PROGRESSIVE REHABILITATION AND CLOSURE PLAN

BARBARA COPPER PROJECT

VERSION	DESCRIPTION	POSITION	REVIEWER	DATE
1.0 (Rev C)	PRCP for BCP (Round Oak Minerals)	Senior Environmental Advisor	Gemma Brown	28/07/2022
2.0 (Rev D)	Revised following regulator request for information	Principal Mine Closure	Gemma Brown	06/04/2023
3.0	Revised to include underground	Principal Mine Closure	Gemma Brown	21/03/2024
3.1	Revised following regulator request for information (DESI) for underground	Principal Mine Closure	Gemma Brown	30/05/2024
3.2	Revised following further DESI IR – management strategies for timeframes	Principal Mine Closure	Gemma Brown	25/06/2024
3.3	Revised for Stage 1 Underground	Principal Mine Closure	Gemma Brown	19/08/2024

Title of Project: Barbara Copper Project

Date: 19/08/2024

Tenure Number(s): Mining Lease 90241

Environmental Authority Holder Name: Aeris Resources Limited Round Oak Minerals Pty Limited subsidiary of Aeris

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1 INTRODUCTION

Aeris Resources Minerals Pty Limited (Aeris Resources) is required to submit a Progressive Rehabilitation and Closure Plan (PRCP) for its mining operations in Queensland under transitional provisions of the recent rehabilitation reforms and amendments to the *Environmental Protection Act 1994* (EP Act). The PRCP is required for the operations on Mining Lease (ML) ML90241 under the Environmental Authority (EA) EPML02840015 (30 September 2022) and provided in 0. Aeris Resources acquired Round Oak Minerals Pty Limited in July 2022. Aeris (ASX: AIS) is an established copper-gold producer and explorer listed on the Australian Securities Exchange. The company is headquartered in Brisbane, Queensland.

The Barbara Copper Project (BCP) (the Project) is authorised under an EA for resource activities relevant to mining metals (copper, lead, silver, zinc, gold, and iron ore). The Project is currently an open cut copper mine that has extracted approximately 772,000 tonnes of ore. The mine operated from June 2019 until March 2021 and was placed on care and maintenance in April 2021.

The Department of Environment and Science (DES) *Guideline: Progressive Rehabilitation and Closure Plans* (ESR/2019/4964 Version 2.00: March 2021) (referred to herein as the PRCP Guideline) provides the information to assist companies in complying with the amendments to the EP Act and the *Mineral and Energy Resources (Financial Provisioning) Act 2018* (Qld) (MERFP Act). It also contains information for existing EA holders for transitioning their mining activity to the PRCP framework. The PRCP Guideline has been used in the preparation of this PRCP, and a checklist as per Section 6 of the DES Submission of a Progressive Rehabilitation and Closure plan application form (ESR/2019/4957 Version 3.00: Feb 2021) has been provided in 0.

The two components of the PRCP are:

- PRCP planning component (this report), which provides the background information to the PRCP Schedule.
- PRCP Schedule which includes the development of rehabilitation milestones (RM) and milestone criteria and the timing for each RM to be achieved. The PRCP Schedule is provided as a separate standalone spreadsheet (ESR/2019/5103.xls) for DES.

The purpose of this plan is to:

- Demonstrate how and where activities will be carried out on land in a way that maximises the progressive rehabilitation of land to a stable condition, and
- Provide the condition to which Aeris Resources will rehabilitate the land before the EA may be surrendered.

The PRCP process is based on rehabilitation and closure methods for surrender which does not include the residual risk framework applied to an EA as part of the surrender application.

1.1 CURRENT LAND OUTCOME DOCUMENTS

The Project is considered a transitional PRCP, as mining activities are in process or have already occurred. Current land outcome documents were used to populate this PRCP where relevant. The applicable land outcome documents are provided in Table 1-1.

Table 1-1 Land outcome documents used to support this PRCP

TYPE	DOCUMENT NUMBER	DOCUMENT NAME
Environmental Authority	EA EPML02840015	EA EPML02840015 Round Oak Minerals Pty Ltd-Barbara (0)
Required under EA condition B2	BCP-HST-PLA-001	Air Quality Monitoring Program (0)
Required under EA condition E16	ROM-HSE-PLN-Barbara	Groundwater Management Plan (0)
Required under EA condition E20	623.20018.20211-R01-v2.0	Receiving Environment Monitoring Program (0)
Required under EA condition E22	118131.06.R01-b	Water Management Plan 0
Required under EA condition E23	01901105 BCP	Erosion and Sediment Control Plan 0

1.2 REHABILITATION OBJECTIVES

The overarching objective of mine rehabilitation and closure is to achieve a safe, stable, and non-polluting site which can sustain the agreed post mining land uses (PMLU). This plan has been developed to meet the specific rehabilitation objectives listed in Table 1-2. Objectives have been designed to align with existing EA conditions and the Land Use Management Document (Round Oak, 2020a).

This plan provides the strategies and controls that will be implemented to achieve the rehabilitation objectives. The RMs have been developed for individual Rehabilitation Areas (RAs) to meet the overall rehabilitation objectives and to achieve the proposed PMLUs (native ecosystems, water storage and low intensity grazing). This information is provided in the PRCP Schedule.

Table 1-2 Rehabilitation objectives

TO ACHIEVE A SAFE, STABLE, AND NON-POLLUTING SITE WHICH IS CAPABLE OF SUSTAINING THE AGREED POST CLOSURE LAND USE	
NO.	**REHABILITATION OBJECTIVE**
1	Rehabilitation and closure are conducted in a planned, orderly, and transparent manner
2	Rehabilitation performance is assessed on the basis of reliable and scientifically valid evidence
3	Closed project areas do not represent a danger to people or wildlife
4	Agreed environmental and human use values of surface water systems are maintained
5	Groundwater systems return to agreed beneficial uses
6	Post-closure land capability is consistent with post-closure land uses agreed with landholders and other stakeholders
7	Closure landforms are structurally and chemically safe and stable, with minimal requirement for ongoing maintenance or management
8	Successful handover of selected infrastructure and removal of all other infrastructure associated with operations
9	Achievement of agreed baseline for soil contamination
10	Areas disturbed by mining activities are revegetated to an acceptable standard for the PMLU
11	Closure landforms are visually compatible with the surrounding natural landscape
12	Ongoing monitoring and maintenance of rehabilitated areas is appropriately resourced and implemented; accountabilities for post-closure management actions are clearly documented and agreed by responsible parties
13	Closure is implemented to minimise adverse social and economic impacts on local communities

2 PROJECT PLANNING

2.1 MINING OPERATION SUMMARY

The Project is situated in north-west Queensland, 50 kilometres (km) north-east of Mount Isa within the Mount Isa Local Government Area (LGA) (Figure 2-1). The Project is wholly included in ML90241, which is accessible via the Lake Julius / Kajabbi Road (Figure 2-2). The operation is currently in care and maintenance, having completed open pit extraction of the copper and gold ore.

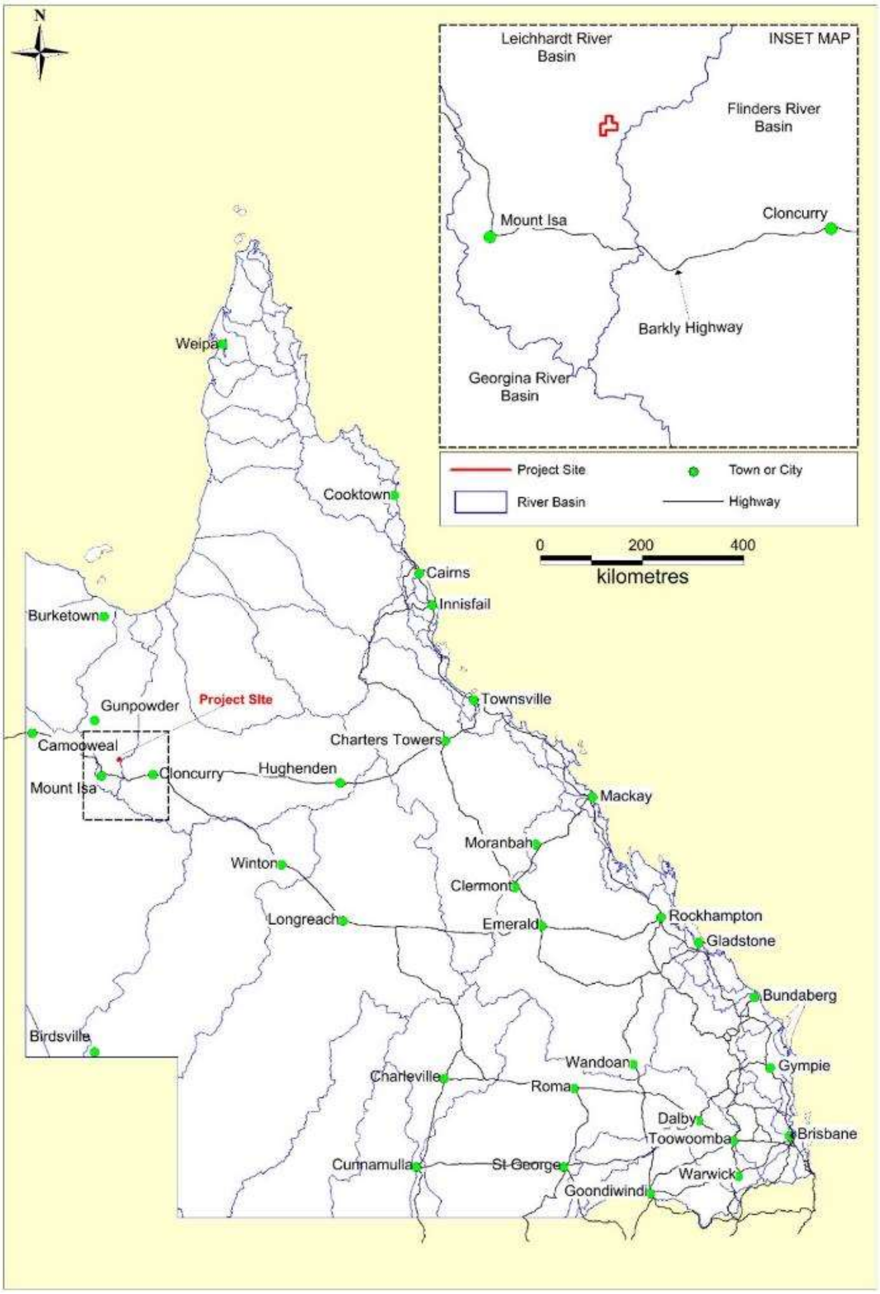


Figure 2-1 Regional location in Queensland

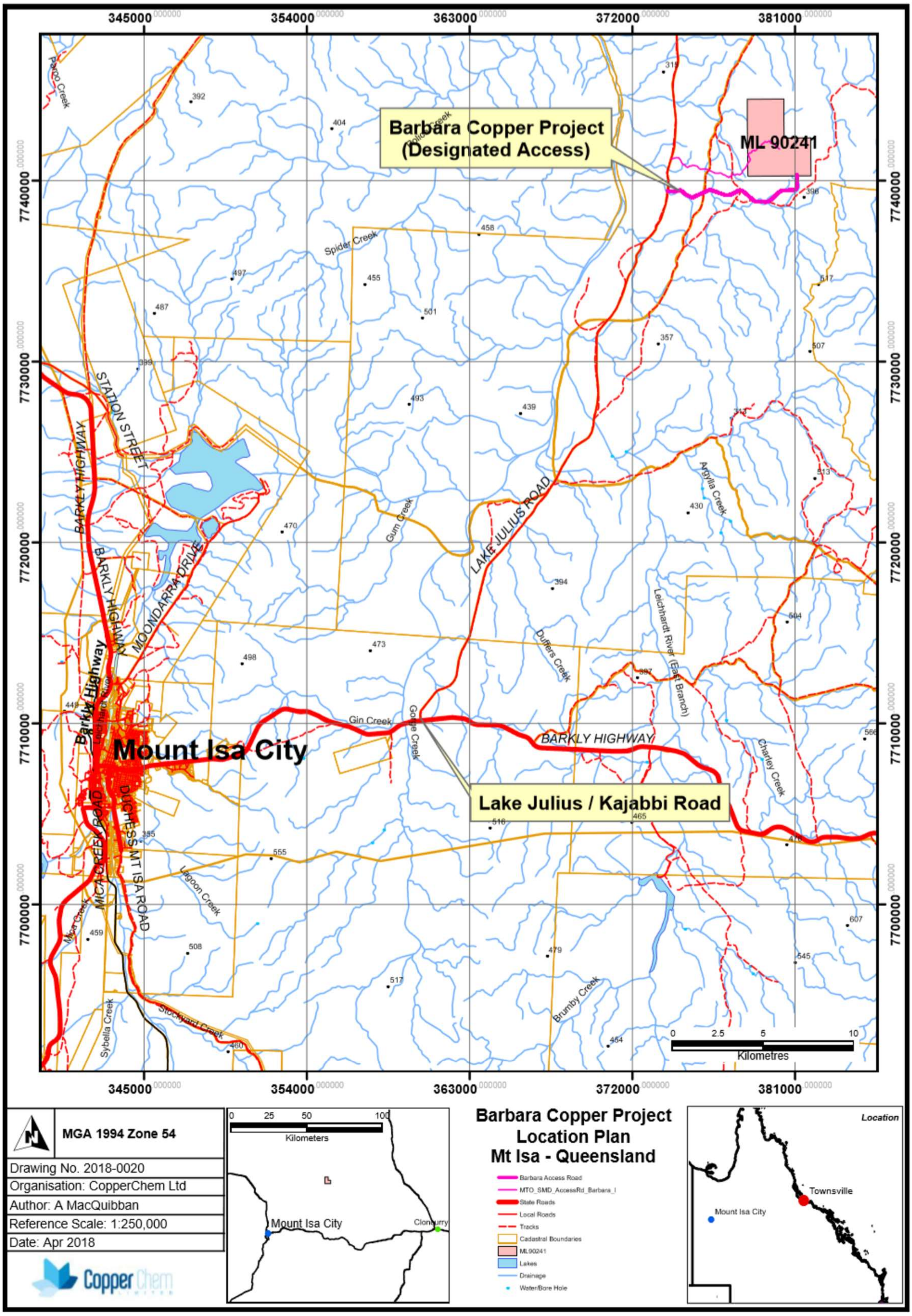


Figure 2-2 Project location

The Project operated as an open cut copper mine producing approximately 772,000 tonnes of ore over 21 months. All ore excavated from the two mine pits was trucked to Mount Isa for processing by a third party.

The Project includes two completed open pits; North Pit and South Pit was mined using a conventional truck and shovel operation with an out of pit dump for stockpiling overburden. Mining in the North Pit ceased at approximately 295 m RL, with pit access currently bunded off. The final pit depth of the South Pit is approximately 205 m RL. The two pits were mined concurrently over a period of approximately two years.

The total disturbance footprint is approved at 66.6 ha with actual total disturbance surveyed as 62.7 ha in 2021. The total area of actual disturbance of the pits is 13.5 ha and was the subject of an EA Amendment in September 2022.

The site is currently under care and maintenance. Recent exploration results and economic evaluation resulted in a Feasibility Study to transition the mine to underground at the start of 2025.. A staged approach for the development of underground has been proposed subject to approval. Staging the underground has been described in Section 2.3.4. This PRCP has been updated to reflect the EA and PRCP Amendment for Stage 1 Underground Mining.

2.2 BASELINE INFORMATION

This section comprises the baseline characteristics of the Project area prior to the commencement of mining activities. The technical reports which support this PRCP are provided as appendices.

2.2.1 Topography

The Project site is largely situated on rocky undulating hills and outcropping, rocky ridgelines in the Mount Isa Inlier of the north-west Highlands Bioregion (AARC, 2014b and AARC, 2014c). The site lies within the Leichardt drainage basin, which spans an area of approximately 32,878 km^2, originating from the south of Mount Isa and draining via the Leichardt River into the Gulf of Carpentaria (AARC, 2014c).

The elevation at the Project ranges from 330 m Australian Datum Height (AHD) on the west side of the mine area to approximately 390 m AHD on the south side of the project area (GeoResGlobe, 2022).

