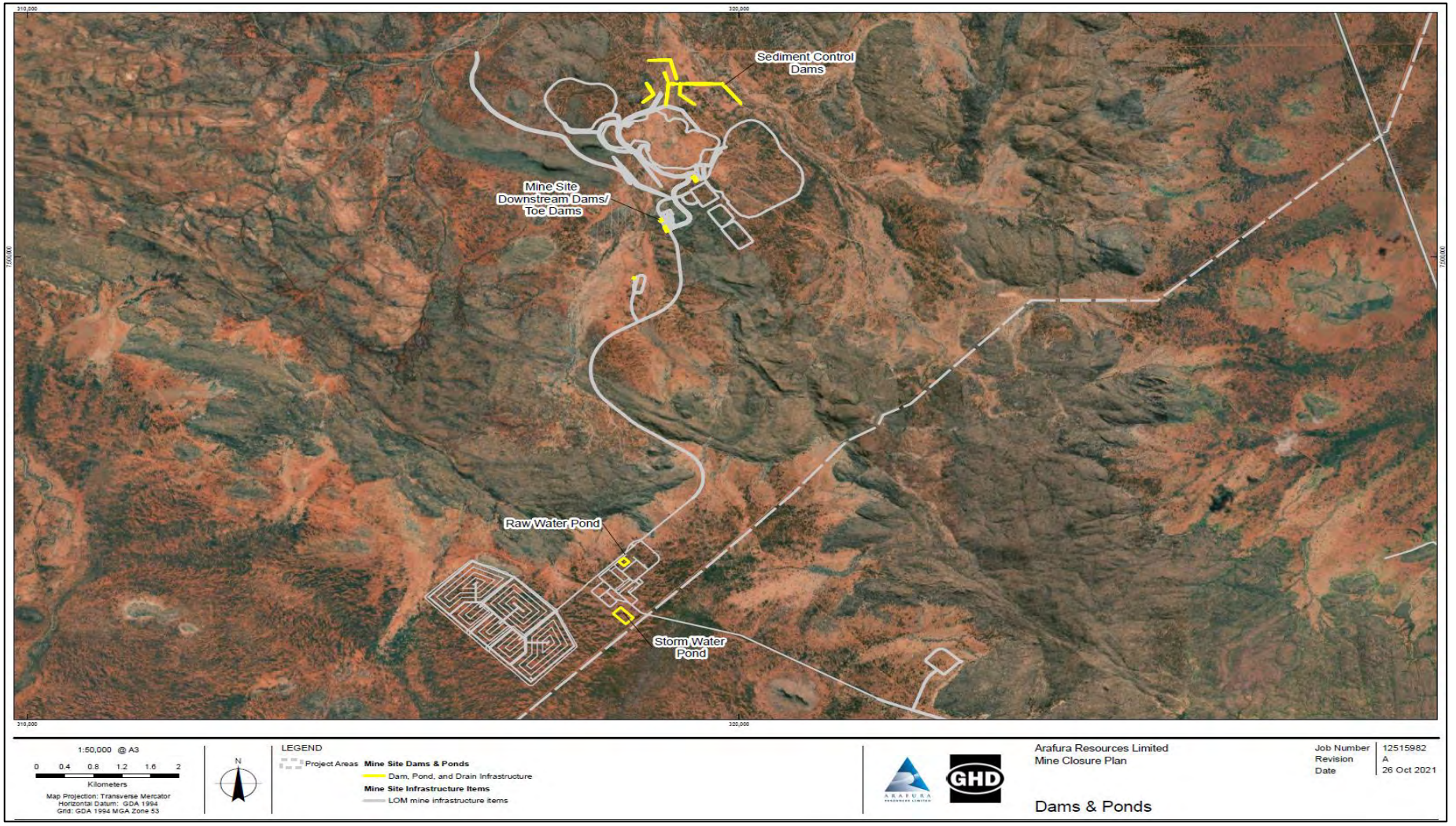

Figure 10-13 Dams & Ponds Domain

10.8.2 Closure Strategy

Consultation with post-closure land users will confirm if there are any ponds required to be retained for post-closure land use. Until this is confirmed, it is assumed that all dams and ponds will be rehabilitated.

Rehabilitation will generally involve:

- Removal of any contaminated sediments and liner materials, as per the results of the contaminated site assessment. Disposal destinations are yet to be confirmed, but may involve encapsulation within the RSF or WRD, or removal to an offsite disposal facility.
- Dozing the embankments into the dam/pond area, and profile to match the surrounding landscape and reinstate any natural drainage regimes.
- Apply topsoil, rip and seed.

10.8.3 Planning & Implementation Schedule

Open Pit Closure & Rehabilitation Planning & Implementation Schedule			
Item	Planning schedule to address knowledge gaps	Schedule	Responsibility
8.1	Stakeholder engagement regarding any preferences for retaining any ponds/dams for post-closure land use.	Operations phase	Environmental Coordinator
8.2	Assess options for disposal of contaminated sediment from ponds.	Operations phase	Environmental Coordinator
Item	Implementation Schedule	Schedule	Responsibility
8.3	Remove of any contaminated sediment and liner systems	Closure	Environmental Coordinator
8.4	Doze in embankments and re-profile area to reinstate natural surface water drainage regimes	Closure	Environmental Coordinator
8.5	Apply topsoil, rip and seed	Closure	Environmental Coordinator
8.6	Monitoring of rehabilitation performance.	Post-closure	Environmental Coordinator

10.9 Unexpected Mine Closure

The following measures are to be in place to prepare for an unexpected closure of the Project:

- Through the Mining Management Plans (MMP) process, reports are to be submitted summarising disturbed areas and progressive rehabilitation status and planned disturbance and rehabilitation for the forthcoming period;
- Closure costs are to be updated providing a detailed allocation of the decommissioning and rehabilitation costs, including a contingency. Any adjustment to the security bond will be made based on the updated costs;

- A Conceptual Care and Maintenance Plan (GHD, 2016) is in place and will be refined in parallel with the MCP. This will provide for making the site secure and safe and implementing an accelerated closure process based on the plans within the MCP based on returning it to the proposed post-closure land use and target ecosystem as defined in Section 8.2;
- Progressive rehabilitation of WRDs and other post-closure landforms will be conducted where possible to reduce the requirement for closure and rehabilitation activities in the event of a sudden closure;
- All water storages and residue storage facilities to be designed to an appropriate ANCOLD risk category and adherence to relevant design standards for the provision of adequate storage capacity; and
- Sufficient freeboard allowance to be maintained to prevent overflow from RSF in high rainfall conditions.

In the case that unexpected or sudden closure is considered permanent, the closure and rehabilitation strategies proposed in the Mine Closure Plan are likely to still remain applicable and will be implemented. This is expected to involve:

- Pit abandonment bunds to be installed in accordance to the WA Guidelines.
- Waste rock dumps, stockpiles and the ROM pad will have embankments reprofiled to a concave slope, with sufficient rock armouring to protect against erosion.
- Any PAF or radioactive material to be encapsulated.
- Perimeter crest bund to be constructed on the WRD upper surface.
- RSF capping strategy to be implemented (once confirmed through technical investigations and agreed with relevant stakeholders).
- Topsoil, application, ripping and seeding over all disturbed areas.
- Stakeholder consultation to confirm preferences for any infrastructure or services to be retained for post-closure use.
- Infrastructure to be removed, and concrete footings removed to approximately 1m below ground surface and backfill with waste rock fill.
- Monitoring and reporting of rehabilitation performance. Maintenance works as required.

11.0 MONITORING AND MAINTENANCE

11.1 Operational Monitoring

Monitoring undertaken during operations will provide data to help refine the MCP. Data gathered during the implementation of the Mining Management Plan and its sub management plans is to be retained in a manner that allows easy access for monitoring purposes. These various management plans are provided in Appendix A – Appendix R within the Project MMP (Arafura, 2021) and include the monitoring of the following aspects:

- Groundwater
- Surface water
- Sediment
- Fauna
- Weeds
- Air quality
- Noise, vibration and light
- Wastes
- Cultural heritage sites
- Social impacts and complaints

Various trials and investigations undertaken to inform closure planning (Section 7.3) are to be monitored and results used to refine closure design and planning.

11.2 Post-Operational Monitoring and Maintenance

The post-closure phase is to include a programme to monitor the effectiveness of rehabilitation and closure and the achievement of closure criteria (Section 9.2).