The topography of the mining area is provided in Figure 2-3.

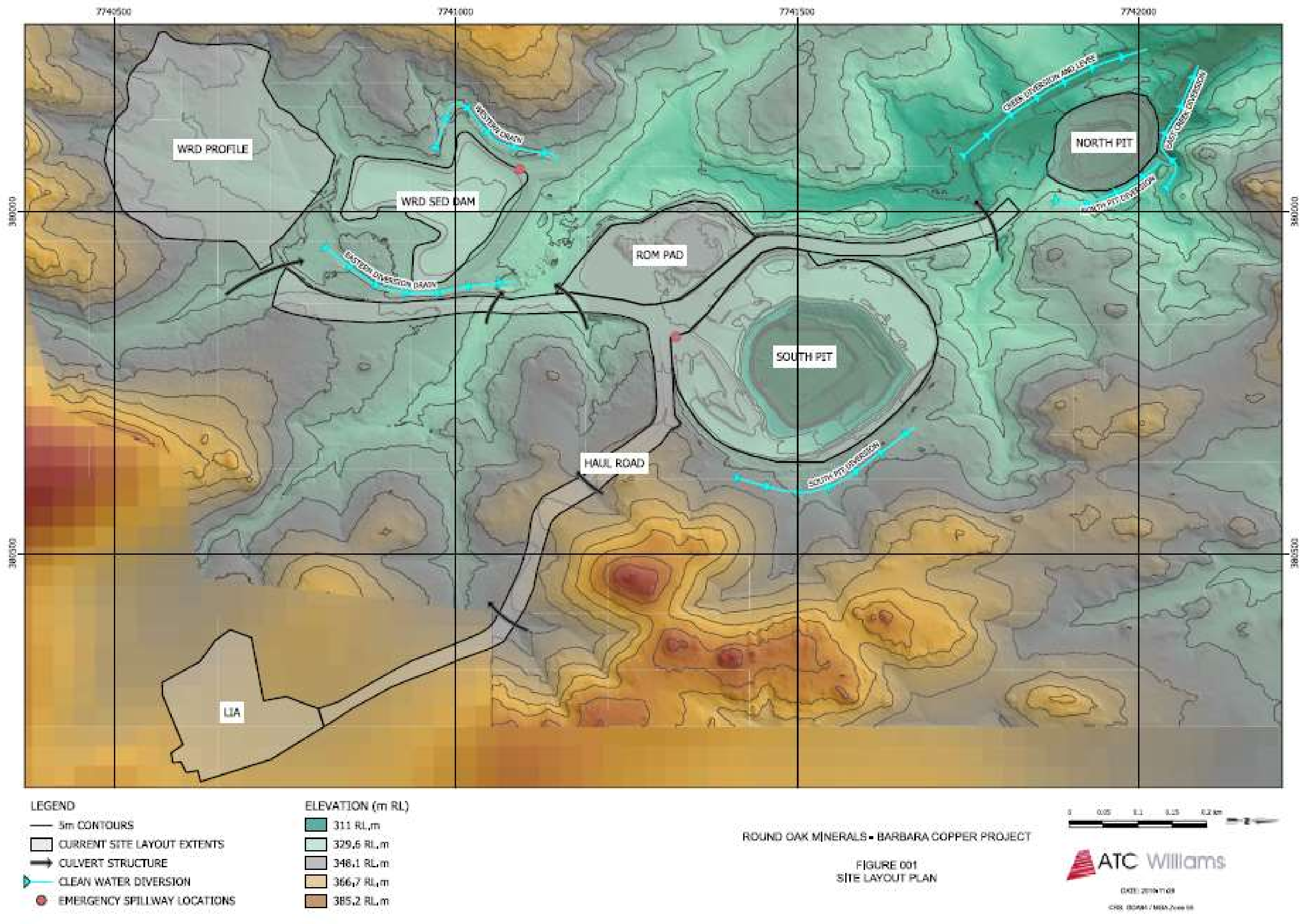


Figure 2-3 Site topography

2.2.2 Climate

The semi-arid to arid Mount Isa area is described as having a tropical continental climate (Bureau of Meteorology (BOM) 2021, Australia – Köppen Australian climate classification scheme).

Climate data for the Project area were assessed from BOM records. The nearest BOM meteorological station is the Mount Isa Airport (Station 029127). This station has data on both rainfall and evaporation – key factors in the assessment of groundwater recharge.

Table 2-1 shows the monthly rainfall and evaporation data from BOM Station 029127 for the years 1966 to 2021 and 1975 to 2021 (BOM, 2021).

Table 2-1 Rainfall and evaporation statistics for Mount Isa Aero

(BOM STATION 29127)			
Month	**Mean rainfall (mm) for years 1966 to 2021**	**Mean monthly evaporation (mm) for years 1975 to 2021**	**Mean daily evaporation (mm) for years 1975 to 2021**
Jan	114.2	297.6	9.6
Feb	102.3	249.2	8.9
Mar	64.5	275.9	8.9
Apr	13.1	249.0	8.3
May	11.6	198.4	6.4
Jun	7.0	159.0	5.3
Jul	5.6	170.5	5.5
Aug	3.4	213.9	6.9
Sep	8.5	267.0	8.9
Oct	18.4	325.5	10.5
Nov	38.2	330.0	11
Dec	72.0	325.5	10.5
Total	459.0	3,066.0	-

Precipitation in the semi-arid to arid climate of Mount Isa is dominated by summer storms and floods. Evaporation is greatest in summer, with average evaporation exceeding 250 mm/month from September to April. Even in the average wettest summer months of January and February, evaporation exceeds average monthly rainfall approximately threefold. The evaporation rate is primarily temperature-related with the highest mean monthly evaporation (330 mm) occurring in November, and the lowest mean (159 mm) in June.

The mean monthly maximum temperature and mean minimum temperature from BOM Station 029127 for the years 1966 to 2021 are shown in Table 2-2.

Table 2-2 Monthly mean temperature statistics for Mount Isa Aero (°C)

(BOM STATION 29127)		
Month	**Mean maximum temperature (1966 to 2021) (°C)**	**Mean minimum temperature (1966 to 2021) (°C)**
Jan	36.6	23.9
Feb	35.5	23.3
Mar	34.4	21.8
Apr	32.1	18.5
May	28.0	13.9
Jun	25.0	159
Jul	25.0	10.0
Aug	27.4	8.7
Sep	31.4	10.2
Oct	34.9	14.2

(BOM STATION 29127)		
Month	Mean maximum temperature (1966 to 2021) (°C)	Mean minimum temperature (1966 to 2021) (°C)
Nov	36.7	18.5
Dec	37.3	21.5

2.2.3 Long-term predictions

A new set of simulations from the latest generation of global climate models are now available, including simulations from Australia's Community Climate and Earth-System Simulator (ACCESS). Results show that over the coming decades, Australia is projected to expect changes to rain, temperature and bushfire frequency (CSIRO & BOM, 2020).

2.2.3.1 Rain

The State of the Climate 2020 (CSIRO & BoM, 2020) states that Australian rainfall is highly variable, which Northern Australia average annual rainfall has increased since national records began in 1900, largely due to increases in rainfall from October to April. The rainfall decile range for the Project area is 8 – 9 (above average), when compared between 1900 and the last 20 years (2000 – 2020).

More intense short-duration heavy rainfall events are predicted throughout the country. Fewer tropical cyclones will occur, but a greater proportion are projected to be high intensity, and with ongoing large variations from year to year (CSIRO & BoM, 2020).

2.2.3.2 Temperature

The State of the Climate 2020 (CSIRO & BoM, 2020) states Australia's climate has warmed on average by 1.44 ± 0.24°C since national records began in 1910, leading to an increase in the frequency of extreme heat events. Most of the warming has occurred since 1950, with each decade being warmer than the ones before. Australia's warmest year on record was 2019, due to the combination of climate variability (La Nina/El Nino events) and long-term warming. Future predictions include continued warming, with more extremely hot days and fewer extremely cool days.

2.2.3.3 Bushfires

Fire weather is largely monitored in Australia using the Forest Fire Danger Index (FFDI). The FFDI indicates the fire danger on a given day based on observations of temperature, rainfall, humidity, and wind speed. The frequency of the most dangerous 10 per cent of fire weather days has increased significantly in recent decades across many regions of Australia, especially in the south and east. North-west Queensland has encountered the change in dangerous fire weather days from no change to five less days annually, when comparing time periods of 1950 to 1985 and 1985 to 2020. Predictions of future bushfires or dangerous fire weather for the coming decade (2020 to 2030) include potentially longer fire seasons and an increase in the number of fire weather days (CSIRO & BOM, 2020).

2.2.4 Geology

Bedrock geology in the area comprises Proterozoic rocks of the Mount Isa Inlier. The regional geology around the Project is shown in Figure 2-4.

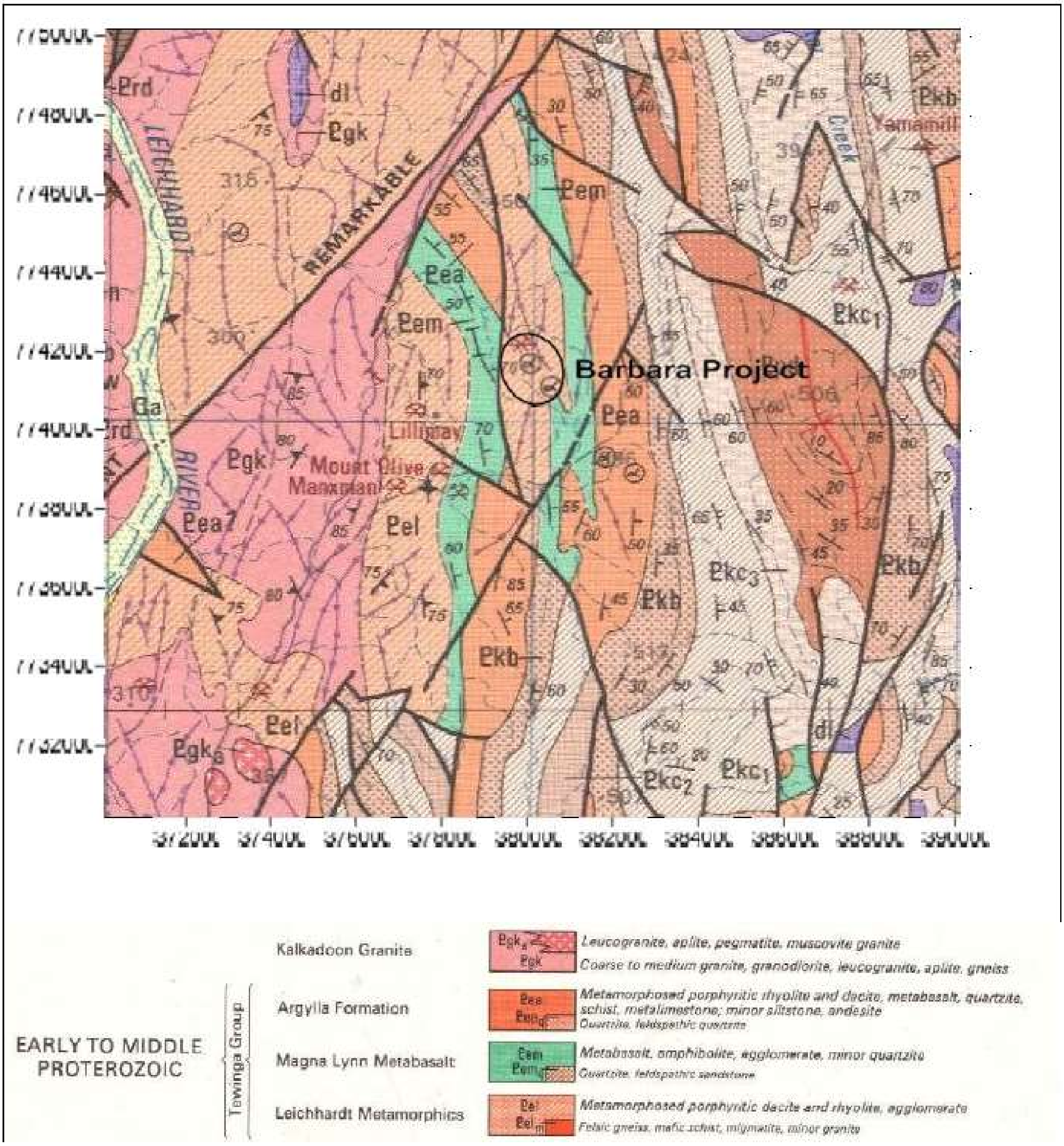


Figure 2-4 Regional geology

Rock types at Barbara include felsic volcanics (forming the hills), dolerite/amphibolite (in the drainages/valleys) and basalt (forming plateaus). The felsic volcanics are the dominant rock type in the Project area. The felsic and mafic volcanics dip at 60 degrees towards the north-east and the dolerites are sub-vertical within the Project area. These three rock types are resistant to weathering and extensive outcrops occur throughout the area.

The mineralisation is structurally controlled by the Barbara Shear Zone and occurs as a series of sulphide lodes hosted within a package of rhyodacitic volcanic rocks intruded by dolerite dykes. Sulphide mineralisation comprises semi-massive pyrrhotite/pyrite with chalcopyrite and chalcopyrite stringer veins (Egi, 2014).

The main landforms at the Project are erosional hills, ridges, and plateaus, colluvial footslopes and alluvial channels. The area is dominated by exposed and subcropping Proterozoic rocks forming hills and plateaus which dominate the landscape. Small areas of proximal colluvium are found at footslopes flanking the sides of ridges at the base of scarps. Minimal alluvial sediments are found in immature drainage systems. There are no palaeodrainage networks present in the area (CopperChem and Syndicated Metals, 2014).

The copper sulphide in the area can occur close to surface with a maximum thickness of 45 m and consisting of massive sulphide through to stringer veins within an alteration zone of biotite, tourmaline and quartz. The weathering profile averages around 15 m deep.

The Barbara area and surrounds are constituted of bedrock/saprolite with associated lithosols and locally derived colluvium (Figure 2-5) (Syndicated Metals, 2014).

Aeris RESOURCES

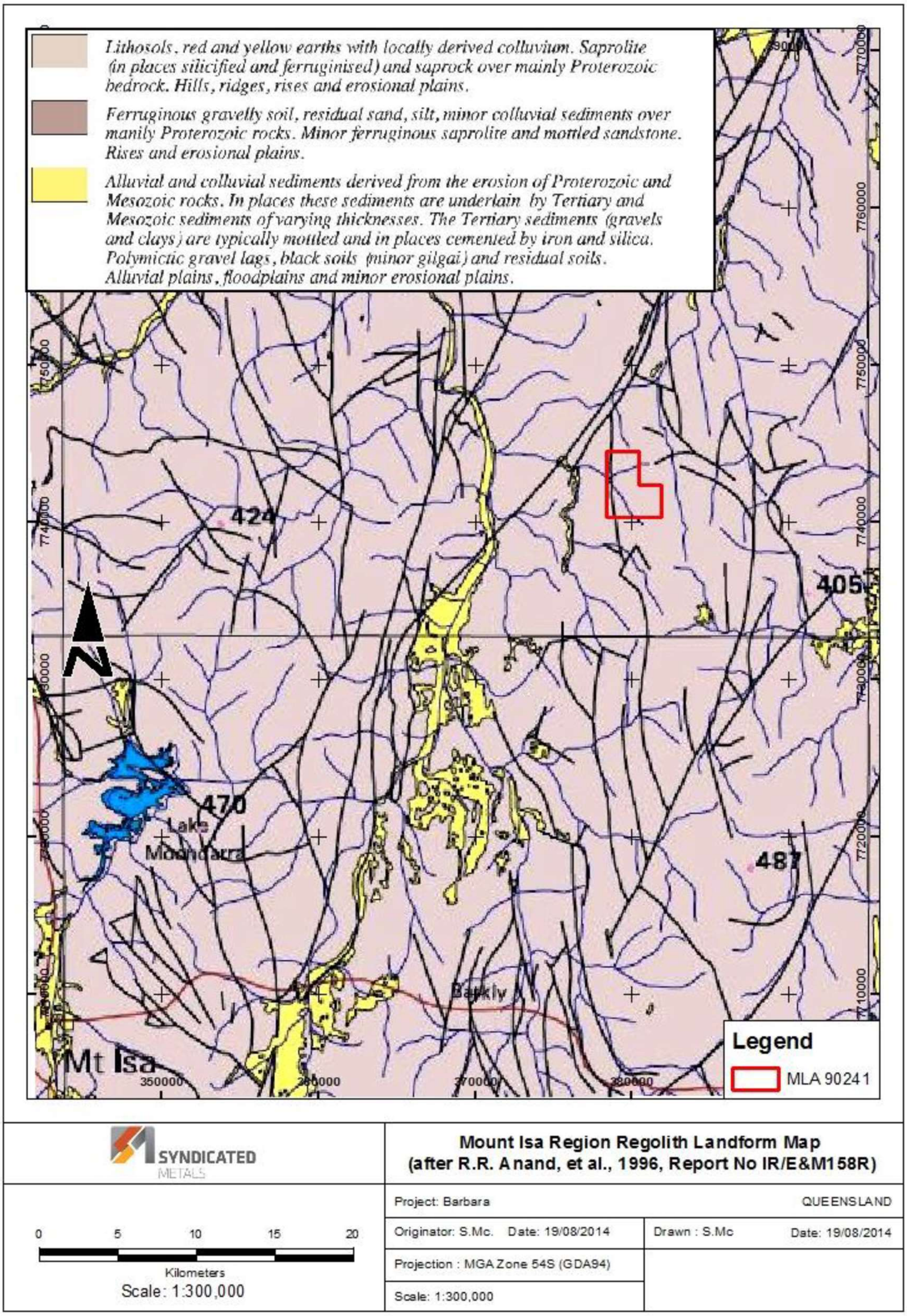


Figure 2-5 Mount Isa Region Regolith Landform Map

2.2.5 Hydrology

The Project is traversed by numerous drainage lines and ephemeral watercourses which drain into the Leichhardt River (refer to Figure 2-6 and Figure 2-7). One larger, order 3 watercourse flows through the south-western and north-western areas of the Project area. With the exception of one stream order 3 watercourse ('Watercourse A'), all other watercourses near the Project site are classified as stream order 1 and 2. The third-order watercourse passes from the east, through the south-west portion of the site, flows west, off-site and returns through the western boundary in the north before heading off-site and draining north-west into the Leichhardt River. All other drainage lines and tributaries occurring on the Project site drain into the third-order watercourse. The Leichhardt River eventually drains into the Gulf of Carpentaria.

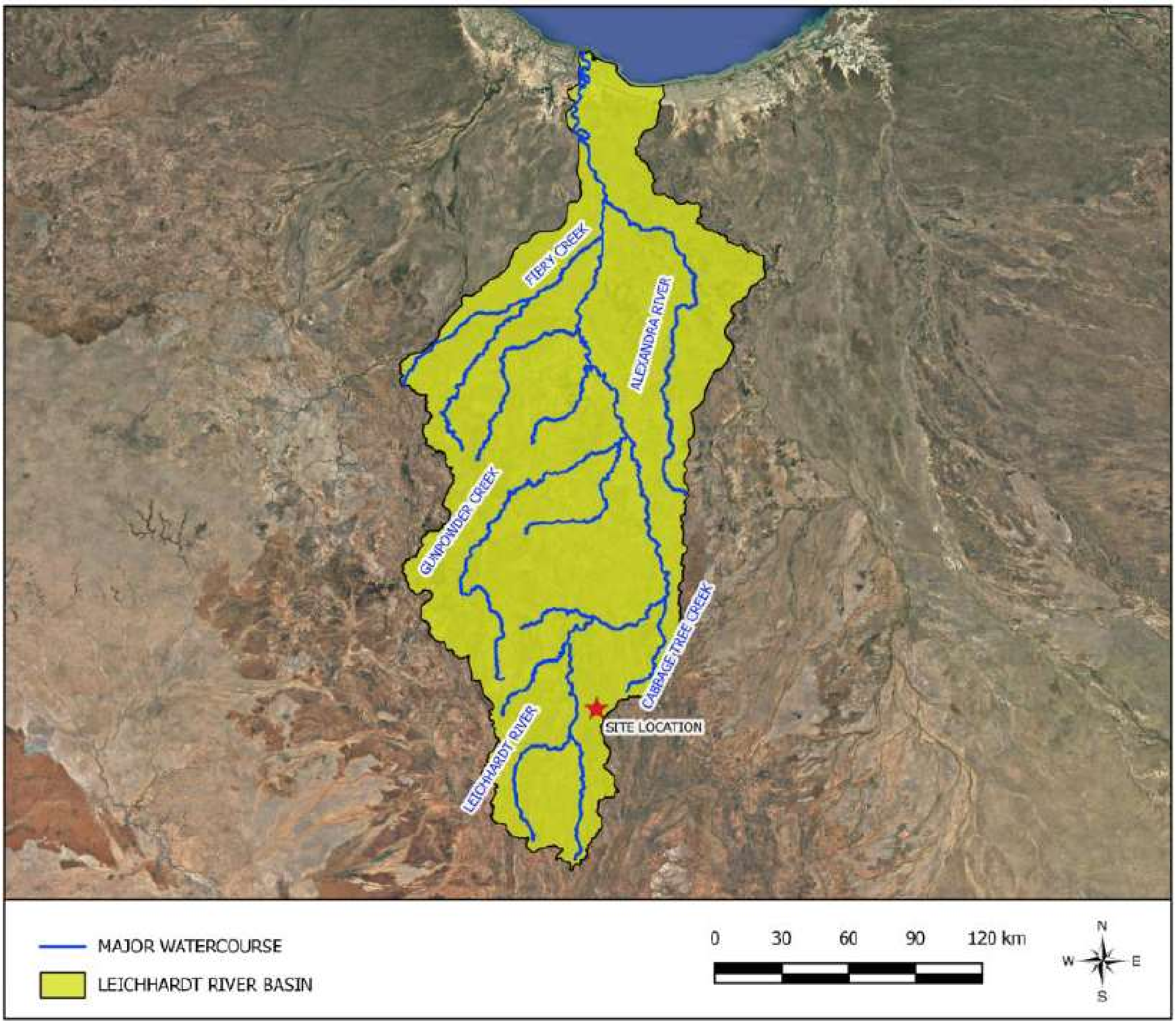


Figure 2-6 Major watercourses and Leichhardt River basin catchment

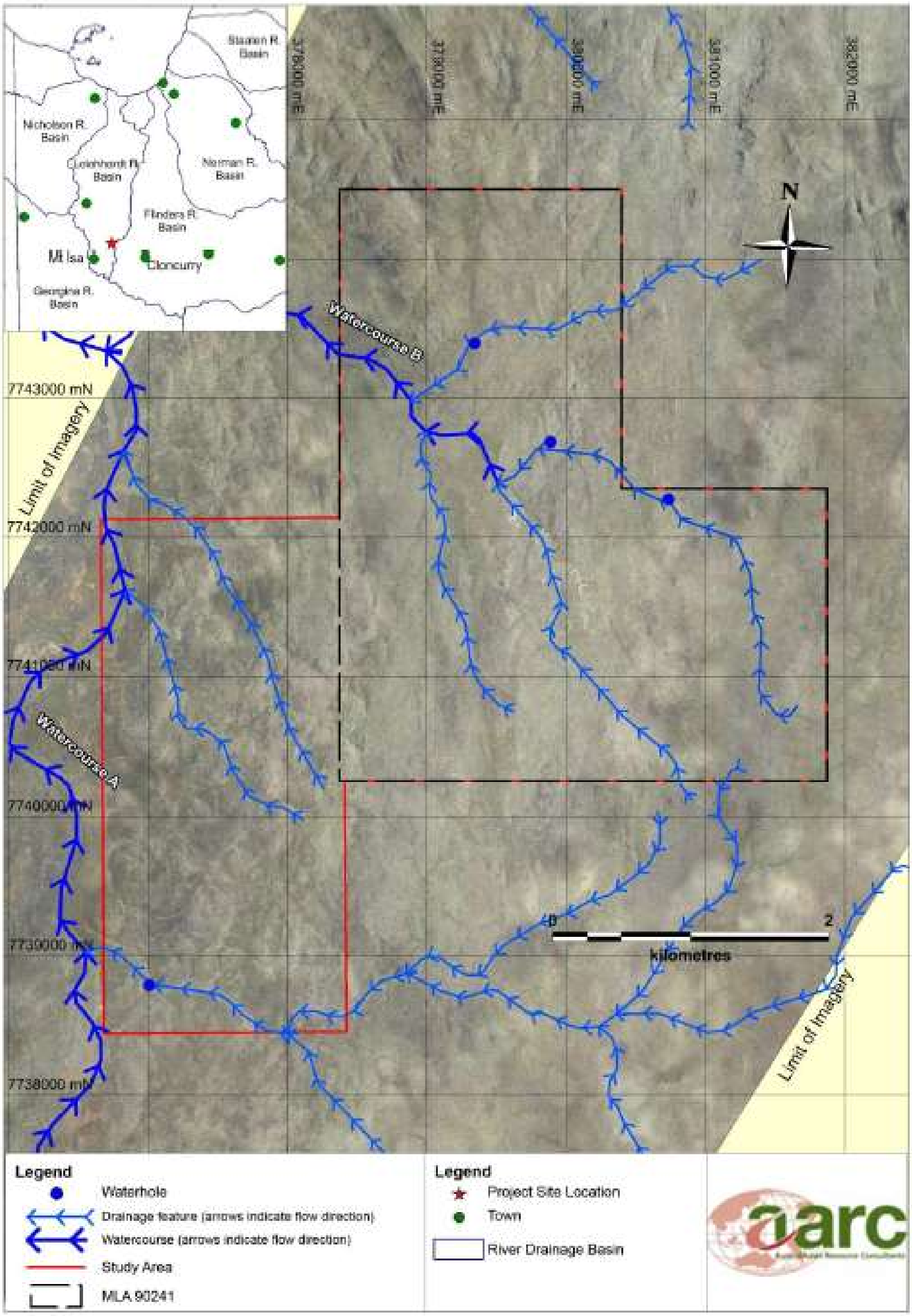


Figure 2-7 Watercourses at the Project area

These waterways drain north-west to form an unnamed order 3 creek which flows into the Leichhardt River and subsequently north into the Gulf of Carpentaria. The waterways are ephemeral and flow only after heavy rainfall. There are no wetlands within the Project area boundary. Lake Julius, a large lacustrine wetland listed on the Directory of Important Wetlands in Australia, is located approximately 17 km downstream of the Project.

A receiving environment monitoring program (REMP) (0) has been implemented annually at the Project to monitor surface water quality during wet and dry seasons over time.

There are 10 established monitoring sites within the REMP (Figure 2-8).

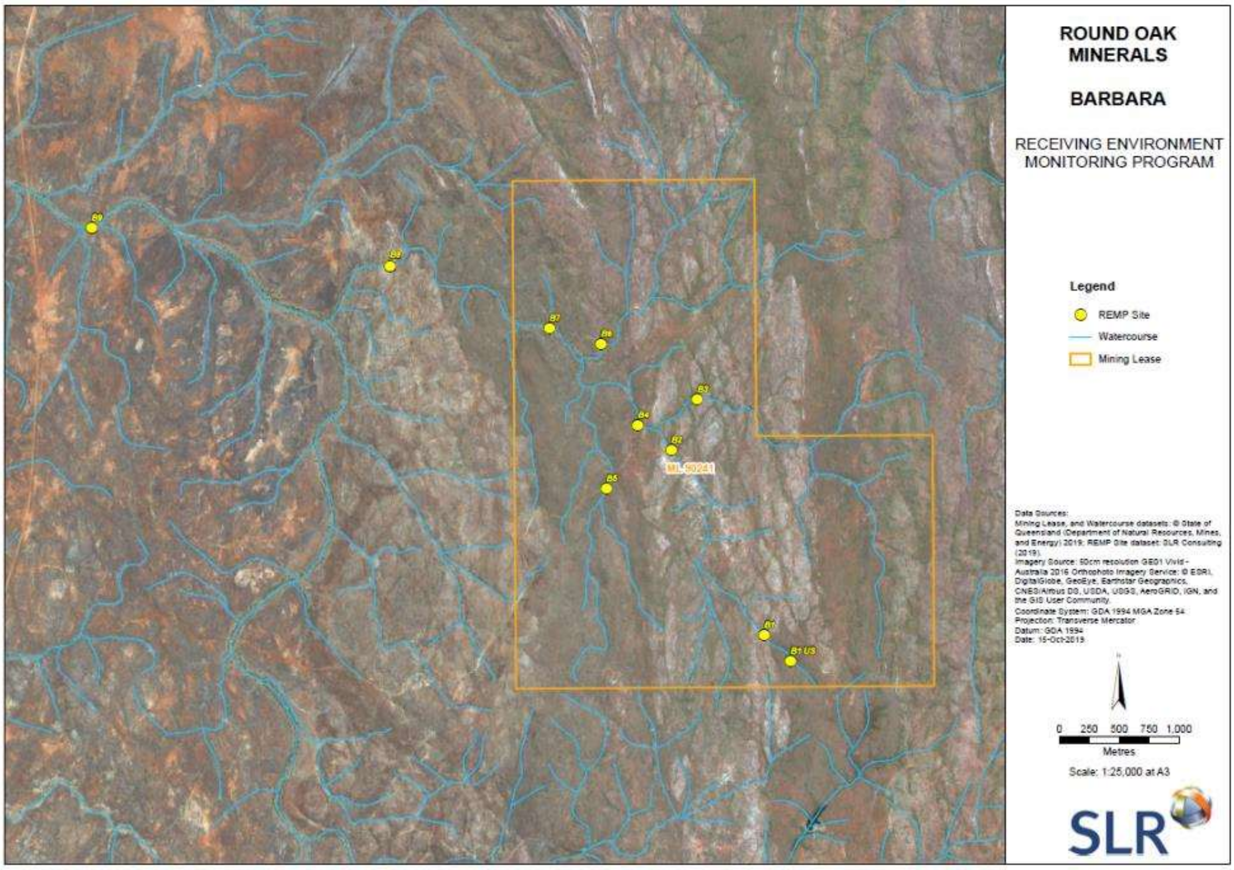


Figure 2-8 Surface water monitoring site locations

2.2.5.1 Surface water quality characteristics

Water quality data collected during each survey is assessed against the ANZECC and ARMCANZ (2000) guidelines for tropical Australia upland streams, Queensland water quality guidelines (QWQG) regional guideline values for the Gulf Rivers (EHP, 2009), and Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018). Data is also compared against results from previous surveys to identify any changes in water quality that may be attributed to mine operations.

Monitoring of physiochemical characteristics for receiving waters at the Project since 2018 indicates pH is typically above the ANZECC high guideline value, while dissolved oxygen is below the guideline value.

Fine fraction copper concentrations have increased at all sites since the commencement of the Project REMP (Figure 2-8). Downstream site results are generally elevated above those of upstream sites, however concentrations at upstream site B1US have notably risen during 2021 compared to previous years. Fine fraction copper concentrations at downstream sites B2 and B4 have been consistently high and elevated above the Australian & New Zealand Guidelines (ANZG) GV-High value over time. In addition to fine fraction copper concentrations, chromium concentrations at B1US have also increased since the commencement of the REMP.

The concentration of heavy metals in surface water is typically within the limits defined by the ANZG guidelines, although exceedances for total and dissolved copper have been recorded at sites B1US (upstream), B3 (upstream), B5 (upstream), B6 (upstream), B1 (downstream), B2 (downstream), B4 (downstream), B7 (downstream), and B9 (downstream) since the REMP was established at the Project in 2018. Dissolved and total copper concentrations for these three sites are displayed in Figure 2-9 and are presented against the ANZG limit for comparison.

The cause of these heavy metal exceedances, particularly for copper is not known. However, as increases in copper concentrations have been recorded at upstream and downstream monitoring sites, this may be attributed to the highly mineralised local landscape and historical mine activity.