Post-closure monitoring is to include assessments of public safety, geotechnical stability, physical stability, chemical stability and revegetation success.

A preliminary monitoring programme is outlined in Table 11-1. Further details of the monitoring location, frequency and parameters is to be included in future revisions of the MCP in consultation with the Northern Territory Government prior to closure.

For consistency and continuity many of the monitoring parameters and locations will be the same as during operation.

Following the end of operations, an agreed monitoring program is to be implemented, that will span the closure and rehabilitation phases. The programme is to record progress on meeting completion criteria.

The need for any ongoing monitoring is to be reassessed as required.

11.2.1 Post-Closure Maintenance

Where monitoring identifies failure to meet completion criteria or predictive trends, the causes are to be investigated and where practicable, alternate remediation determined and implemented.

11.2.2 Post-Closure Reporting

Reports detailing the monitoring results are to be issued along with the Mining Management Plan to DITT. The reports and monitoring will be completed by suitably qualified individuals and to also be provided to the relevant governing authorities.

The completion criteria and monitoring programme may change as research and development findings and monitoring trends emerge.

11.2.3 Rehabilitation Audit

Prior to relinquishment, a Rehabilitation Audit is to be completed to assess the achievement of the completion criteria. The results are to be provided to the DITT for consideration as to whether the site can be relinquished.

Table 11-1 Post-Closure Monitoring Programme

Discipline	Parameter	Approach	Frequency
Meteorological data	Rainfall, evaporation, wind and temperature.	Maintain weather station post-closure.	Continuous
Surface Water	Surface water runoff flows.	Use already installed rising stage samplers and gauging stations in creeks in and around Project to monitor surface flows.	During periods of flow
	Surface water quality in watercourses. Physical, chemical and biological characteristics assessed against baseline and site-specific trigger values where sufficient data is available.	Use already installed rising stage samplers and gauging stations in creeks in and around Project to monitor surface flows.	During periods of flow
	Pit lake water quality.	In situ testing and laboratory analysed samples.	Six-monthly
Groundwater	Groundwater Quality. Physical and chemical parameters. Groundwater site specific trigger values established for the process site and mine site for assessment purposes.	Sampling from groundwater monitoring boreholes. The sample locations are to focus on areas likely to be impacted by mining operations. Piezometer monitoring with RSF/WRD. Visual inspections for seepage.	Six-monthly continuous
	Groundwater levels.	Boreholes	Six-monthly
Stability	Phreatic levels within and physical condition of embankments.	Embankment piezometers and survey pins, regular dam inspections.	Quarterly

Discipline	Parameter	Approach	Frequency
	Erosion. Length, depth and attributes of the erosion post-closure landforms and watercourses including presence of gullies, rills and excess sedimentation in local watercourses.	Combination of traditional field transects and using unmanned aerial vehicles (UAV's) and remote sensing techniques to measure the extent of gully and sheet erosion. Ground-truthing measurements in the field.	Annual to 3-yearly, depending on techniques adopted and rate of change and following significant weather events.
	Pit wall stability.	Geotechnical Assessment. Visual inspection and photographic record.	Annual
Ecological and landscape rehabilitation	Revegetation. Plant establishment, survival/success rate, growth, diversity, cover and weeds. Include measurement of analogue sites to compare performance/metrics.	Combination of quadrat and transect surveys of rehabilitated areas and using UAV's and remote sensing techniques.	Annual to 3-yearly, depending on techniques adopted and rate of change.
	Overall ecosystem function. This comprises surface soil condition assessment, vegetation establishment, erosion and habitat development.	Rehabilitation monitoring and assessment Regularly scheduled monitoring of transects on both rehabilitated landforms and analogue sites (i.e. undisturbed sites similar to the target ecosystems of the rehabilitation areas) to determine trends of ecosystem development, functional role of vegetation structure and habitat quality for fauna. Typically these sites are established in advance of mine closure to allow for baseline information to be collected.	Annual to 3-yearly, depending on techniques adopted and rate of change.

Discipline	Parameter	Approach	Frequency
	Fauna	Species specific fauna surveys including camera surveys for populations of key threatened fauna, indicator species and pests.	Annual or biannual dependent on seasonal conditions.
	Riparian condition. Riparian and riverine revegetation and geomorphology of diverted or rehabilitated channels as well as the extent of natural regeneration and the characteristics of the evolving ecosystem.	UAV's and remote sensing techniques, with in-field ground-truthing.	Annual to 3-yearly, depending on techniques adopted and rate of change.

12.0 FINANCIAL PROVISIONING FOR CLOSURE

In accordance with the NT Mining Management Act, Arafura will lodge a financial security with the Department of Industry, Tourism and Trade (DITT). The amount of the security has been calculated using the NT Government's security calculator, which applies various liability rates to the extent of disturbance proposed for the Project within the Mining Management Plan. The completed security calculator for the Nolans Project will be submitted separately from this Mine Closure Plan as Annexure A.

Separate to the NT DITT security calculation will be Arafura's obligations for calculating and reporting liability in accordance with Australian Accounting Standards. This liability calculation process will be implemented once construction disturbance commences, and on-the-ground liability is first incurred. The process involves calculation of the liability based specifically on the nature of the disturbance and the closure strategies proposed in the MCP. Third party contractor rates are applied and where possible, costs are prepared using a 'first-principles' methodology.

The liability estimation will account for two categories of cost estimates:

- Life-of-Mine (LOM) – the LOM liability estimate includes the liability that currently exists as well as any liability that is expected into the future, according to the budget plan (e.g. future expansion of waste dumps, future infrastructure); and
- International Financial Reporting Standards (IFRS), applied in Australia via AASB137 – the IFRS estimate includes only the liability that exists at the balance sheet date (i.e. 30 June). It excludes liability associated with any land that has not yet been disturbed or liability that has not yet been incurred. The IFRS estimate represents the best estimate of the expenditure required to successfully close the site and rehabilitate the existing disturbance, meeting all closure objectives and criteria as required by policy objectives, legal obligations and agreements with stakeholders. It is the IFRS estimate that is reported on the company's financial statements. The liability estimates are based on closure strategies that assume the project will progress as per the current life-of-mine business plan and budget. The MCP includes consideration of unexpected closure of the operation – Section 10.9.

These liability calculations will be reviewed and updated at least annually so that adequate and accurate financial provisions can be made during the operational phase of the project and to prevent the Project owners, future land owners or the community from facing unexpected or unacceptable liability.

Refining of rehabilitation strategies will continue throughout the operational phase and the liability estimates can be adjusted accordingly to account for improved information and any changes to the LOM plan. The accuracy of the liability estimate over time should continue to improve.

Key features of the liability estimation process include:

- Where possible, costs are estimated by first-principles methods using data such as material volumes, equipment type, hourly equipment rates, haul/doze distances, equipment production rates and efficiencies;

- Costs will be based on third party contractor rates. Hourly rates for equipment can be sourced from mining contractors on site, or a professional estimator and updated regularly;
- Specialist demolition contractors will provide input to refine the estimated costs for infrastructure demolition and disposal;
- Key assumptions and/or the basis of liability calculations will be documented within the liability model;
- The timing of likely mine closure expenditure will be provided in a cash flow schedule, which allows for project planning/budgeting as well as discounting and inflation calculations by Arafura;
- The liability estimate model will be updated at least annually reflect any changes in mine closure strategies and will periodically undergoes third party verification by Arafura's finance auditors;
- Key risks and knowledge gaps will continue to be addressed to improve the accuracy and certainty in relation to the closure strategies and the associated liability estimates.

13.0 MANAGEMENT OF INFORMATION AND DATA

Arafura maintains an Environmental Management System (EMS) that is aligned to ISO14001, the International Standard for Environmental Management. The EMS includes the key component of 'document control and records management'. All documents are maintained in electronic format and included in regular system back-up and protection protocols. Documents relating to mine closure are managed within the site's existing EMS procedures.

Stakeholder engagement information is managed through an electronic register which records details of emails, meetings and conversations between Arafura personnel and stakeholders.

The Mine Closure Plan itself represents a key instrument for managing mine closure information and data. The Plan is reviewed regularly or when operational circumstances change. Formal MCP revision and re-submission to regulators will be conducted as per regulatory advice, but is expected to be about every three years or as agreed. Review of the MCP and associated mine closure liability estimate is managed within the site's EMS.

Reviews of the Mine Closure Plan are risk-based (in accordance with the site EMS) whereby risks are assessed and control measures are documented. If required, future risk control measures are identified (e.g. the need for more rehabilitation trials) and are managed via annual improvement programs.

Document and data management at the Nolans site will be integrated within the eventual site document and records management system. Information management relating to mine closure is expected to include:

1. Annual compilation of relevant operational data including:
    i. Rehabilitation monitoring;
    ii. Groundwater and surface water monitoring;
    iii. Materials characterisation data;
    iv. Land clearing and disturbance reconciliation;
    v. Resources monitoring (soils, growth medium);
2. Annual record of activities related to closure including stakeholder communications, planning and rehabilitation.

Annual budgets allow for data management and storage, as well as compilation of a GIS information database.

APPENDIX A Stakeholder Engagement Register

Date	Description of Engagement	Stakeholders	Stakeholder Comments/Issue	Proponent Response and/or Resolution
Jun-15	Meeting	Anmatjerr Council - Alice	General questions about a range of project issues. Discussed all aspects of the project including LOM etc.	Answered all questions put.
29-Jun-15	Meeting - on Country	Native Title Holders	General questions about a range of project issues. Discussed all aspects of the project including LOM etc. Numerous questions on radiation and water usage.	Answered all questions from the TOs. Lots of questions on a range of aspects of the project. Focus on Bush tucker etc form the project impacts.
30-Jun-15	Meeting	Laramba Community Council	General questions about a range of project issues. Discussed all aspects of the project including LOM etc.	Answered all questions put.
Aug-15	Meeting	Anmatjerr Council-Alice	General questions about a range of project issues. Discussed all aspects of the project including LOM etc. Focus mostly on opportunities.	Answered all questions put.
26-27 Aug - 15	Conference	Mining in the Territory	Engaged with a range of stakeholders who attended the conference including locals who came to look at display and get general information on the project.	Answered all questions put. Provided project fact sheets.
15-16 Sept -15	Meeting	Aileron Pastoral	Covered all aspects of the project including impacts on the station's operation. Also spoke about what happens after the project finishes.	Discussion on the project. Lots of discussion on impacts and compensation.
7-Oct-15	Site Visit	NT EPA Board	Covered all aspects of the entire project.	Answered questions on the project with focus on the EIS studies and project risks etc.
8-Oct-15	Meeting	Anmatjerr Council-Alice	Update on the project.	Answered all general questions.
19-Feb-16	Meeting	DLRM	Specifically focused on water usage for the project and the likely impact on sustainability of the water resources including the pit.	Provide information on water usage and plans.
15-16 Mar - 16	Conference	AGES Alice Springs	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Provided project information and answered all questions.
24-Mar-16	Meeting	NT Cattlemen	General overview of the project.	Provided project update and asked questions about Cattlemans Assoc. position on land access and compensation.
26-Mar-16	Meeting on Site	Native Title Holders	General overview of the project and update on planned changes. Spoke about the EIS and the findings of the studies.	Answered all questions on project studies, water usage and cultural heritage matters.
27-Mar-16	Meeting	Ti Tree Council	General overview of the project and update on planned changes. Spoke about the EIS and the findings of the studies.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities.

Date	Description of Engagement	Stakeholders	Stakeholder Comments/Issue	Proponent Response and/or Resolution
28-Mar-16	Meetings	Alice Community	General overview of the project and update on planned changes. Spoke about the EIS and the findings of the studies.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
29-Mar-16	Meetings	Alice Community	General overview of the project and update on planned changes. Spoke about the EIS and the findings of the studies.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
3-4 May - 16	Meetings	DoE Canberra etc	Discussion on EPBC and discussed all aspects of the project and the EIS studies.	Provided information on what was coming in the EIS and the EPBC submission.
24-Jun-16	Meeting	NT EPA	Discussions on the EIS and questions about all aspects of the project.	Provided information on what was coming in the EIS and the EPBC submission.
28-Jun-16	Meeting	Arid Lands Env Centre	Site visit	Discussed all aspects of the project openly. Lots of questions on every aspect of the project.
01-Jul-16	Display	Alice Springs Show	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
02-Jul-16	Display	Alice Springs Show	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
05-Jul-16	Meeting	DPIR	Mine Closure Guidelines	Discussion on closure matters generally
23-Aug-16	Meeting	NT EPA	Assessment Officers	Discussions on EIS
22-Mar-17	Meeting	DPIR	CEO of DPIR	General update on all aspects
27-Apr-17	Display	AGES Alice Springs	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
28-Apr-17	Display	AGES Alice Springs	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
29-Apr-17	Site Visits	DPIR	Provided tour of the project and discussed in detail the scope and scale of the project. WRDs, TSFs, pit etc.	Discussed and answered all questions. Visited all parts of the project.

Date	Description of Engagement	Stakeholders	Stakeholder Comments/Issue	Proponent Response and/or Resolution
30-Apr-17	Site Visits	NTG	Provided tour of the project and discussed in detail the scope and scale of the project. WRDs, TSFs, pit etc.	Discussed and answered all questions. Visited all parts of the project.
18-Aug-17	Meeting	Central Desert Shire	General project overview.	Main focus was on benefits of the project for business and employment.
25-Oct-17	Conference	Barkley Regional Development	General project overview.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
23-Feb-18	Meeting	DPIR	Wanted to understand the MMP	Discussed the MMP content including closure. Lots of discussion on AMD and NORM.
21-Mar-18	Conference	AGES Alice Springs	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
22-Mar-18	Conference	AGES Alice Springs	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
04-Apr-18	Phone	Aileron Pastoral Holdings	APH want info on the MMP lodged.	Provided information on the MMP and work program planned.
06-Jul-18	Display	Alice Springs Show	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
07-Jul-18	Display	Alice Springs Show	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
05-Sep-18	Display	Mining in the Territory	General project overview.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
06-Sep-18	Display	Mining in the Territory	General project overview.	Answered all questions on project studies, water usage. Want information on job opportunities and

Date	Description of Engagement	Stakeholders	Stakeholder Comments/Issue	Proponent Response and/or Resolution
				business opportunities. What's in for Alice Springs and the NT.
26-Sep-18	Meeting	NTG	Water usage and management.	Provided details on the planned water usage and management of the resources.
08-Nov-18	Meeting	Alice Springs Council	General project overview.	Answered all questions openly.
18-Mar-19	Dsiplay	Chamber of Commerce Alice Springs	General project overview.	Answered all questions openly.
19-Mar-19	Display	AGES	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
20-Mar-19	Display	AGES	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
04-Sep-19	Display	Mining in the Territory	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
05-Sep-19	Display	Mining in the Territory	Engaged with a range of stakeholders who attend the conference including locals who came to look at display and get general information on the project.	Answered all questions on project studies, water usage. Want information on job opportunities and business opportunities. What's in for Alice Springs and the NT.
27-Sep-19	Meeting	CLC Joe Martin Jard	Focused on project benefits and Tos involvement in the project.	Provided information on what the project could deliver and what the opportunities could be for investment.
25-Feb-20	Meeting	Pastoralists	General update on the project and the potential impacts on the stations and opportunities. Lots of questions on water.	Answered all questions put by this group.
26-Feb-20	Meeting	Native Title Holders	Discussed to project in detail and specifically discussed the benefits and the opportunities.	Answered specific questions posed by this large group of TO's. Over 100 participated and we answered all questions. Questions on water, radiations, opportunities and compensation.
13-Aug-20	Meeting	DITT	MMP	General questions about the MMP, what will be included. Also discussed compliance with EPA recommendations and closure possibilities.
24-Aug-20	Meeting	CAERC	General project overview.	General project update.