Macroinvertebrates observed at the Project provide an indication of water quality and are generally reflective of the highly ephemeral nature of receiving waters in the local region. The macroinvertebrates community consists largely of tolerant taxa and few Plecoptera (stoneflies), Ephemeroptera (mayflies) and Trichoptera (caddisflies) (PET) taxa, thereby achieving low SIGNAL 2 scores. Due to inconsistent sampling, it is not possible to establish a temporal trend.

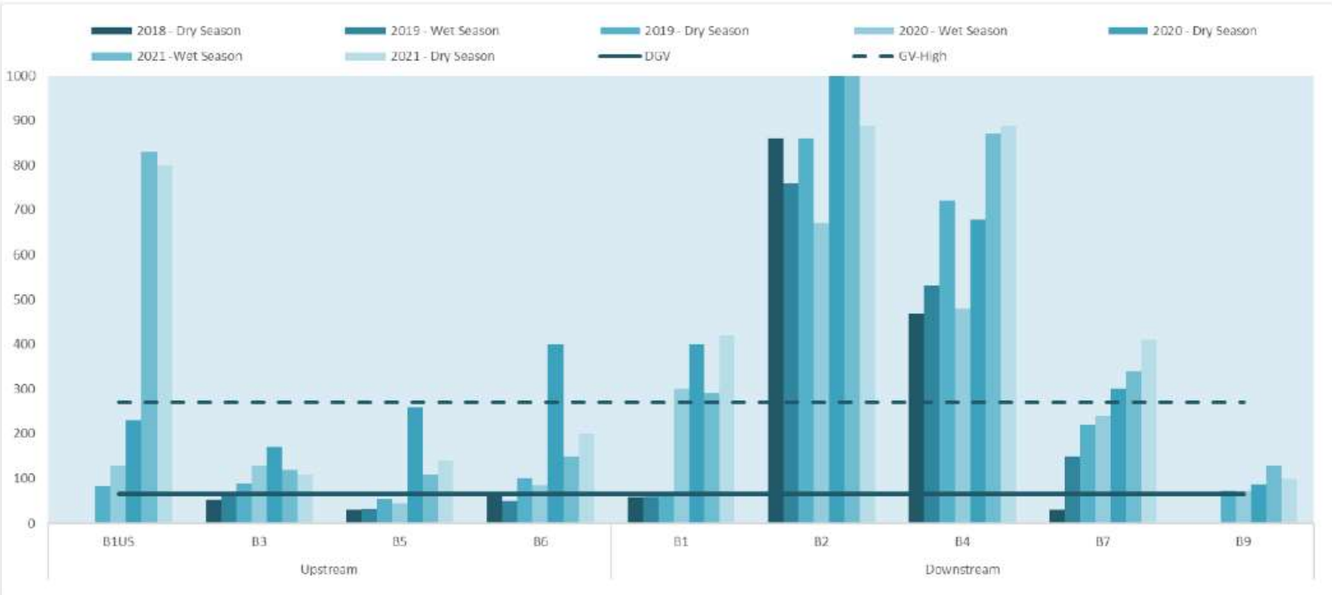


Figure 2-9 Temporal comparison of fine fraction copper at all monitoring sites on the Project area

Further details from water quality characteristics for the Project can be sourced from 0 the *Barbara Copper Project: REMP Annual Report* (SLR 2020).

2.2.5.2 Stream sediment quality

Baseline stream sediment monitoring was undertaken in 2014 both upstream and downstream of Project activities (AARC, 2014b). Samples of the stream-bed substrate were taken at regular intervals along a 50 m stretch of the creek bed at each site (monitoring locations shown in Figure 2-8). The sub-samples were mixed to obtain a composite sample, sealed in sterilised glass jars and sent to a National Association of Testing Authorities accredited laboratory for analysis.

Stream sediments were found to contain a high proportion of coarse particles (i.e., gravel and sand). Metal concentrations in stream sediment were generally low. Copper and nickel levels above the low Interim Sediment Quality Guideline (ISQG) were recorded at a small number of sites. All results fell below the high ISQG (AARC, 2014b).

2.2.6 Hydrogeology

2.2.6.1 Groundwater occurrence and local aquifers

Groundwater at the Project site is primarily associated with the ore body. Groundwater exists in fractured rock aquifer systems in the rhyodacite, schist and amphibolite units. Monitoring in exploration holes in October 2013 (pre-mining) suggested a median depth to groundwater of approximately 12 m below the ground surface (Rob Lait & Associates, 2013).

It was noted at the pre-feasibility stage that the potentiometric surface was highly undulating suggesting there is variation in local permeability, and it is compartmentalised by faults and shears.

Observations made during a groundwater monitoring bore drilling program early 2014 (Rob Lait & Associates, 2014) included the following:

- Shearing in Barbara Shear Zone is almost vertical and pervasive to several hundred metres.
- The most productive aquifer intervals are either in the orebody itself or where a combination of shearing and quartz veining occurs.
- Quartz veining is suspected to be generally massive (Michael Martin, Syndicated Metals, pers. comm.)
- Shearing is not constrained to any particular lithology because it is a shear zone.
- There is no predictable depth pattern for the occurrence of aquifer intervals. This is typical of sheared fractured rock terrain.
- Airlift yields are highly variable. This is typical of fractured rock aquifers.
- BAWB01 and BARC071 were the most productive in terms of airlift yield.
- Drilling and construction logs show no groundwater at all at depths of less than 19 m below ground level.
- Three of the groundwater monitoring bores encountered no free groundwater at all during drilling. Two of these bores (BAWB02 and BAWB04) subsequently slowly 'made' water.

Based on the historical investigations undertaken for Syndicated Metals Ltd, the occurrence of aquifer/groundwater bearing systems can be described as follows:

- The geology of the area comprises steeply dipping units and structures. Recent drilling in the area has shown that minimal groundwater has been encountered in joints, faults, and shear zones. These 'fractured rock' style aquifers store far less groundwater per cubic metre than other aquifers. Yields from them are difficult to predict and are frequently low.
- The **primary aquifer** occurs within the Leichardt Metamorphics, generally at the base of the weathered zone.
- Syndicated Metals (2014) has extensively investigated the regolith and has concluded that there is almost no potential for the development of regolith aquifers. There is little regolith at the Project site and **no regolith aquifers** are identifiable.

- Shallow/horizontal aquifers may form within beds of unconsolidated sand, sandstone, and clay sand with minor clay or silt from the Cenozoic periods. These beds can be deposited in paleo-drainage systems as channel and valley-fill sediments in lower lying areas. Syndicated Metals (2014) reports that deposition of alluvium within drainage systems is minimal, and there are **no paleochannels** in the area. There is little or no potential for the development of alluvial aquifers at the Project site.

2.2.6.2 Aquifer characteristics

Airlift yields

Table 2-3 shows the depths of the aquifer intervals encountered during drilling of the groundwater monitoring bores.

Table 2-3 Depths of aquifer intervals and airlift yield

BORE	DEPTH OF AQUIFER INTERVAL (M)	AIRLIFT YIELD RECORDED (L/S)
BAWB01	22-23	0.6
	34-35	0.3
	43-44	0.2
BAWB02	No aquifer intervals encountered	
BAWB03	No aquifer intervals encountered	
BAWB04	No aquifer intervals encountered	
BAWB05	39-40	0.2
	49-51	0.1
BARC071	19-22	0.5
	108-109	0.3

Airlift yields test were undertaken in five RC mineral exploration drill holes in the ore body (Robert Lait & Associates, 2014). Figure 2-10 shows a graph of yields against time. The airlift yield testing program illustrated that groundwater yield from the orebody inevitably declined as airlifting continued over two hours. The airlift yield testing program results suggest groundwater depletion of the orebody under continuous extraction (either by pumping or groundwater inflow to open pits).

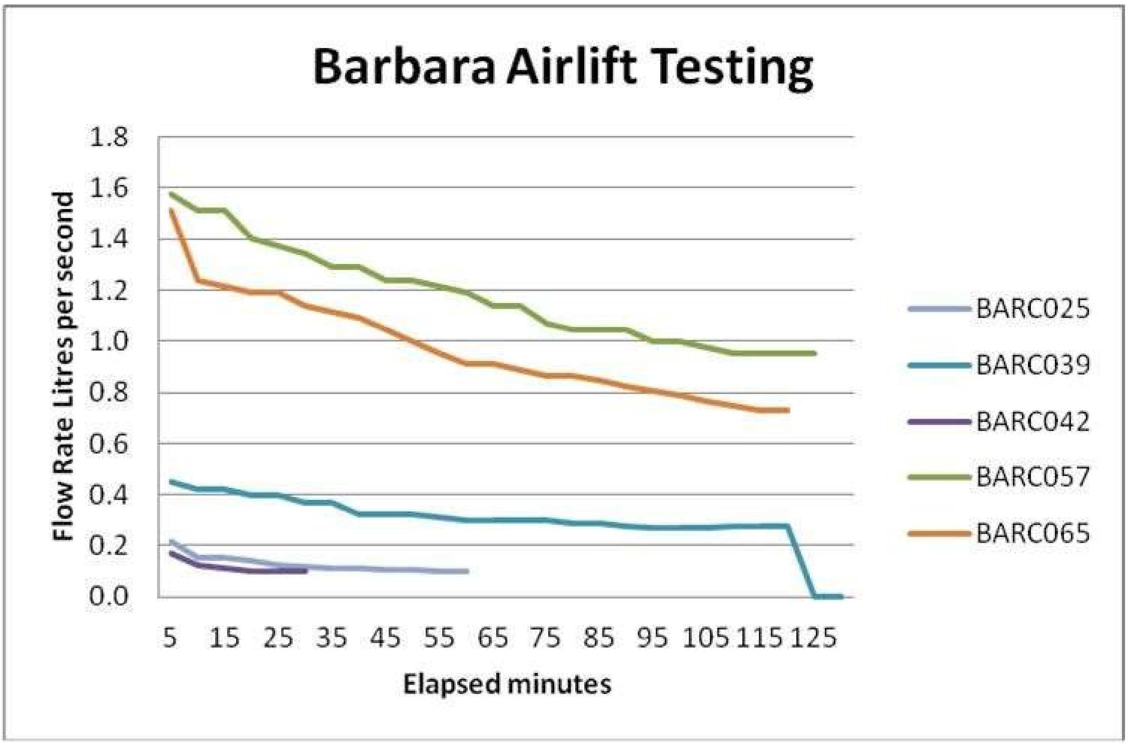


Figure 2-10 Airlift Yield from Mineral Exploration Bores (RLA, 2014)

Pumping test

A pumping test was conducted on a temporary production bore installed for drilling water supply (bore BAWB07). Before the pumping test, the standing water level in BAWB07 was 28.79m below the top of the casing. BAWB07 was pumped at a discharge rate of 1.62 L/s.

Figure 2-11 shows a graph of drawdown and recovery water levels plotted against the logarithm of time in minutes for this pumping test.

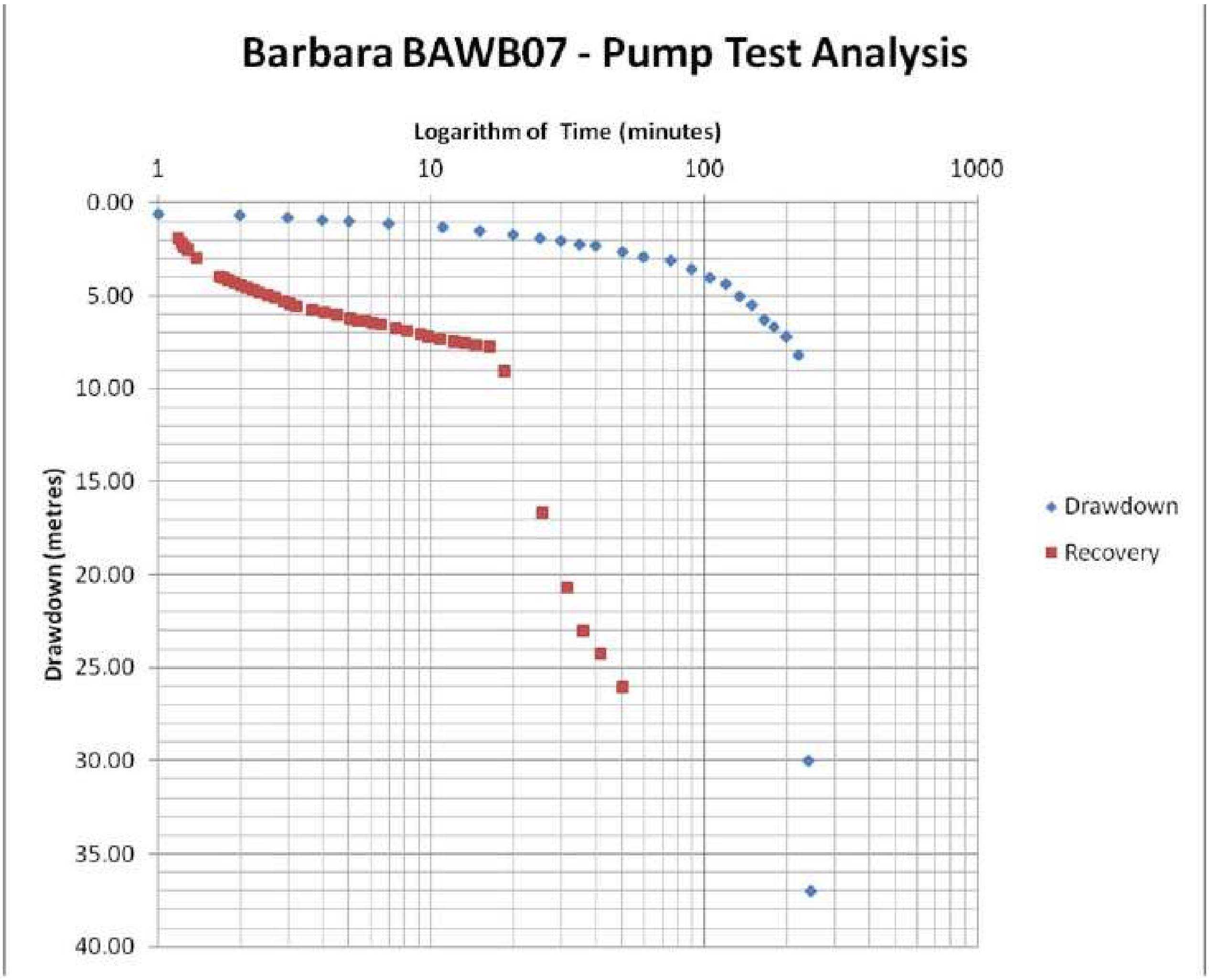


Figure 2-11 Graph of Drawdown and Recovery Water Levels in BAWB07

The results of the pumping test indicate that the prime aquifer interval in BAWB07 resides in the depth interval from 28 to 37 m. Once the groundwater from this aquifer interval was exhausted by pumping, there was little or no groundwater contribution from the strata at a depth of greater than 37 m. The groundwater that resided within the orebody would have been depleted once open-pit mine development commenced. Natural recharge will be slow.

Falling head permeability tests

RLA (2014) references falling head permeability tests undertaken on bores BAWB01, BAWB02, BAWB04 and BAWB05. Calculated hydraulic conductivity values are regarded as extremely low to locally high (Table 2-4).

Table 2-4 Hydraulic conductivity values calculated from slug test at Barbara monitoring bores (RLA 2014)

BORE	HYDRAULIC CONDUCTIVITY (M/D)	HYDRAULIC CONDUCTIVITY (M/S)	QUALITATIVE DESCRIPTION
BAWB01	8.00E+02	9.26E-03	Locally high
BAWB02	1.93E-05	2.23E-10	Extremely low
BAWB04	1.98E-03	2.29E-08	Very low
BAWB05	6.86E-04	7.94E-09	Very low

2.2.6.3 Groundwater levels and flow

Groundwater levels in mineral exploration bores (2013)

Between 2008 and 2012, mineral exploration drilling programs were undertaken at and near the Project site. Several of the diamond and reverse circulation drill holes remained open for a time, which permitted the measurement of groundwater levels across the ore body. Syndicated Metals undertook a groundwater level measuring campaign in October 2013 in forty (40) exploration drill holes. The depth to groundwater in these bores ranged from 6.12 metres below ground level (mbgl) to 37.9 mbgl, equivalent to 303 mAHD and 297 mAHD.