Date	Description of Engagement	Stakeholders	Stakeholder Comments/Issue	Proponent Response and/or Resolution
28-May-21	Meeting	DITT	MMP	General questions about the MMP, what will be included. Also discussed compliance with EPA recommendations and closure possibilities. How to treat the plan demolition etc.
26-Sep-21	Meeting	DITT	MMP	General questions about the MMP, what will be included. Also discussed compliance with EPA recommendations and closure possibilities. How to treat the plan demolition etc.
12-Oct-21	Display	Central Aust Landcare	General information on all aspects	A range of questions
13-Oct-21	Display	Central Aust Landcare	General information on all aspects	A range of questions
13-Oct-21	Presentation	Chamber of Commerce Alice Springs	General information on all aspects	No questions

APPENDIX B Risk Assessment Matrix

Likelihood	Consequence Level				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	High
Unlikely	Low	Low	Medium	Medium	High
Rare	Low	Low	Low	Medium	Medium

Extreme	Intolerable - Risk reduction is mandatory wherever practicable. Residual risk can only be accepted if endorsed by senior management
High	Intolerable or tolerable if managed to as low as reasonably practicable - Senior management accountability
Medium	Intolerable or tolerable if managed to as low as reasonably practicable - Management responsibility
Low	Tolerable - Maintain systematic controls and monitor

Certainty descriptors	Explanation
High Level	Risk ranking is based on testing, modelling or simulation, use of prototype or experiments. Analysis is based on verified models and/or data. Assessment is based on an historical basis.
Medium Level	Risk ranking is based on similar conditions being observed previously and/or qualitative analysis.
Low Level	Risk ranking is based on subjective opinion or relevant past experience

The likelihood of the risk occurring should consider the probability of the maximum credible consequence as described in the Consequence Guide assuming the specified planned controls are in place and operating at their expected level of performance. The adequacy of these controls to manage the risk should be considered when assigning the likelihood rating.

LIKELIHOOD Descriptor	Explanation
Almost Certain	The event is expected to occur in most circumstances This event could occur at least once during a project of this nature 91-100% chance of occurring during the project
Likely	The event will probably occur in most circumstances This event could occur up to once during a project of this nature 51-90% chance of occurring during the project
Possible	The event could occur but not expected This event could occur up to once every 10 projects of this nature 11-50% chance of occurring during the project
Unlikely	The event could occur but is improbable This event could occur up to once every 10-100 projects of this nature 1-10% chance of occurring during the project
Rare	The event may occur only in exceptional circumstances This event is not expected to occur except under exceptional circumstances (up to once every 100 projects of this nature) Less than 1% chance of occurring during the project
Factor	**Definition**
Long term	More than 5 years (greater than 2x construction period).
Medium-term	2-5 years (up to 2x construction period).
Short-term	Up to 2 years

The descriptors in the Consequence Table are proposed to assist specialists to assign consequence levels to impact pathways within their area of study. These are to be used as a guide only and specialists are also to use their judgment and experience to assign consequence levels. The reason(s) for assigning likelihood and consequence levels and risk ratings are to be documented by specialists

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Air	Air quality	No measurable air quality impacts or exceedance of air quality standards	Local short term and approaching exceedance of air quality standards	Local minor long term, or widespread minor short term or exceedance of air quality standards	Widespread (regional) major short-term exceedance of air quality standards	Regional long-term change in air quality or exceedance of air quality standards
Air	Noise	Applicable standards / guidelines met at all sensitive receptors at all times	Isolated and temporary increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor	Short term, local increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor	Long term, local increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor	Long term, regional increase in noise levels exceeding relevant noise standards / guidelines at a sensitive receptor
Biodiversity	Listed Flora Species	Minor local habitat modification and/or lifecycle disruption for a listed species	Moderate local habitat modification and/or lifecycle disruption for a listed species	Substantial local habitat modification and/or lifecycle disruption for a listed species	Moderate regional habitat modification and/or lifecycle disruption for a listed species	Substantial regional habitat modification and/or lifecycle disruption for a listed species
Biodiversity	Listed Threatened Fauna Species	No loss of individuals of listed fauna species	Minor local decrease in size of population(s) of listed fauna species	Moderate local decrease in size of population(s) of listed fauna species	Substantial local decrease in size of population(s) of listed fauna species	Moderate or substantial regional decrease in size of population(s) of listed fauna species

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Biodiversity	General flora and fauna	Insignificant or imperceptible effects	Local short-term decrease in abundance of some species with no lasting effects on local population	Local long-term decrease in abundance of some species resulting in some change to community structure	Regional decrease in abundance of some species resulting in some changes to community structure	Regional loss of numerous species resulting in the dominance of only a few species
Historic and cultural heritage	Aboriginal and cultural heritage	Minor repairable damage to more common structures or sites. No disturbance of historic and / or cultural heritage sites	Moderate or repairable damage or infringement to sensitive structures or sites of cultural significance or sacred value	Considerable damage or infringement to sensitive structures or sites of cultural significance or sacred value	Major damage or infringement to sensitive structures or sites of cultural significance or sacred value	Irreparable and permanent damage to sensitive structures or sites of cultural significance or sacred value
Human health and safety	Safety	Low level short term subjective inconvenience or symptoms. Typically a first aid and no medical treatment.	Reversible / minor injuries requiring medical treatment, but does not lead to restricted duties. Typically a medical treatment.	Reversible injury or moderate irreversible damage or impairment to one or more persons. Typically a lost time injury.	Single fatality and/or severe irreversible damage or severe impairment to one or more persons.	Multiple fatalities or permanent damage to multiple people.
Human health and safety	Health	Reversible health effects of little concern, requiring first aid treatment at most.	Reversible health effects of concern that would typically result in medical treatment.	Severe, reversible health effects of concern that would typically result in a lost time illness.	Single fatality or irreversible health effects or disabling illness.	Multiple fatalities or serious disabling illness to multiple people.

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Radiation	Occupational exposure	<1 mSv/y Measurable increase in radiation dose with outcomes below public dose limit.	<5 mSv/y Measurable increase in radiation dose with outcomes remaining below dose constraints.	>5 mSv/y and <20 mSv/y Measurable increase in radiation dose with outcomes between dose constraint and dose limit (averaged over five years).	>20 mSv/y and <50 mSv/y Measurable increase in radiation dose with outcomes between dose limit (averaged over five years) and maximum annual dose.	>50 mSv/y Measurable increase in radiation dose with outcomes greater than the maximum annual dose.
Radiation	Public exposure	No change from background Dose not discernible above natural background	<0.3 mSv/y Measurable increase in radiation dose with outcomes below public dose constraint	>0.3 mSv/y and <1 mSv/y Measurable increase in radiation dose with outcomes between dose constraint and dose limit (averaged over five years) for public	>1 mSv/y and <5 mSv/y Measurable increase in radiation dose with outcomes between dose limit (averaged over five years) and maximum annual dose for public.	>5 mSv/y Measurable increase in radiation dose with outcomes greater than the maximum annual dose for public
Radiation	Environmental impact	ERICA RQ < 0.1	ERICA RQ >0.1 and <1.0	ERICA RQ >1.0 plus justification	ERICA RQ >1.0 and no justification	ERICA RQ > 10.0

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Socio-economic	Community	Local, small-scale, easily reversible change on social characteristics or values of the communities of interest or communities can easily adapt or cope with change.	Short-term recoverable changes to social characteristics and values of the communities of interest or community has substantial capacity to adapt and cope with change.	Medium-term recoverable changes to social characteristics and values of the communities of interest or community has some capacity to adapt and cope with change.	Long-term recoverable changes to social characteristics and values of the communities of interest or community has limited capacity to adapt and cope with change.	Irreversible changes to social characteristics and values of the communities of interest or community has no capacity to adapt and cope with change.
Socio-economic	Visual and landscape	Almost imperceptible or no visual change from sensitive receptors or places of cultural and natural value. No loss of / or change to features or characteristics of the landscape.	Minor visual change from sensitive receptors or places of cultural and natural value. Minor loss or alteration to key landscape characteristics, or introduction of elements that may be visible but not uncharacteristic.	Moderate visual change from sensitive receptors and places of cultural and natural value. Discernible changes in the landscape due to partial loss or change to characteristics of the landscape.	Significant visual change from sensitive receptors and places of cultural and natural value. Discernible change, which is out of scale with the landscape, at odds with landform and will leave an adverse impact.	Catastrophic visual change from sensitive receptors and places of cultural and natural value. A substantial change to the landscape due to total loss of elements or characteristics, causing the landscape to be permanently changed and its quality diminished.

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Transport	Traffic and transport operations and conditions	Negligible adverse impact on traffic and transport conditions. No perceptible deterioration of road integrity.	Detectable adverse changes in traffic and transport condition (decrease in Level of Service) at one or two locations at any one point in time during the construction period or at a single location during operations. Seasonal, local deterioration of road integrity.	Detectable adverse change in traffic and transport conditions (decrease in Level of Service) at multiple locations. Short term, local deterioration of road integrity.	Traffic and transport congestion and delays exceed acceptable levels at multiple locations. Short term, regional deterioration of road integrity.	Traffic and transport congestion and delays severely restrict the safe operation and efficiency of the transport network. Long term, regional deterioration of road integrity.
Transport	Road safety	No increase in vehicle incidents along relevant haulage routes above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of five per cent above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of ten per cent above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of twenty per cent above historical baseline trend.	An increase in vehicle incidents along relevant haulage routes of greater than twenty per cent above historical baseline trend.

Category of Impact	Aspect	Insignificant	Minor	Moderate	Major	Catastrophic
Water	Surface water	Minimal contamination or change with no significant loss of quality	Local minor short-term reduction or change in water quality. Local contamination or change that can be immediately remediated.	Local minor long term or widespread minor short term or local major short-term reduction or change in water quality. Local contamination or change that can be remediated in long term.	Widespread (regional) major short-term reduction or change in water quality. Local contamination or change that cannot be remediated in long term. Widespread contamination or change that can be remediated	Regional long-term reduction or change in water quality. Widespread contamination or change that cannot be immediately remediated.
Water	Groundwater	Negligible change to groundwater regime, quality and availability	Changes to groundwater regime, quality and availability but no significant implications.	Changes to groundwater regime, quality and availability with minor groundwater implications for a localised area.	Groundwater regime, quality or availability significantly compromised.	Widespread groundwater resource depletion, contamination or subsidence

APPENDIX C Nolans Project Mine Closure Risk Register

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
5	Construction of linear infrastructure (i.e. utilities corridors and access roads) results in altered surface water flows	Surface water	Potential for cross drainage structures associated with linear infrastructure (utilities corridors, access roads) to impede or divert natural flow and/or increasing channel flow velocity. Includes pipelines, roads between the Mine Site and Processing Site crossing the upper reaches of Kerosene Camp Creek as well as access road from the Stuart Highway, which will cross the headwaters of a number of small creeks draining into the Southern Basins.	Appropriate consideration of surface water flow in design, placement of infrastructure and construction including: - Maintain natural surface water flows in minor watercourses by the use of floodways at creek crossings. - Adoption of appropriately sized culverts to maintain flows at major creek crossings. - Provision of suitable outlet scour protection measures.	Insignificant	Unlikely	Low	No additional controls	Insignificant	Unlikely	Low
6	Diversion of Kerosene Camp Creek and alteration of waterway form	Surface water	Altered hydrological regime (increase in flows) in the western arm of Kerosene Camp Creek , downstream of the diversion channel outlet resulting in channel adjustments (widening) along this section of creek. Long term localised increased velocity and erosion downstream of the	Implement a Diversion Management Plan, including: - Collation of baseline water quality - Hydraulic modelling of design - Performance criteria for water quality, ecology and geomorphology Implement a Biodiversity Management Plan (BMP), including: - Site planning to minimise vegetation clearing where possible Implementation of a Water	Insignificant	Likely	Medium	Engineered design of the outlet to the diversion to minimise change in velocity and associated scouring including to have similar gradient as downstream; Monitor diversion outlet and repair/ make design changes to outlet if damage / scouring exceeds expectations, including installation of rip-rap	Insignificant	Possible	Medium

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
			diversion during infrequent rainfall event. Loss of water (40% reduction in flows) to catchment downstream from the original creek alignment including loss of water to the diversion and to sediment basins on the mine site	Management Plan, including: - Runoff from disturbed areas will be diverted into sediment ponds and not discharged into the natural environment - Design outlet to have similar gradient to existing and reduce angle at which the diversion enters the natural channel Maintain installed rising stage samplers and gauging stations in creeks in and around Nolans to monitor surface flows and water quality in creeks.							
18	Progressive water table drawdown from groundwater extraction rates from the Southern basins borefield	Groundwater	Decline in availability of water to existing and/or future users within the Southern basin (i.e. bore water for communities of Alyuen, Laramba / Napperby). Less groundwater availability to surrounding landholders' bores	- Undertake hydrogeological investigations and predictive groundwater flow modelling; - Identify current and potential future users; - Monitoring program, including bores to assess impacts on water table; - Install groundwater monitoring bores and provide substitute water source from elsewhere for existing stock bores if required. The Water Abstraction Management Plan will include assessment and management of any stock or drinking water bores that could be impacted by the Project, in agreement with the owners and/or operators of those bores. This is to include: a) conducting a hydro-census	*Moderate*	*Possible*	*Medium*	- Future recalibration of groundwater model, informed by historical operational data after several years of Project operations; - Alternative water supplies to supplement demand for directly impacted users, or change to borefield management if water table drawdown is demonstrated to be unacceptable; - Development and implementation of additional groundwater and surface water management strategies. A Water Abstraction Management Plan will be developed, which provides; a) a full description of the groundwater model, assumptions and parameters b) further information to validate the existing class 1 groundwater model, c) revised model outputs for estimated groundwater drawdown, and recovery of groundwater levels post-closure (including 50, 100 and 1000 years), at the borefield and mine site	*Moderate*	*Possible*	*Medium*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
				(condition) survey of local groundwater users prior to construction to establish baseline conditions b) a program to monitor water levels at those bores to detect whether levels are within observed baseline conditions c) measures to ensure identified groundwater user bores remain operational or provide an alternative water bore or supplies if required.				d) a framework identifying timing, methods and parameters for the collection of further information on baseline groundwater levels, flow directions and flow rates to understand natural variance and hydrological conditions in the borefield and mine site e) details of all monitoring bores, f) confirmation that all bores and bore meters would be constructed, operated and registered in accordance with the 'Minimum construction requirements for water bores in Australia' g) measures to quantify and record the volume of water abstracted from the borefield and mine site h) a framework, including timeframes, for progressing to a Class 2 numerical groundwater model i) an independent peer review of the updated Water Abstraction Management Plan by a suitably qualified independent professional			
19	Water table drawdown in the Ti Tree or basins associated with Alice Springs water supplies from the cumulative effect of the Southern basins borefield and mine dewatering	Groundwater	Decline in availability of water to existing and or future users, including bores for agricultural users drawing from the Ti Tree basin.	- Undertake hydrogeological investigations and predictive groundwater flow modelling; - Monitoring program, including bores to assess impacts on water table; - Development and implementation of groundwater and surface water management strategies	*Minor*	*Unlikely*	*Low*	Future recalibration of groundwater model, informed by historical operational data after several years of Project operations Water Abstraction Management Plan will be developed, as above.	*Minor*	*Unlikely*	*Low*
20	Seepage from Residual Storage Facility (RSF) at the Processing Site, including failure of low	Groundwater	Seepage of tailings water containing metals at levels exceeding guideline thresholds, with localised contamination of	- Installation of low permeability soil liner system; - Groundwater monitoring program; - Thickener on benefactor to reduce volume of entrained water entering the RSF;	*Minor*	*Likely*	*Medium*	- Seepage interception and collection system; - Avoid placement of future stock bores within close proximity An appropriately qualified and experienced Independent Certifying Engineer will provide:	*Minor*	*Likely*	*Medium*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
	permeability soil liner system		groundwater and discharge to surface water.	- Supernatant reclaim; - Testing to confirm chemical properties; - Residue storage facility management and water discharge; - Ongoing AMD sampling and analysis; - Mine Management Plan; - Sediment and Erosion Control Plan; - Controlled and managed site drainage and release to adequately dilute fluoride; - Water cover to minimise dust generation until capped.				a) objective and independent expert review to the relevant regulator on the suitability of the site selection for the waste rock dumps, tailings and residue storage facilities including review of alternative sites and assessment of comparative risks b) objective and independent expert review to the relevant regulator on the adequacy of residue storage facility design, including details of the sub-surface drainage and type of low-permeability liners to ensure long-term containment of tailings/residues or leachate from waste rock dumps c) regular inspections, auditing and reporting to the relevant regulator during construction of residue storage facilities and waste rock dumps to ensure construction and operation is in accordance with the endorsed design and design objectives d) objective and independent expert review of the proposed performance monitoring program for the waste storages including potential seepage and leachates from the storage facilities e) objective and independent expert review of the decommissioning and final rehabilitation to minimise long-term risks to the environment, community, future land use and visual amenity from the waste storages f) an independent assessment of the Project's management of tailings and residues, including performance monitoring results in an annual report to the relevant regulator and the Proponent or Operator. The annual report shall be provided on the websites of (as applicable), the Proponent and Operator and the relevant regulator An independent process safety expert, endorsed			