Pre-mining groundwater levels and flow (2014)

Table 2-5 shows depth to groundwater measured in the dedicated groundwater monitoring bores at the Project in May and July 2014 (pre-mining). In general groundwater levels fell slightly between May and July 2014.

The depths to groundwater in bores BAWB07 and BARC071 differ by about 5 m. These bores are in very close proximity to each other and are separated topographically by about 1 m. Such differing depths to groundwater are not unusual in fractured rock aquifers and illustrated the disconnect between aquifers over such short horizontal distances.

Table 2-5 Depth to groundwater

GROUNDWATER MONITORING BORE	DATE OF MEASUREMENT	STANDING WATER LEVEL (M BELOW MEASUREMENT POINT)
BAWB01	21/05/2014	16.24
BAWB01	29/07/2014	16.33
BAWB02	21/05/2014	8.26
BAWB02	29/07/2014	9.00
BAWB04	20/05/2014	14.38
BAWB04	29/07/2014	14.46
BAWB05	21/05/2014	25.96
BAWB05	29/07/2014	25.81
BAWB07	20/05/2014	16.38
BAWB07	29/07/2014	16.93
BARC071	21/05/2014	21.55
BARC071	29/07/2014	21.70

Figure 2-12 present a contour map of pre-mining absolute groundwater elevations (as mAHD). A profile of the potentiometric surface from BAWB02 to BAWB05 (i.e., north-west to south-east) is also shown in Figure 2-12.

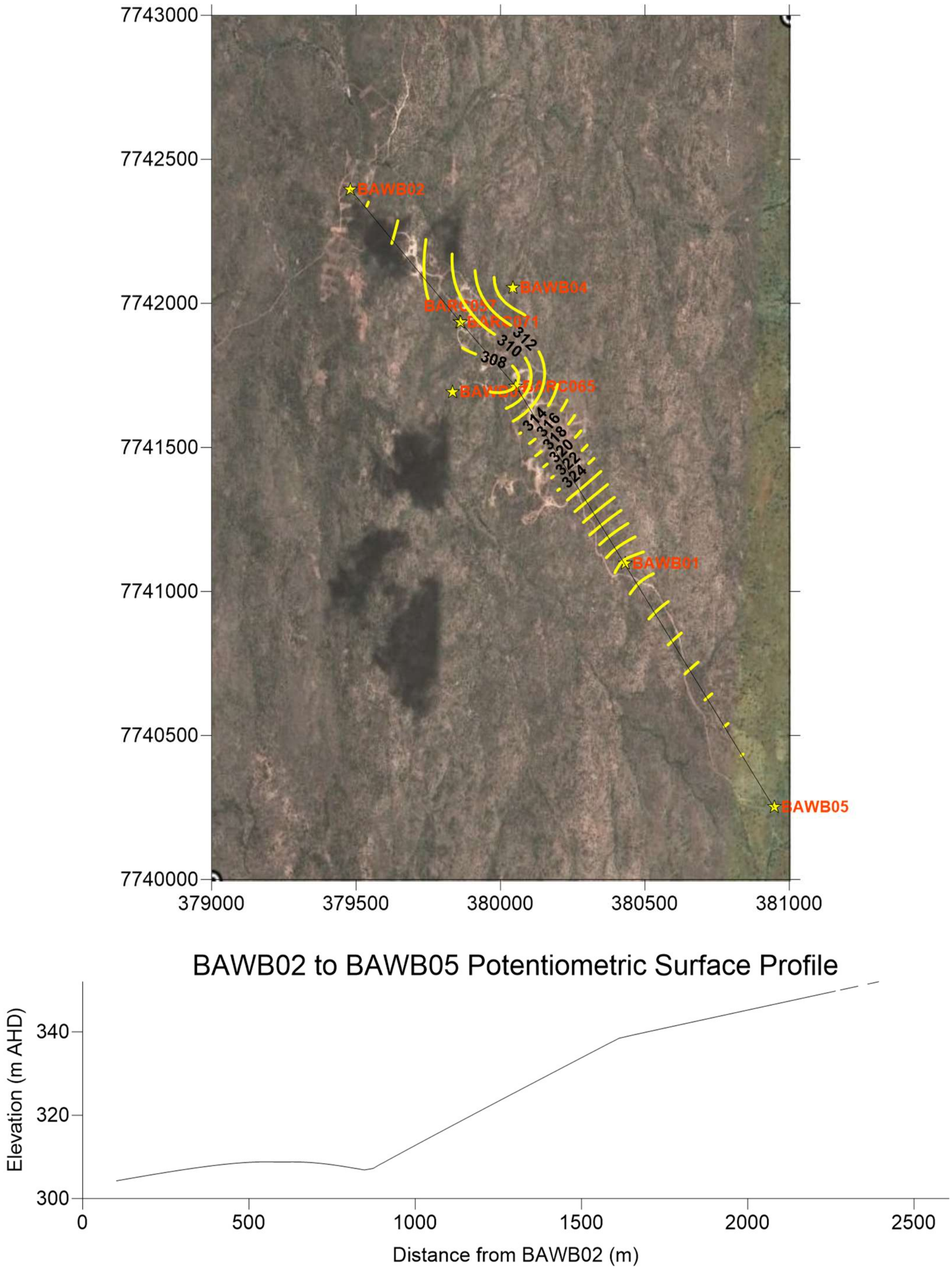


Figure 2-12 Contour of groundwater elevation for July 2014 and profile of the potentiometric surface (contours and elevations in m AHD) (RLA, 2014a)

The contours and potentiometric surface profile show that, provided hydraulic continuity exists throughout the Leichhardt Metamorphics, groundwater flow will be from south-west to north-east within the Barbara Shear Zone. The local depression in the potentiometric surface is due to depression by pumping within the orebody.

The groundwater gradient within the Barbara Shear Zone is 0.02 or 2%, which is relatively steep. This steep gradient is a reflection of the low hydraulic conductivity of the aquifers within the Leichhardt Metamorphics.

2018-2022 groundwater levels and flow

Regular groundwater monitoring and sampling has been undertaken since 2018 in accordance with the EA conditions. The monitoring program includes monitoring and sampling of EA compliance and seepage monitoring bores.

Figure 2-13 shows time series of measures groundwater levels (as depth to water below reference level) in the EA compliance monitoring bores. The measurements indicate the following:

- In 2018, the depth to groundwater ranged between 5 and 25 mbRL. These levels are within the range observed in October 2013 within the RC exploration drill holes. A contour map of the June 2018 groundwater levels is presented in Figure 2-15.
- Early-2019, the water level in the bores seems to have risen and is between 5 and 10 metres shallower than in 2018, most likely in response to the significant rainfall in February 2019.
- Since 2019, groundwater levels in the bores have declined, reflecting the open-cut mining operations and dewatering of the aquifers due to groundwater seepage/inflow into the open pits. The decline rate has slowed down since mining started in June 2019.
- Since mining finished in March 2021, groundwater levels seem to be slowly recovering to pre-mining levels.

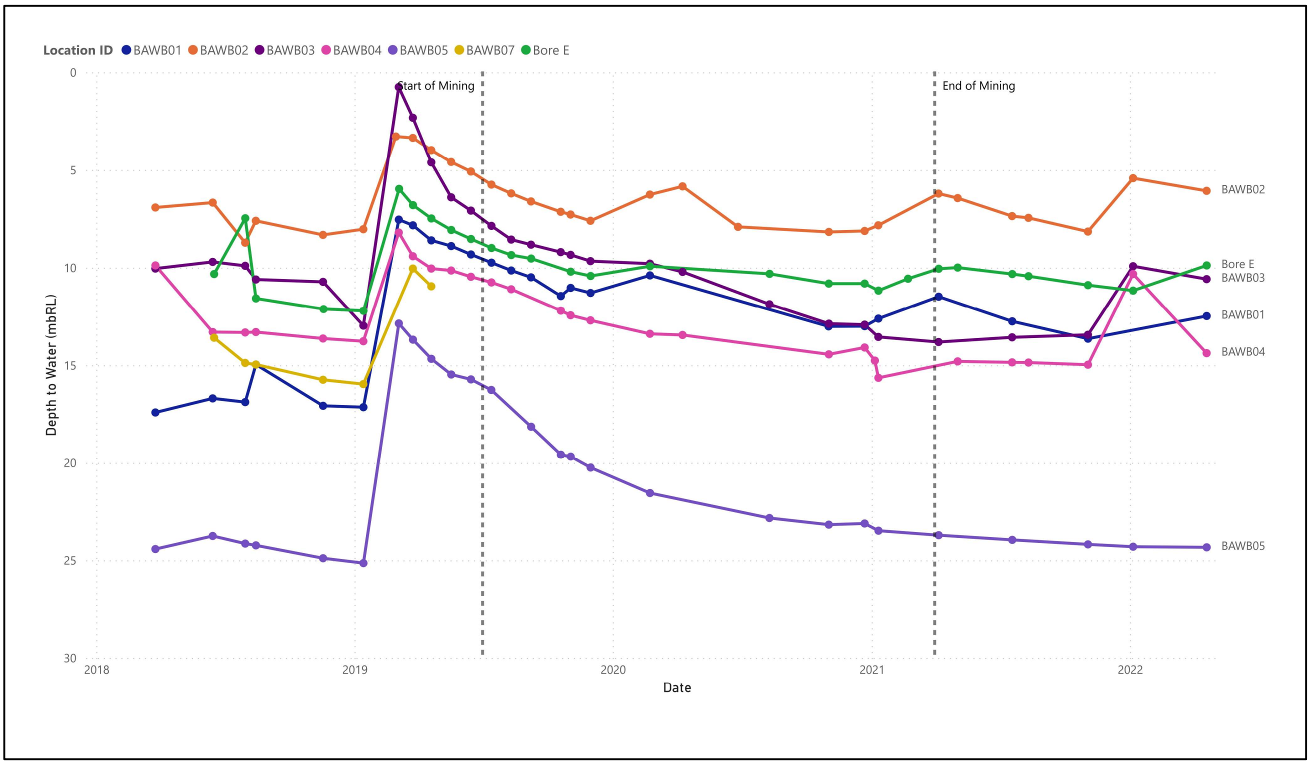


Figure 2-13 Depth to water (mbRL) measurements in EA compliance monitoring bores

Figure 2-14 shows time series of measures groundwater levels (as depth to water below reference level) in the EA seepage monitoring bores. The measurements indicate the following:

- Generally, groundwater levels in the seepage monitoring bores increased during the mining operations. This may represent minor seepage from the sediment dam or recharge from the underlying previous alluvial channel.
- Since mining operations finished in March 2021, groundwater levels in the seepage monitoring wells have generally remained stable or started to decline.

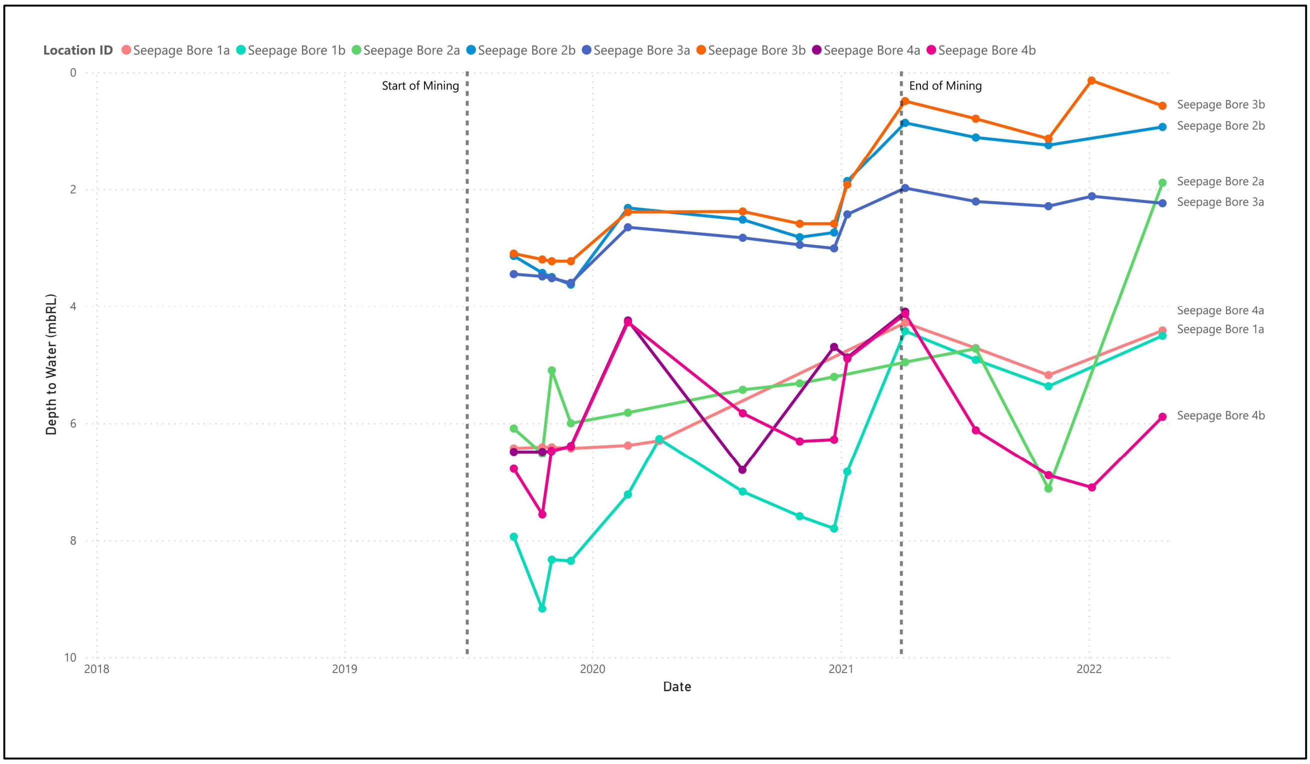


Figure 2-14 Depth to water (mbRL) measurements in EA seepage monitoring bores

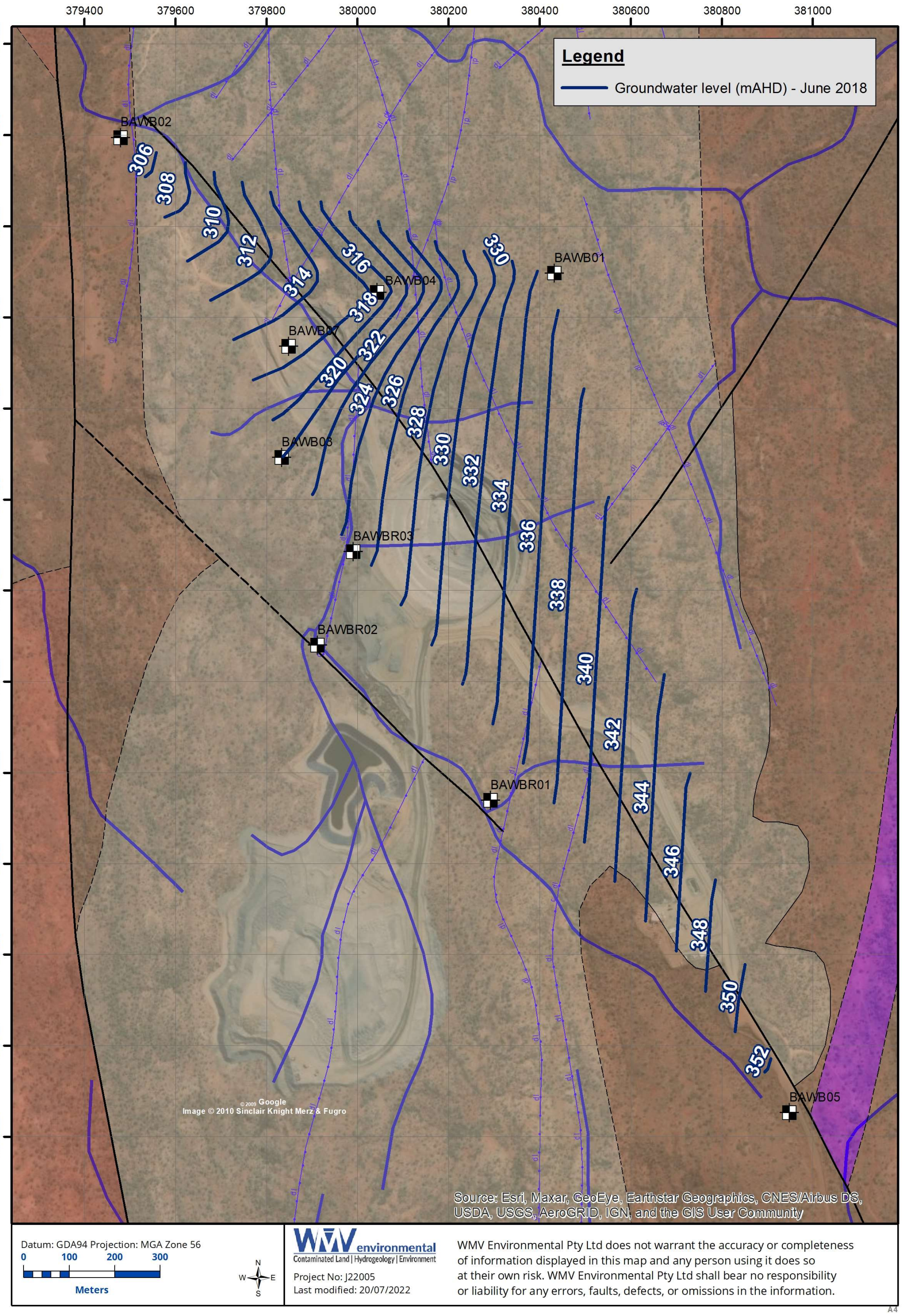


Figure 2-15 Contour map of June 2018 groundwater levels

2.2.6.4 Groundwater-surface water interactions

Depth to groundwater at the Project is in excess of 8 m below ground level. The drainage features at the Project are immature and only incised to a shallow depth. None of the drainage incision reaches 8 m depth. As such, there are no groundwater – surface water interactions at the Project site (RLA, 2014a).