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
								by the relevant regulator to: a) develop a process safety plan that details how process safety systems would be implemented to prevent the occurrence of a major process safety incident b) provide oversight of the implementation of process safety via regular inspections c) provide reporting of process safety oversight to the relevant regulator. The process safety plan must: a) identify major process safety hazards at the Project b) document the risks and controls and identify critical controls c) provide bowtie diagrams to present risks and controls for the Project's identified process safety hazards in a graphical form d) document the controls and associated accountabilities and active monitoring responsibilities e) monitor and report on the effectiveness of the controls, identifying areas for improvement and actioning f) document the independent process safety expert's oversight inspection schedule that would report on whether process safety systems are embedded into the culture of the organisation g) provide provisions for publicly reporting the independent process safety oversight reports.			
21	Seepage from Water Leach, Neutralisation and Residue Storage Facilities (RSFs) at Processing Site, including failure	Groundwater	Release to groundwater of leachate (e.g. elevated levels of radioactive material, metals), with localised contamination of groundwater exceeding guideline thresholds.	- HDPE / low permeability soil liner system, including double lined system, with seepage detection; - Groundwater monitoring program; - Thickener in beneficiation plant to reduce volume of entrained water; - Multi-stage neutralisation process (pH control);	*Major*	*Unlikely*	*Medium*	Avoid placement of future stock bores within close proximity Additional controls as detailed above	*Major*	*Unlikely*	*Medium*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
	of HDPE / low permeability soil liner system			- Supernatant reclaim from tailings and residue disposal							
23	Embankment failure of Tailings Storage Facility (RSF) containing beneficiation tailings at Processing Site	Surface water	Contamination of surrounding land and ephemeral waterways from uncontrolled release resulting in impact on ecosystem health.	For all receptors: RSF design to include: - RSF to have storage capacity to contain a 1 in 100-year ARI average annual rainfall whilst retaining sufficient additional freeboard to accommodate a PMP 72-hour storm rainfall event. - All RSFs will during construction be supervised by qualified engineering personnel. A construction quality assurance plan be implemented to ensure constructed dams meet design criteria. - Selection of appropriate ANCOLD risk category and adherence to relevant design standards for the provision of adequate storage capacity and freeboard allowance; Monitoring Plan for the RSFto include: - Embankment piezometers to monitor the phreatic surface within the RSF embankment. - Install shallow seepage detection bores outside but near the toe of embankments.	Moderate	Rare	Low	Annual geotechnical inspection of RSF embankment	Moderate	Rare	Low
		Groundwater	Release of tailings water containing metals at levels exceeding guideline thresholds, with localised contamination of groundwater and discharge to surface water.		Moderate	Rare	Low	Avoid placement of future stock bores within close proximity	Moderate	Rare	Low
		Flora	Immediate inundation of flora within flow path of failed embankment, with secondary longer term impacts including potential vegetation loss associated with the contamination of surrounding land and ephemeral waterways from the uncontrolled release.		Minor	Rare	Low	No additional controls	Minor	Rare	Low

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
		Fauna	Loss or disturbance of fauna habitats due to inundation or degradation of surface water quality, including potential food chain accumulation of metals, results in decline in size of population of listed threatened species.	- Daily inspections to identify evidence of seepage. Annual dam safety audit will be completed by a suitably qualified person to inspect all the aspects of the dam, which includes the geotechnical stability of the dam and seepage. Develop a Water Management Plan which incorporates an Emergency Response Plan including with specific actions to be implemented proactively to reduce the potential of an uncontrolled release or dam failure. Positioning and design of RSF will take account of the risk of flooding and erosion along existing watercourses and will either position infrastructure outside the 1 in 1,000-year ARI flood extent; or incorporate flood protection measures into potentially flood prone areas.	Minor	Rare	Low	A Biodiversity Management Plan and Biodiversity Management Plan have been developed. The Biodiversity Management Plan contains: a) an identification of potential project impacts and risks, mitigation measures and preventative actions for the protection of biodiversity values and habitat for threatened species b) a procedure for pre-clearance surveys for threatened species, including the great desert skink c) the final alignment of the borefield access track, incorporating a buffer of at least 200 m around the known warren of the great desert skink d) the scope, standards and timeframes for a flora and fauna monitoring program e) procedures for managing fire risk from the Project on habitat for threatened species f) weed hygiene and control procedures for avoiding the introduction and/or spread of weeds into habitat for threatened species g) procedures for avoiding and/or managing the risk of introduced fauna on threatened species	Minor	Rare	Low
25	Embankment failure of Water Leach, Neutralisation and Phosphate Residue Storage Facilities (RSFs) at Processing Site, due to slope instability or	Surface water	Contamination of surrounding land and ephemeral waterways from uncontrolled release resulting in impact on ecosystem health. Waterways downstream of the residue storage facilities are minor creeks	For all receptors: RSF design to include: - RSF to have storage capacity to contain a 1 in 100-year ARI average annual rainfall whilst retaining sufficient additional freeboard to accommodate a PMP 72-hour storm rainfall event. - All RSFs will during construction be	Major	Rare	Medium	No additional controls	Major	Rare	Medium

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
	extreme weather event		draining to the Southern Basins.	supervised by qualified engineering personnel. A construction quality assurance plan be implemented to ensure constructed dams meet design criteria. - Selection of appropriate ANCOLD risk category and adherence to relevant design standards for the provision of adequate storage capacity and freeboard allowance; Monitoring Plan for the RSFto include: - Embankment piezometers to monitor the phreatic surface within the RSF embankment. - Install shallow seepage detection bores outside but near the toe of embankments. - Daily inspections to identify evidence of seepage. Annual dam safety audit will be completed by a suitably qualified person to inspect all the aspects of the dam, which includes the geotechnical stability of the dam and seepage. Develop a Water Management Plan which incorporates an Emergency Response Plan including with specific actions to be implemented proactively to reduce the potential of an uncontrolled release or dam failure. Positioning and design of RSF will take account of the risk of flooding							
		Groundwater	Contamination of a significant groundwater resource. Impact on Southern basins and consequential impacts to water supply for existing and potential users (i.e. borewater for communities of Alyuen, Laramba / Napperby).		Major	Rare	Medium	Avoid placement of future stock bores within close proximity	Major	Rare	Medium
		Flora	Immediate inundation of flora within flow path of failed embankment, with secondary longer term impacts including potential vegetation loss associated with the contamination of surrounding land and ephemeral waterways from the uncontrolled release.		Major	Rare	Medium	No additional controls	Major	Rare	Medium
		Fauna	Loss or disturbance of fauna habitats due to inundation or degradation of surface water quality through released contaminants, results in decline in size of population of listed threatened species.		Moderate	Rare	Low	No additional controls	Moderate	Rare	Low

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
				and erosion along existing watercourses and will either position infrastructure outside the 1 in 1,000-year ARI flood extent; or incorporate flood protection measures into potentially flood prone areas.							
29	Uncontrolled AMD seepage from in-pit and ex-pit AMD material at Mine Site, including pit walls, ROM pad or storage	Groundwater	Contamination of a groundwater resource, including acidity, salinity or metals.	- Testing to confirm chemical properties. Only trace AMD material identified in material likely to make up pit walls or be dewatered by mine drainage; - PAF encapsulation cells within ex-pit WRDs; - Dumps and fill areas profiled to shed and capture runoff; - Clean, dirty and contaminated water drainage systems; - Surface water management basins; - On completion of mining, pit will re-flood above the level of any significant AMD in the aquifers surrounding the pit, preventing further oxidisation; - AMD Management Plan, with regular review. Including ongoing AMD sampling and analysis; - Mine Management Plan; - Sediment and Erosion Control Plan; - Water Management Plan; - Selective materials handling and placement using mine schedule and geochemical model; - Controlled and managed site drainage and release; - Compaction of construction material and waste rock;	*Minor*	*Unlikely*	*Low*	No additional controls	*Minor*	*Unlikely*	*Low*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
				- Rapid recovery of groundwater levels to prevent further PAF oxidisation and post mining							
30	Waste rock dump cover material and/or design allowing for erosion and exposure of waste rock and excessive leachate generation	Groundwater	Contamination of a groundwater resource, including acidity, salinity or metals.	- Use of appropriate cover material; - Physical isolation of radioactive material by non-radioactive material; - Compaction of PAF waste in cell limiting infiltration; - Provision for capture and treat via polishing pond (if required); - Cover materials resource assessment; - Large scale cover trials to determine a suitable cover design; - Mine Management Plan; - Sediment and Erosion Control Plan; - Water Management Plan; - Controlled and managed site drainage and release; - Controlled placement of cover material; - Controlled and managed site drainage and release.	*Insignificant*	*Unlikely*	*Low*	No additional controls	*Insignificant*	*Unlikely*	*Low*
		Radiation	Rain water comes in contact encapsulated radioactive material resulting in mobilisation of radionuclides and their movement into the ecosystem		*Insignificant*	*Rare*	*Low*	No additional controls	*Insignificant*	*Rare*	*Low*
31	'First flush' surge of stored oxidation products (AMD / NMD / SD) generated in mine storage facilities at Mine site (Waste Rock Dump, Long Term Stockpile,	Surface water	Contamination of ephemeral waterways and subsequently groundwater from uncontrolled release resulting in impact on ecosystem health and/ or public water supply.	Sediment control ponds	*Insignificant*	*Unlikely*	*Low*	No additional controls	*Insignificant*	*Unlikely*	*Low*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
	ROM Pad etc) over extended dry periods, discharging downstream										
		Groundwater	Release to groundwater of leachate (elevated levels of radioactive material). Contamination of a significant groundwater resource. Impact on Ti Tree groundwater basin and consequential impacts to water supply (domestic, agricultural)		*Insignificant*	*Unlikely*	*Low*	No additional controls	*Insignificant*	*Unlikely*	*Low*
32	Mine void post-closure results in a long term source of contaminated water with the potential to contaminate groundwater and surface water	Groundwater	After decommissioning the mine void modelled to act as a sink, concentrating salts/contaminants through evaporation. Impact to surrounding groundwater is non credible.	- Closure water balance; - Undertake hydrogeological investigations; - Undertake predictive groundwater flow modelling.	*Moderate*	*Rare*	*Low*	Monitoring and confirmation of the balance (calibration) to ensure the pit always behaves as a sink. This means that contaminated water is always flowing towards the pit.	*Moderate*	*Rare*	*Low*
		Fauna	After decommissioning the mine void modelled to act as a sink, concentrating salts/contaminants through evaporation. Will be a hypersaline waterbody, with potential hazard to fauna.		*Minor*	*Rare*	*Low*	No additional controls	*Minor*	*Rare*	*Low*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
66	Public radiation exposure as a result of emissions from the Project.	Radiation	Worst credible consequence to human health and safety of public located at nearby off-site receptor, is the potential for measurable increase to radiation exposure, up to 1 mSv per year. Exposure may occur through the following routes: - via direct gamma 'shine' or direct irradiation from large masses of low specific activity material or smaller masses of high specific activity material; - via inhalation of long-lived alpha-emitting radionuclides (U, Th, Ra, Po) in airborne ore dust, process dust, product dust, or tailings dust; - via inhalation of short-lived radon decay products (radon and thoron daughters) - via ingestion of radionuclides in foods	- Compliance with relevant legislative requirements including the Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing, 2005 (RPS #9) and Code of Practice for Safe Transport of Radioactive Materials 2008 (RPS #2); - Radiation Management Plan (RMP); - Plant and process design specifications to minimize emissions - Dust suppression systems e.g. roads, stockpiles, tipping points, conveyors, crushers etc.; - Dust collection systems and scrubbers; - Dust deposition monitoring.	*Insignificant*	*Rare*	*Low*	No additional controls	*Insignificant*	*Rare*	*Low*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
67	Off site radiation dose via the consumption of local bush foods (plant or animal) which have been exposed to elevated levels of radiation through air emissions or surface or groundwater dispersion.	Radiation	Worst credible consequence to human health and safety of traditional owners and their families, is the potential for measurable increase to radiation exposure, above 1 mSv per year (average) or above 5mSv/y in any one year	- Bunded pipeline, designed for 6 hour capacity at maximum flow rate; - Process shutdown; - Pressure sensors; - Flow meters; - Design - deflector screens on welded joints	*Insignificant*	*Rare*	*Low*	Monitoring program will identify any changes from original assumptions, with review and implementation of additional suitable planned controls.	*Insignificant*	*Rare*	*Low*
70	Radiation exposure to non human biota as a result of emissions from the Project.	Radiation	Worst credible consequence is impact to populations of listed threatened species or domestic stock, with radiation exposure exceeding the trigger level (of 10 uGy/h). Exposure may occur through deposition of long-lived alpha-emitting radionuclides (U, Th, Ra, Po) in airborne ore dust, process dust, product dust, or tailings dust	- Compliance with relevant legislative requirements including the Code of Practice on Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing, 2005 (RPS #9) and Code of Practice for Safe Transport of Radioactive Materials 2008 (RPS #2); - Radiation Management Plan (RMP); - Plant and process design specifications include radiation exposure considerations including automation where possible, minimising maintenance times to allow quick change out, shielding of specific equipment etc.; - Operations procedures include radiation exposure considerations; - Dust suppression systems e.g. roads, stockpiles, tipping points, conveyors, crushers etc.; - Dust collection systems and	*Insignificant*	*Rare*	*Low*	No additional controls	*Insignificant*	*Rare*	*Low*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
				scrubbers; - Radiation monitoring program;							
73	Build up of radionuclide concentrations in the pit lake sediments	Radiation	Elevated concentration of radionuclides in pit lake water resulting in build-up of concentrations	Radionuclide concentration modelling	*Insignificant*	*Rare*	*Low*	No additional controls	*Insignificant*	*Rare*	*Low*
74	Closure designs not developed in detail to enable appropriate closure execution, resulting in significantly higher closure cost above closure provisioning.	Mine closure	Insufficient closure cost provision resulting in inability to execute closure plan. Delays or inability to achieve effective rehabilitation by Project proponent, (e.g. closure design or materials not adequate causing erosion, or contaminated seepage resulting in non sustainable ecosystems and downstream effects). Delays in achieving rehabilitation criterion and or relinquishment and could be period of several years.	- Conceptual closure plan developed for the project at start-up. - Annual review of concept plans with updated estimates of disturbance with associated rehabilitation estimates. - Regular monitoring of identified key environmental aspects of operation that are potentially most problematic during operation and at closure i.e. tailings, waste rock, seepage to ensure these aspects are fully understood and accounted for in all closure designs and proposals.	*Major*	*Unlikely*	*Medium*	- Increase level detail in closure designs during operations (detailed design level 5yrs prior to closure) - Prepare decommissioning and rehabilitation plan - WRD/RSF constructed in stages with progressive rehab where appropriate - cover material to be sourced from both the site or regionally as required	*Major*	*Unlikely*	*Medium*

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
75	Closure plan not accepted by DITT including due to lack of stakeholder acceptance, resulting in delays to Project approvals and requirement for more extensive rehabilitation.	Mine closure	Requirement for much more extensive closure plan (e.g. request to provide more detail in plans / depth/design of cover and/or revegetation). Worst credible consequence is inability to relinquish the site to the government post-closure for return to agreed land use, with ongoing environmental impacts	Develop and implement a continuous stakeholder engagement and communications plan for informing local and regional communities and other stakeholders of closure planning processes including agreeing on post-mining land uses, closure objectives, completion criteria and implementation strategies, and include in Closure Plan.	Major	Unlikely	Medium	- Continued stakeholder engagement throughout LOM - Regular update of closure plan throughout LOM	Major	Rare	Medium
76	Poor management of waste materials during operations leads to closure plans being unachievable or costly.	Mine closure	Delays to effective rehabilitation by Project proponent, including through erosion, or contaminated seepage resulting in non sustainable ecosystems and downstream effects. Delays associated with cost overruns could be period of several years.	- Undertake a closure materials balance based on the mine plan and closure design; - Review the long-term dump schedule in relation to the long-term closure plan; - Operational controls on mine waste management (i.e.; waste classification); - Competent operational management personnel and systems	Moderate	Unlikely	Medium	Progressive rehabilitation of landforms during operations to limit area of active disturbance and provide proofing of closure designs through field performance (e.g. six WRDs proposed, some could be rehabilitated during operational phase, particularly any visible outer faces)	Moderate	Unlikely	Medium
77	Unexpected early closure of the Project, including due to delays or falling commodity prices.	Mine closure	Delays to effective rehabilitation by Project proponent, including through erosion or contaminated seepage resulting in non sustainable ecosystems and downstream effects. Potentially exacerbated by closure designs not	- Long term offtake arrangements for clients; - Strategic long term investors; - Preliminary closure plan; - Commit to developing/refining closure designs through operations; - closure materials topsoils etc. stockpiles at start-up of operations; - WRD/RSF designs conservative and limited impact should they enter early closure as closure concept does not	Moderate	Unlikely	Medium	- Develop detailed closure designs; - Update closure costs estimate every 3 years - Prepare decommissioning and rehabilitation plan; - WRD/RSF constructed in stages with progressive rehabilitation where appropriate; - Care and Maintenance Plan, for short term stop to operations	Moderate	Unlikely	Medium