2.2.6.5 Groundwater recharge/discharge

Given the arid climate and skeletal soils in the Project area, rainfall infiltration is considered to be minimal, with the vast majority of water lost by evaporation and transpiration. From exploration drilling logs and data recorded during the construction of groundwater monitoring bores in 2014, it is considered that direct rainfall recharge mechanism to the Leichardt Metamorphics aquifer at the Project is episodic recharge via lineaments aligned with watercourses (RLA, 2014).

2.2.6.6 Conceptual groundwater model

A groundwater conceptual model developed for the Project (WMV Environmental, 2022) is presented in Table 2-6. A hydrogeological cross-section showing the underlying geology/lithology and groundwater level is provided in Section 6.1.5.1

Table 2-6 Groundwater conceptual model

ASPECT	DESCRIPTION
Groundwater occurrence/ aquifers	• The primary aquifer occurs within the Leichardt Metamorphics, generally at the base of the weathered zone. • There is little regolith at the Project site and no regolith aquifers are identifiable. • Deposition of alluvium within drainage systems is minimal and there are no paleochannels present in the area. There is little or no potential for the development of alluvial aquifers at the Project site
Hydraulic properties	• Results of falling head permeability tests indicate that hydraulic conductivities are generally very low.
Recharge/ discharge mechanisms	• Direct rainfall recharge through overlying soil and sediments is minor. • The main recharge mechanism to the Leichhardt Metamorphics aquifer at the Project is episodic recharge via lineaments aligned with watercourses.
Depth to groundwater	• Depth to groundwater, as measured in open mineral exploration bores in October 2013, ranged from 7 to 37 metres below ground level (m bgl). • In 2018, depth to water in monitoring bores ranged between 5 and 25 m bgl. • Since 2019, groundwater levels have declined, reflecting the open cut mining operations and dewatering of the aquifers due to groundwater seepage/inflow into the open pits. The decline rate slowed down since mining started in June 2019. • Since mining finished in March 2021, groundwater levels seem to be slowly recovering to pre-mining levels.
Groundwater flow	Prior to commencement of mining, the contours and potentiometric surface profile show that, provided hydraulic continuity exists throughout the Leichhardt Metamorphics, groundwater flow will be from south-west to north-east within the Barbara Shear Zone.
Groundwater – Surface water interaction	The depth to groundwater at the Project is in excess of 8 m below level surface. The drainage features at the Project are immature and only incised to a shallow depth. None of the drainage incision reaches 8m depth. Therefore, groundwater-surface water interaction on a semi local/regional scale is minimal. Ephemeral water bodies (groundwater seeps/springs) are known to occur at and in the vicinity of the mine site. These water bodies are the results of significant rainfall events, with rainfall and flow in the creeks accumulating in lower-lying creek sections. Some minor temporary interaction with shallow groundwater is expected. However, this interaction dissipates as shallow groundwater levels drop.

2.2.6.7 Groundwater hydrogeochemistry and water types

Groundwater samples obtained per-, during and post-mining were analysed for major ions and alkalinity to allow for hydrogeochemical interpretation

The trilinear or Piper diagram (Piper, 1944) is used to determine the evolution of groundwater in particular aquifers or rock types. Figure 2-16 shows the Piper diagram that was constructed from the major ion data obtained pre-mining. The major ion data from privately owned bore RN 39511 were also included in this assessment.

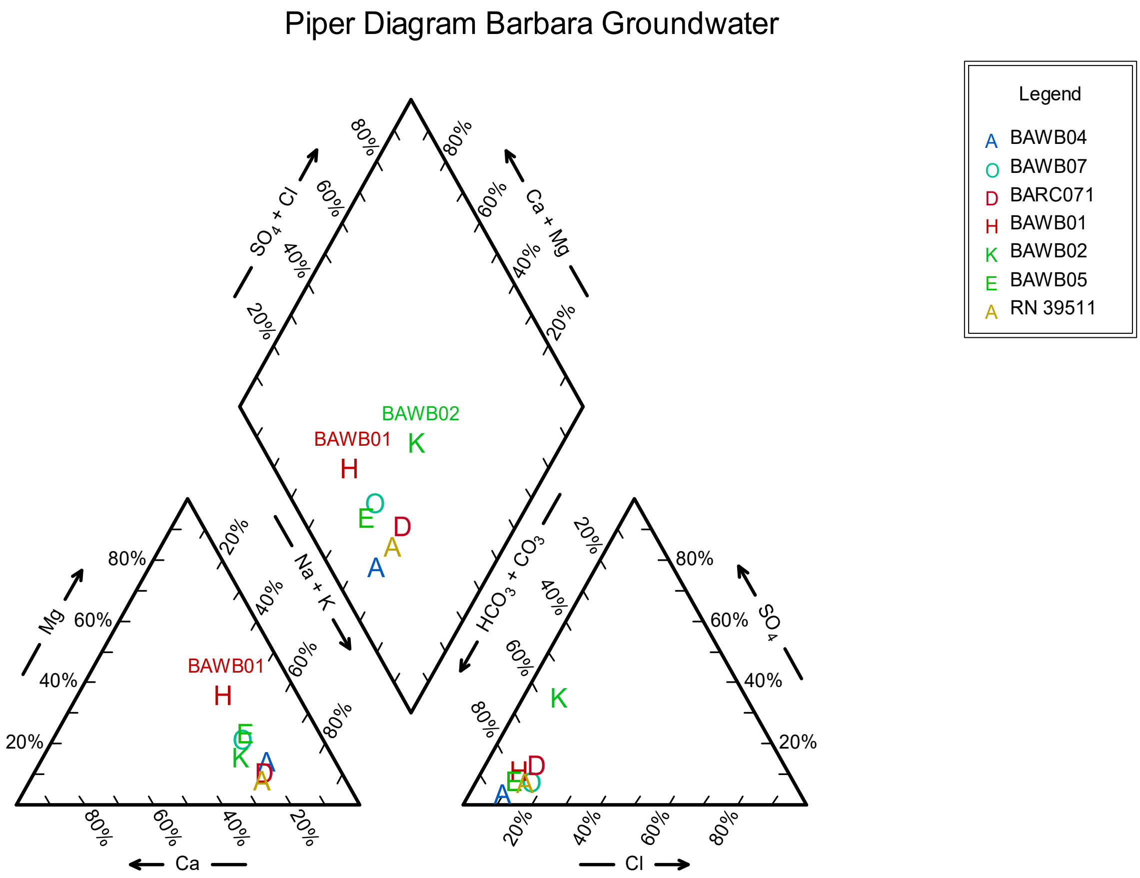


Figure 2-16 Piper diagram for groundwater (RLA, 2014a)

Piper and Durov diagrams for the EA compliance and seepage monitoring bores are presented in Figure 2-17 and Figure 2-18, respectively.

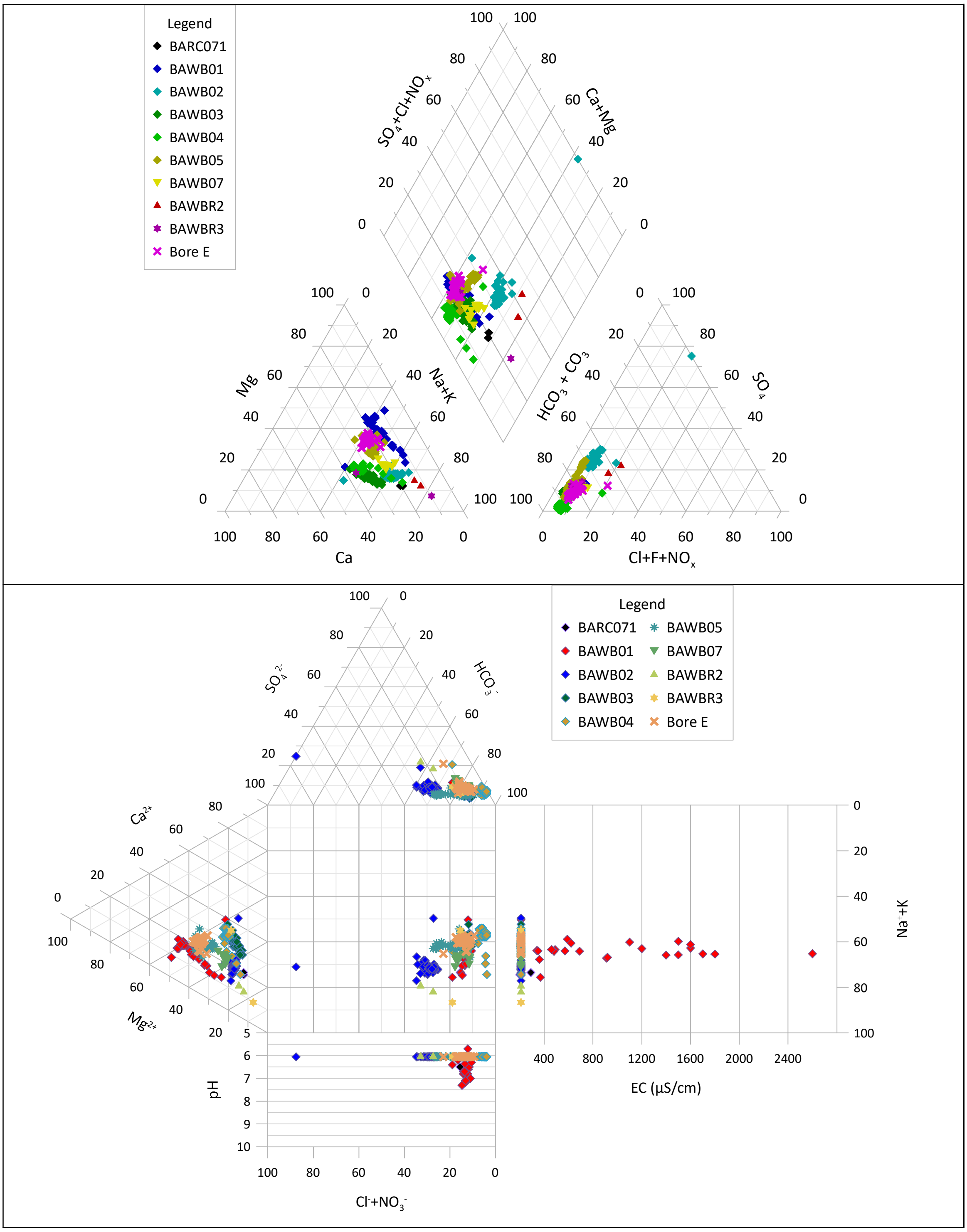


Figure 2-17 Piper and Durov diagram for EA compliance monitoring bores (WMV Environmental, 2023)

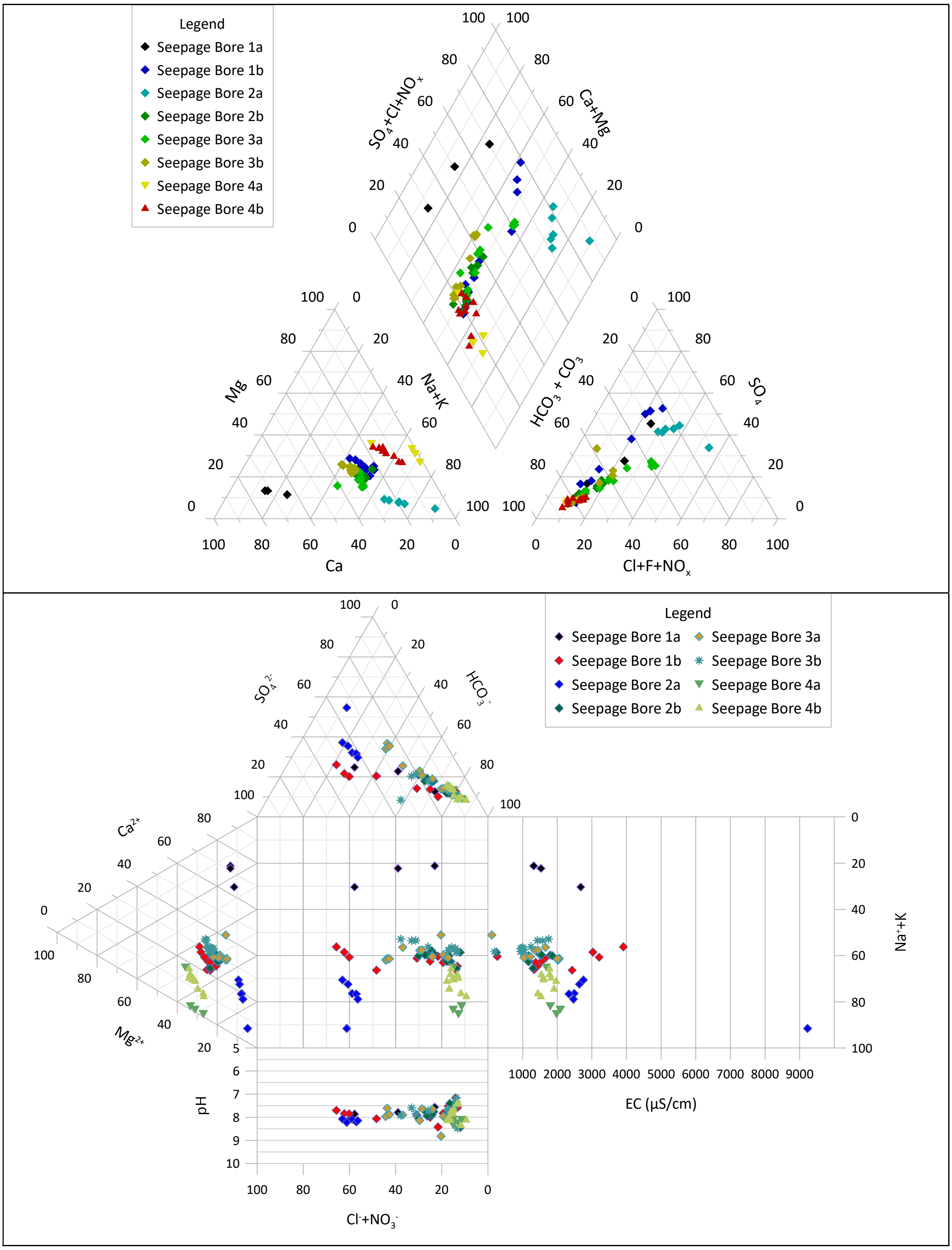


Figure 2-18 Piper and Durov diagram for EA seepage monitoring bores (WMV Environmental, 2023)

Based on the ionic composition of the water samples and the Piper diagrams, the groundwater in the monitoring wells at BCP can be classified as per Table 2-7. The Piper diagrams show that the groundwater in the monitoring bores is generally of a sodium-bicarbonate water type, with minor variations. In addition, the mining operations at BCP have not changed or adversely affected the water type over time. There is no indication of high sulfate content in the groundwater, even in the groundwater from bore BAWB02, which is in the Green Zone orebody, or from bores BAWB07 and BARC071, which are in the Barbara orebody.