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
			yet developed in detail at time of early closure.	significantly change; - Progressive rehabilitation; - Bonds held by NT Government requires 110% of estimated closure cost reviewed and provided annually.							
78	Insufficient funds / bonds for Project closure activities, including due to inadequate closure plan designs, poor assumptions or failure to recognise impact of changes to operations on closure plans	Mine closure	Delays to effective rehabilitation, with unremediated Project site potentially acting as source of ongoing environmental hazard. Worst credible consequence is involuntary administration, with NT Government to complete remediation with bonds shortfall and consequential budgetary impact.	- Robust closure costs estimate with realistic assumptions; - Closure plan/designs planned to be refined during operations; - Closure costs estimate revised annually; - Closure plans audited by regulator prior to approval; - Bonds held as bank guarantee or cash in NT	Moderate	Rare	Low	- Progressive rehabilitation planned which enables reduction in liability during operations and identification of closure design issues.	Moderate	Rare	Low
79	Rehabilitation activities or constructed landforms not conforming or performing to design due to ineffective implementation of design or poor rehabilitation execution or design failure.	Mine closure	Environmental damage caused during rehabilitation works and delays to effective rehabilitation, with unremediated Project site potentially acting as source of ongoing environmental hazard.	- Prepare preliminary closure plan; - Develop detailed designs and tender documents for closure activities during operations and prior to closure works; - Prepare Decommissioning and Rehabilitation plan; - Employ closure project manager; - Undertake inspections & monitoring	Moderate	Rare	Low	- Review plan and design performance and amend as required; - Undertake rework on rehabilitation	Moderate	Rare	Low

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
80	Contaminated sites not adequately remediated, including Water Leach, Neutralisation and Residue Storage Facilities (RSFs) or Excess Process Liquor Evaporation Ponds, Mill, fuel farms or consumable storage areas.	Mine closure	Delays to effective rehabilitation by Project proponent, including through erosion, or contaminated seepage resulting in non sustainable ecosystems and downstream effects. Delays associated with cost overruns could be period of several years. Inability to relinquish, leading to damage to reputation, not able to get bond, ongoing enviro damage	- Reporting of spills; - Contaminated sites register; - Contaminated sites report; - Contaminated sites rehabilitation designs; - Closure plan. Operator is responsible for site until demonstration that able to meet agreed closure objectives and criteria	Major	Unlikely	Medium	Undertake further sampling/monitoring to accurately define level and extent of any ground contamination and improve volumetric estimates.	Major	Unlikely	Medium
81	Failure of post-closure RSF cover and batters, leading to erosion, contaminated seepage loss of material to the environment	Mine closure	Erosion and dispersion of particulate matter via air, surface, or groundwater flows, with resultant downstream effects on dependant ecosystems.	- Refine the engineering design for all RSF cover designs including evaluation of suitable materials; - Modelled scenarios for loss of cover to assess potential impacts	Moderate	Rare	Low	- Complete cover design trials at site prior to implementation; - Monitor cover performance and adjust design parameters as required.	Moderate	Rare	Low
82	Stakeholder expectations for closure are not met (e.g. retention of infrastructure or services, access to pit water)	Mine closure	Inadequate stakeholder identification and/or engagement.	Stakeholder engagement strategy involves discussions of closure strategies, post-closure land-use, closure objectives, completion criteria, and opportunities to retain infrastructure or services for post-closure use.	Minor	Unlikely	Low	No additional controls	Minor	Unlikely	Low

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
83	Public safety issues associated with the closed site	Mine closure	Safety issues could be associated with: - Steep pit walls - inadequate disposal of infrastructure demolition waste - soil or water contamination - erosion gullies on RSF or WRD's.	Pit bund proposed - location and dimensions in accordance with WA Guidelines. Blocking of ramp into pit. Signage to warn of safety risks Infrastructure demolition and disposal practices to consider safety risks (e.g. suitable burial cover) Contaminated sites assessment, remediation and validation of clean-up.	Major	Rare	Medium	Safety assessment of the site and proposed closure strategies during opeational phase.	Moderate	Rare	Low
84	Fauna safety issues associated with the closed site	Mine closure	(e.g. chasing water into the pit, failed plugs in drill holes)	Exploration rehabilitation involves plugging of drill holes to industry standards.	Minor	Unlikely	Low	Consideration of alternative watering points for fauna Consideration of fencing needs (in consultation with pastoralist stakeholders)	Minor	Unlikely	Low
85	Socioeconomic transition from operational to closure phases	Mine closure	Risk of economic or social dislocation/interruption of local communities once operations cease.	Social impact assessment conducted - Arafura progress with the findings and recommendations.	Moderate	Rare	Low	No additional controls	Moderate	Rare	Low
86	Pit wall fails outside the abandonment bund	Mine closure	Pit abandonment bund constructed inside zone of potential instability. Inadequate consideration of geotechnical features in the pit. Seismic event.	Pit bund proposed - location and dimensions in accordance with WA Guidelines (step back from zone of potential subsidence)	Minor	Unlikely	Low	No additional controls	Minor	Unlikely	Low
87	Materials balance - inadequate volumes or physical/chemical properties of materials required for rehabilitation	Mine closure	Inadequate planning of closure strategies and identification/stockpiling of materials required. Inadequate waste characterisation to determine physical and chemical properties and	Geochemical and geotechnical characterisation of soils and waste rock materials has commenced and will continue as further waste materials become available for testing. Closure strategies for RSF and WRD landforms continue to be developed	Moderate	Possible	Medium	Material characterisation and landform closure strategies continue to progress through the construction and operational phases of mining.	Moderate	Unlikely	Medium

Ref	Aspect	Impact and Pathway		Planned Controls to Manage Risk	Initial Risk			Additional Controls Proposed to Mitigate Risk	Residual Risk		
	strategies (e.g. topsoil, rock armour, capillary break material, RPL material).		implications for rehabilitation.	(conceptual at the moment) and consider the properties and volumes of materials required.							
88	Saline road material inhibits revegetation success.	Mine closure	Salinity on roads from watering with brackish/saline water for dust suppression.	Monitoring of water quality used for dust suppression. Assessment of soil salinity to assess closure strategies for roads and other areas of disturbance.	Minor	Unlikely	Low	If salinity is an issue, consider risk mitigation measures such as removing top layer of affected soil, selection of salt tolerant species for revegetation.	Minor	Unlikely	Low
89	Understatement of closure liability	Mine closure	Closure costs would be higher than estimated. Financial risk to company.	Managed through aspects such as contingency and conservatism in costs for demolition and roads (which may be retained). Liability estimates to be regularly updated to reflect the latest levels of disturbance and updates to proposed closure strategies.	Minor	Unlikely	Low	No additional controls	Minor	Unlikely	Low
90	Impacts on visual amenity - mainly associated with RSF and WRD landforms	Mine closure	Landform design may detract from the visual amenity due to height, profile and extent of revegetation success.	Conceptual landform designs have considered visual amenity and the natural profile of landforms in the area (e.g. concave slopes). Revegetation strategies aim to replicate the natural vegetation communities for similar landforms.	Minor	Unlikely	Low	Visual amenity assessment could be conducted to allow stakeholders to understand the eventual visual impact.	Minor	Unlikely	Low

ANNEXURE A ARMS-N-EST-N-0001 MINE CLOSURE AND SECURITY ESTIMATE