Table 2-7 Water-type classification of groundwater at BCP (based on Piper diagram)

BORE ID	PERIOD		
	PRE-MINING	DURING MINING	POST-MINING
EA compliance monitoring bores			
BARC071	Na-HCO3	-	-
BAWB01	Na-Mg-HCO3 to Mg-Na-HCO3	Na-Mg-HCO3	Mg-Na-HCO3
BAWB02	Na-HCO3 to Na-HCO3-SO4	Na-HCO3 to Na-HCO3-SO4	Na-HCO3
BAWB03	Na-Ca-HCO3	Na-Ca-HCO3	Na-Ca-HCO3
BAWB04	Na-Ca-HCO3	Na-Ca-HCO3	Na-Ca-HCO3
BAWB05	Na-Mg-HCO3	Na-Mg-HCO3	Na-Mg-HCO3
BAWB07	Na-HCO3	-	-
BAWBR2	-	Na-HCO3	Na-HCO3
BAWBR3	Na-Ca-HCO3	-	-
Bore E	Na-Mg-HCO3	Na-Mg-HCO3	Na-Mg-HCO3
EA Seepage monitoring bores			
Seepage Bore 1a	-	-	Ca-HCO3-SO4
Seepage Bore 1b	-	Na-Ca-HCO3	Na-Mg-Ca-SO4-HCO3
Seepage Bore 2a	-	Na-SO4-Cl	Na-SO4-Cl-HCO3
Seepage Bore 2b	-	Na-Ca-HCO3	Na-Ca-HCO3
Seepage Bore 3a	-	Na-Ca-HCO3 to Na-Ca-HCO3-Cl-SO4	Na-Ca-HCO3
Seepage Bore 3b	-	Na-Ca-HCO3	Na-Ca-Mg-HCO3
Seepage Bore 4a	-	Na-Mg-HCO3	Na-Mg-HCO3
Seepage Bore 4b	-	Na-Mg-HCO3	Na-Mg-HCO3

2.2.6.8 Groundwater quality

Groundwater sampling and monitoring has been undertaken at the Project site, as part of initial investigations and EA compliance monitoring programs. Detailed discussion on the groundwater monitoring data and analysis results is provided in the "*Barbara Copper Project Progressive Rehabilitation and Closure Plan. Groundwater Technical Report*." (i.e., the Groundwater Conceptual Model report) (WMV Environmental, 2023), attached as 0.

Stock watering is considered the only beneficial use of groundwater at and near the Project, and the ANZECC 2000 livestock drinking water quality guidelines have been considered in assessing the groundwater quality. As there is no to limited groundwater-surface water interaction, the ANZG 2018 guidelines for the protection of aquatic ecosystems have not been considered. The presence of stygofauna communities within and adjacent to the Project have also been assessed with results showing that stygofauna occurrence is very limited in the area (RLA, 2014a).

Time series and box & whisker plots of groundwater analysis results are included in the Groundwater Conceptual Model report (WMV Environmental, 2023).

Maximum solute concentrations observed in the regional and EA compliance monitoring bores between 2014 and 2022 are presented in

Table 2-8. Groundwater quality in these bores can be summarised as follows:

- Groundwater solute concentrations are below the ANZECC livestock drinking water guideline values. In particular, sulfate concentrations are generally below the guideline value of 2,000 mg/.
- The time series graphs indicate that there is no increasing trend in analyte concentration with time, from before to during to post-mining.
- The box & whisker plots show the natural variability of analyte concentrations within a given well or between wells within a given formation.
- The data and information indicate no evidence that the mining operations have adversely impacted the natural background water quality at the monitoring locations.

Table 2-8 Maximum groundwater solute concentrations in regional and EA compliance monitoring bores

ANALYTE	UNIT	CONCENTRATION	ANALYTE	UNIT	CONCENTRATION
PHYSICO-CHEMICAL PARAMETERS			MAJOR IONS (DISSOLVED)		
Electrical Conductivity @ 25°C	µS/cm	1600	Calcium	mg/L	184
pH - Lab	pH Units	8.66	Chloride	mg/L	950
Total Dissolved Solids	mg/L	820	Fluoride	mg/L	2.4
Alkalinity			Magnesium	mg/L	277
Bicarbonate Alkalinity as CaCO3	mg/L	2200	Potassium	mg/L	25
Carbonate Alkalinity as CaCO3	mg/L	28	Sodium	mg/L	1570
Hydroxide Alkalinity as CaCO3	mg/L	5	Sulfate (as SO4)	mg/L	1290
Total Alkalinity as CaCO3	mg/L	2200			
Metals (dissolved)			**Metals (total)**		
Aluminium	mg/L	0.034	Aluminium	mg/L	0.19
Arsenic	mg/L	0.018	Arsenic	mg/L	0.019
Barium	mg/L	0.491	Barium	mg/L	0.514
Beryllium	mg/L	0.001	Beryllium	mg/L	0.001
Bismuth	mg/L	0.001	Bismuth	mg/L	0.001
Boron	mg/L	0.35	Boron	mg/L	0.35
Cadmium	mg/L	0.0005	Cadmium	mg/L	0.0005
Chromium	mg/L	0.006	Chromium	mg/L	0.012
Cobalt	mg/L	0.005	Cobalt	mg/L	0.014
Copper	mg/L	0.034	Copper	mg/L	0.369
Iron	mg/L	0.005	Iron	mg/L	1.4
Lead	mg/L	0.006	Lead	mg/L	0.019
Manganese	mg/L	4.06	Manganese	mg/L	4.35
Mercury	mg/L	0.0001	Mercury	mg/L	0.0001
Molybdenum	mg/L	0.031	Molybdenum	mg/L	0.033
Nickel	mg/L	0.016	Nickel	mg/L	0.014
Selenium	mg/L	0.01	Selenium	mg/L	0.01
Silicon	mg/L	28	Silicon	mg/L	29
Uranium	mg/L	0.143	Uranium	mg/L	0.156
Vanadium	mg/L	0.01	Vanadium	mg/L	0.011
Zinc	mg/L	0.06	Zinc	mg/L	0.074

Maximum solute concentrations observed in the EA seepage monitoring bores between 2019 and 2022 are presented in Table 2-9. Groundwater quality in these bores can be summarised as follows:

- Groundwater solute concentrations are below the ANZECC livestock drinking water guideline values, except for fluoride and some metalloids in seepage bores 1b, 2a and 4b. Sulfate concentrations are below the guideline value of 2,000 mg/L.
- The time series graphs indicate that there is no increasing trend in analyte concentration with time, except for pH, electrical conductivity and sulfate.
    - A minor increasing trend in sulfate concentrations can be observed in some seepage monitoring bores.
    - pH levels increase with time, from slightly acidic to slightly alkaline.
    - Salinity, expressed as electrical conductivity, appears to be increasing with time.
- The box & whisker plots show the natural variability of analyte concentrations within a given well or between wells within a given formation.

Table 2-9 Maximum groundwater solute concentrations in EA seepage monitoring bores

ANALYTE	UNIT	CONCENTRATION	ANALYTE	UNIT	CONCENTRATION
PHYSICO-CHEMICAL PARAMETERS			MAJOR IONS (DISSOLVED)		
Electrical Conductivity @ 25°C	µS/cm	109	Calcium	mg/L	415
pH - Lab	pH Units	7.16	Chloride	mg/L	1950
			Fluoride	mg/L	5.4
ALKALINITY			MAGNESIUM	MG/L	166
Bicarbonate Alkalinity as CaCO3	mg/L	964	Potassium	mg/L	16
Carbonate Alkalinity as CaCO3	mg/L	412	Sodium	mg/L	2170
Hydroxide Alkalinity as CaCO3	mg/L	1	Sulfate (as SO4)	mg/L	1620
Total Alkalinity as CaCO3	mg/L	964			
METALS (DISSOLVED)			METALS (TOTAL)		
Arsenic	mg/L	0.008	Arsenic	mg/L	0.008
Barium	mg/L	0.329	Barium	mg/L	0.362
Bismuth	mg/L	0.001	Bismuth	mg/L	0.001
Chromium	mg/L	0.002	Chromium	mg/L	0.003
Cobalt	mg/L	0.009	Cobalt	mg/L	0.01
Copper	mg/L	0.01	Copper	mg/L	0.07
Molybdenum	mg/L	0.038	Molybdenum	mg/L	0.044
Nickel	mg/L	0.013	Nickel	mg/L	0.01
Selenium	mg/L	0.06	Selenium	mg/L	0.06
Uranium	mg/L	0.25	Uranium	mg/L	0.247

2.2.7 Soil

A Soil and Land Suitability Assessment (SLSA) was conducted (AustralAsian Resource Consultants, 2016a) to classify soil types, assess the suitability of growth media material and identify potential management limitations associated with soil characteristics at the Project site. Based on field observations and laboratory analysis, three broad soil management units were confirmed within the study area. A description of the dominant soil types identified in each management unit, together with typical chemical characteristics, is included in the following section. The distribution of these soil management units has been mapped at a semi-detailed scale representation of 1:50,000 (McKenzie et al., 2008) in Figure 2-19.

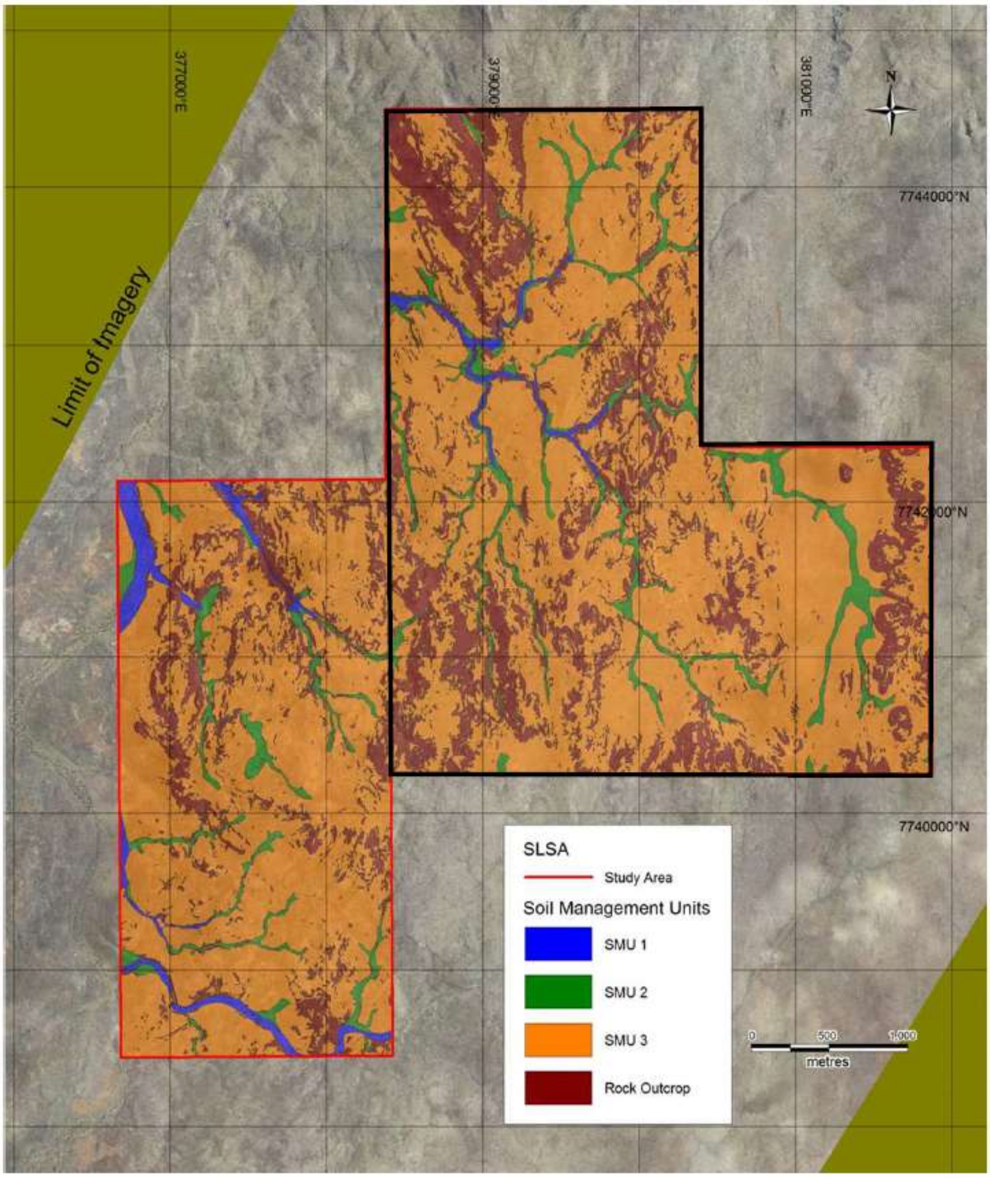


Figure 2-19 Distribution of soil management units within the Project area

2.2.7.1 SMU 1 – River red gum sands

Soil Mapping Unit (SMU) 1 (Figure 2-19), identified as the River Red Gum Sands, consists of sand textured soil and is typically associated with higher order drainage lines and ephemeral watercourses. These soils are often deeper and well-draining although soil depths may become shallow in upper tributaries where rocky parent material occurs within 0.5 m of the surface (sometimes present on the surface).

These soils have a high gravel and cobble content, with an abundance of rounded coarse fragments and a loose surface. Finer stream sediments are removed via alluvial action with occasional evidence of distinct depositional horizons associated with streamflow and regular inundation. These areas are sparsely covered with surface vegetation but are associated with larger river red gum and riverine species.

Soil chemistry indicates deficiencies in major soil nutrients with very low levels of nitrogen, phosphorus, and potassium. The pH is neutral and within the preferred range for most plant species. This soil constitutes a Tenosol under the Australian Soils Classification (Isbell, 2016).

2.2.7.2 SMU 2 – Cloncurry box drainage terrace

SMU 2 (Figure 2-19), identified as the Cloncurry Box Drainage Terraces, consists of loamy to clayey sands along terraces adjacent to open drainage depressions. These soils occur on relatively flat topography (1 to 2%) in isolated areas of greater deposition within the undulating topography found on-site. Areas of SMU 2 are commonly intersected by thin drainage lines of SMU 1 and areas of rock outcrops. Soils of SMU 2 typically have lower fine gravel content but larger (20 to 60+ mm) sub-rounded to rounded coarse fragments present throughout profile. This soil constitutes a Tenosol under the Australian Soils Classification (Isbell, 2016).

Within this SMU there is evidence of very minor areas of gully erosion associated with the ephemeral watercourses which transect SMU 2, although soil chemistry suggests soil is not prone to erosivity or dispersion.

Typically, soil chemistry indicates deficiency in major soil nutrients with very low to low levels of nitrogen and phosphorus. Levels of exchangeable potassium are moderate, higher than those observed in the other SMUs within the study area. Soil pH is neutral, bordering on mildly alkaline, but still within the preferred range for most plant species.

2.2.7.3 SMU 3 – Snappy gum slopes

SMU 3 (Figure 2-19), identified as the Snappy Gum Slopes, consist of slopes of clayey sands to sandy clay loams with moderate to high gravel content (Coarse Fragment Size: 6 to 20 mm and 20 to 60 mm; Shape: angular) on steep lower slopes. These areas are often dominated on the steeper slopes by extensive areas of rock outcrop (as mapped in Figure 2-19). Slopes within the SMU vary from 0 to 20+% with an average of 6%.

Soils of SMU 3 vary considerably in depth, with significant areas of shallow rocky substrate encountered within 15 to 70 cm of the surface across the study area. Soil chemistry indicates deficiencies in major soil nutrients with very low to low levels of nitrogen, low to moderate levels of phosphorus, and low levels of exchangeable potassium. Soil pH varies slightly across the study area but is typically neutral, bordering on mildly alkaline, but still within the preferred range for most plant species. This soil constitutes a Tenosol under the Australian Soils Classification (Isbell, 2016).

SMU 3 is the predominant soil unit where the Project's mining activities have occurred.

2.2.8 Land stability

For the North and South pits, the pre-mining geotechnical assessment indicated the rock mass that comprises the proposed pit walls will typically be very good quality rock, high to very high intact rock strength, fresh Felsic volcanics. The main defect type in the volcanics are joints, typically sub-vertical or sub-horizontal with variable dip direction, however joint orientation can be scattered. There is likely to be some influence of the Barbara Fault Zone in the east wall and foliation maybe a dominant structure in some of the rock mass to comprise this wall (ATCW, 2020).

The pre-mining geotechnical assessment indicated localised zones of poor rock mass are likely, and stability will need to be managed at the project operations stage by ensuring appropriate geotechnical risk reduction/elimination systems are in place. Scaling will be critical to improve pit wall conditions and reduce rock fall potential. The potential for crest loss is high and good blasting practices are required to maintain berm width (PSM, 2014).

2.2.9 Terrestrial ecology

2.2.9.1 Vegetation communities

Flora surveys were conducted prior to mining to assess vegetation communities and ecological values. Survey timing was selected in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*., 2017). Seven vegetation communities were identified across the Project site, all of which are classified as remnant vegetation. A summary of each vegetation community is provided in Figure 2-20 (refer to MLA area only). The location and extent of each vegetation community on the Project site are presented in Table 2-10.

No flora species of conservation significance were found in the Investigation Area (AARC, 2014c).

Full descriptions and photographs of the vegetation communities are provided in *Barbara Copper Project: Terrestrial Flora and Fauna Assessment* (AARC, 2014c), included in this report in 0.

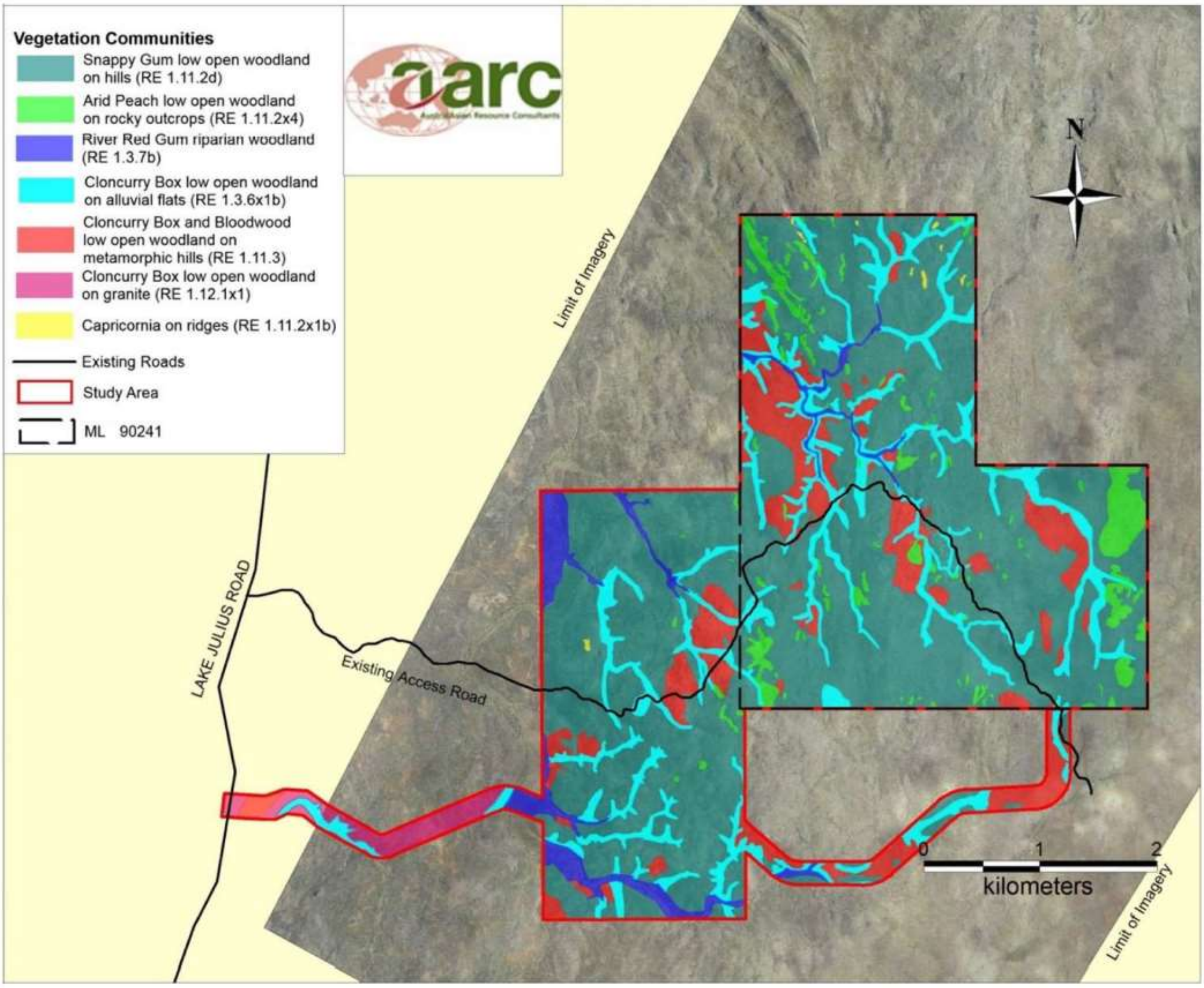


Figure 2-20 Vegetation communities within the study area (AARC, 2014)

Table 2-10 Pre-mining vegetation community descriptions

COMMUNITY NO.	1	2	3	4	5	6	7
COMMUNITY NAME	LOW OPEN WOODLAND OF SNAPPY GUM	LOW OPEN WOODLAND OF CLONCURRY BOX AND BLOODWOOD	LOW OPEN WOODLAND OF CLONCURRY BOX ON ALLUVIAL FLATS	RIVER RED GUM AND NORTHERN SWAMP BOX RIPARIAN WOODLAND	LOW OPEN WOODLAND OF ARID PEACH ON ROCKY OUTCROPS	CAPRICORNIA RIDGES	LOW OPEN WOODLAND AND BLOODWOOD ON GRANITES
Regional Ecosystem	1.11.2d	1.11.3	1.3.6X1b	1.3.7b	1.11.2X4	1.11.2X1b	1.12.1X1
Area (ha)	1,348	236.8	163.5	75.2	81.1	1.92	38.26
EPBC Status	Not Listed	Not Listed	Not listed	Not listed	Not Listed	Not Listed	Not Listed
VM Status	Least Concern	Least Concern	Least Concern	Least Concern	Least Concern	Least Concern	Least Concern
Biodiversity Status	No concern at present	No concern at present	Of Concern	Endangered	No concern at present	No concern at present	No concern at present
Tree Layer	*Eucalyptus leucophloia (D), Corymbia terminalis (A), Terminalia aridicola (A), Brachychiton collinus (A), Corymbia aparrerinja (O), Corymbia capricornia (O), Eucalyptus leucophylla (O)*	*E. leucophylla (CD), C. terminalis (CD), E. leucophloia (A), Terminalia aridicola (A), Atalaya hemiglauca (O), Brachychiton collinus (O)*	*E. leucophylla (D), Lophostemon grandiflorus (A), C. terminalis (O),*	*Eucalyptus camaldulensis (CD), Lophostemon grandiflorus (CD)*	*Terminalia aridicola (D), Brachychiton collinus (SD), E. leucophloia (A)*	*Corymbia capricornia (D), Eucalyptus leucophloia (A), Alphitonia excelsa (A), Terminalia aridicola (A)*	*Eucalyptus leucophylla (CD), C. terminalis (CD), Atalaya hemiglauca (A)*
Shrub Layer	*Acacia phlebocarpa (D), Acacia chisholmii (SD), Acacia holosericea (A), Acacia monticola (A), Acacia melleodora (A)*	*A. holosericea (CD), A. Chisholmii (CD), A. phlebocarpa (A), A. meleodora (A), Gossypium australe (A).*	*A. holosericea (D), Terminalia aridicola (A), A. Chisholmii (A), Melaleuca bracteata (A), A. phlebocarpa (A), Flueggea virosa subsp. melanthesoides (O), Gossypium australe (O)*	*Melaleuca bracteata (CD), Sesbania javanica (CD), A. holosericea (A), Flueggea virosa subsp. melanthesoides (O)*	*Trema tomentosa (D), A. phlebocarpa (A), A. chisholmii (A)*	*Acacia monticola (A), A. orthocarpa (A)*	*Acacia chisholmii (D), Carissa lanceolata (A)*

COMMUNITY NO.	1	2	3	4	5	6	7
COMMUNITY NAME	LOW OPEN WOODLAND OF SNAPPY GUM	LOW OPEN WOODLAND OF CLONCURRY BOX AND BLOODWOOD	LOW OPEN WOODLAND OF CLONCURRY BOX ON ALLUVIAL FLATS	RIVER RED GUM AND NORTHERN SWAMP BOX RIPARIAN WOODLAND	LOW OPEN WOODLAND OF ARID PEACH ON ROCKY OUTCROPS	CAPRICORNIA RIDGES	LOW OPEN WOODLAND AND BLOODWOOD ON GRANITES
Ground Layer	*Triodia pungens (D)*	*Triodia pungens (D)*	*Triodia pungens (D)*	*Cenchrus ciliaris (D)*	*Triodia pungens (D), Cymbopogon bombycinus (A), Sehima nervosum (A)*	*Triodia bitextura (D), Cymbopogon bombycinus (A)*	*Triodia spp. (D)*
Weed Species	*Cenchrus ciliaris (O), Vachellia farnesiana (O), Aerva javanica (O)*	*C. ciliaris (O), V. farnesiana (O), A. javanica (O)*	*C. ciliaris (O), V. farnesiana (O), A. javanica (O)*	*Cenchrus ciliaris (O), V. farnesiana (O)*	*Cenchrus ciliaris (O)*	N/A	N/A
Landform Description	Low open woodland on rock outcrops with a very sparse shrub layer of Acacia spp. and a sparse to very sparse ground layer of *Triodia pungens*. Occurs on steep rocky slopes and crests on metamorphosed igneous rocks.	Low open woodland with Acacia spp. dominated shrub layer and ground layer of Triodia spp. and/or tussock grasses. Occurs on metabasalts and dolerites; skeletal soils, some shallow loams.	Floodplain (other than floodplain wetlands). woodland with a mid-dense ground layer dominated by tussock grasses. Occurs on narrow terraces.	Riverine wetland or fringing riverine wetland. Fringing woodland. Occurs on recent levees and channel deposits of medium and smaller tributaries which are dry for most of the year; alluvial soils.	Low open woodland with mid-dense shrub layer and ground layer of mixed tussock grasses. Occurs on rock outcrops on hills and ranges on strongly folded siliceous sedimentary and metamorphic pre-Cambrian rocks.	This community occurs on small, isolated ridges that form a distinct change in ecotone as the terrain rises sharply and the geology becomes dominated by quartz rock.	Low open woodland and occurs on ranges and stony hills and rises on igneous rocks; skeletal soils and some shallow red earths.
Vegetation Condition	Evidence of low intensity cattle grazing was observed throughout this community with visible impacts limited to faecal evidence. Weed diversity and abundance is relatively low within this RE. Seed dispersal vectors likely include wind transport as well as cattle and avian dispersal. Introduced flora species Buffel Grass (*Pennesetum ciliare*) and Kapok (*Aerva javanica*) were observed to be widespread	Typically subject to low intensity cattle grazing, the impacts were more prominent in areas adjacent to watercourses. As a result of increased grazing pressure, these areas exhibit greater disturbance and weed abundances. Buffel Grass was occasionally observed in high densities and was recorded as co-dominant with Soft Spinifex in areas adjacent to ephemeral	Healthy, with a relatively high diversity of flora species. This is one of the most fertile habitats on the property and is susceptible to greater weed invasion. Introduced species recorded within this community include Mimosa (V. *farnesiana*), Buffel Grass and Kapok. On some drainage lines, Buffel was	This riparian community (RE 1.3.7b) is subject to invasion by introduced species that are known to occur commonly throughout the region including Buffel Grass, Red Natal Grass (*Melinis repens*) and Mimosa. No weed species, listed under the LP Act or listed as of national significance, were observed within the riparian	Native flora species dominated the dry rocky outcrops with only a scattered presence and low abundance of the introduced Buffel Grass recorded. No weed species listed under the LP Act or listed as Weeds of National Significance were recorded from this community.	A low diversity and density of introduced species was recorded in association with the Capricornia ridges. Weed species recorded in low densities included including Buffel Grass and Beggar's Ticks (*Bidens bipinnata*). No weed species, listed under the LP Act or listed as of national significance, were	This community occurs as part of a large patch of remnant vegetation. Previous disturbance within this community is limited to low intensity cattle grazing activities.

COMMUNITY NO.	1	2	3	4	5	6	7
COMMUNITY NAME	**LOW OPEN WOODLAND OF SNAPPY GUM**	**LOW OPEN WOODLAND OF CLONCURRY BOX AND BLOODWOOD**	**LOW OPEN WOODLAND OF CLONCURRY BOX ON ALLUVIAL FLATS**	**RIVER RED GUM AND NORTHERN SWAMP BOX RIPARIAN WOODLAND**	**LOW OPEN WOODLAND OF ARID PEACH ON ROCKY OUTCROPS**	**CAPRICORNIA RIDGES**	**LOW OPEN WOODLAND AND BLOODWOOD ON GRANITES**
	throughout the community, however, present in low densities.	watercourses. Introduced flora species were otherwise found to have a sparse presence within this community. Native species tended to dominate the drier open plains and lower slopes of the surrounding hills.	recorded as co-dominant with native grasses. Kapok was found to occur sporadically throughout the community.	community. This zone was dominated mostly by native vegetation with only low levels of introduced species found in the dry waterways and across stream banks. Overall, the condition of this RE on the Project site is good with only a low diversity of introduced species recorded throughout.		observed within the Capricornia ridges community.	
Habitat Value	Provides habitat for macropods, small mammals, reptiles and open woodland birds.	Provides good habitat variety for birds, large macropods and reptiles in particular through the provision of rocky substrates, leaf litter, fallen timber and Spinifex tussocks.	Provides an abundance of habitat suited to reptiles. This community also provides habitat for birds and large macropods as well as amphibians during wet periods.	Provides good habitat variety for reptiles, amphibians, birds and mammals through the presence of hollow bearing trees, rocky substrates, leaf litter and fallen timber as well as temporary aquatic habitats.	Provides plentiful habitat value for birds, reptiles and rock-dwelling mammals (e.g. Rock Rats and Purple-necked Rock-wallabies) in particular.	This community occupies very small areas of rocky quartz ridges, which are likely to provide limited habitat value for reptiles, birds and mammals.	Provides good habitat variety for birds, large macropods and reptiles in particular through the provision of rocky substrates, fallen timber and Spinifex tussocks. The small rocky hills and low rock outcrops are likely to support reptiles and small mammals. Highly mobile species such as birds and macropods are likely to utilise this community as forage habitat.

Key: D = Dominant, CD = Co-dominant, SD = Sub-dominant, A = Associated, O = Occasional

2.2.9.2 Fauna presence and populations

In a study conducted by AARC (2014c), a total of 144 fauna species were identified on the Project site, consisting of nine amphibians, 80 birds, 27 reptiles and 28 mammals. One threatened bird species, the Golden-backed Honeyeater (*Melithreptus gularis laetior*) and one threatened mammal species, the Purple-necked Rock-wallaby (*Petrogale purpureicollis*) were recorded on the Project site. Under the Queensland *Nature Conservation (Wildlife) Regulation 2006* (NCWR), the Golden-backed Honeyeater is classified as Near Threatened and the Purple-necked Rock-wallaby is listed as Vulnerable. One migratory bird species, the Rainbow Bee-eater was also recorded on the Project site.

Two fauna species of conservation significance (i.e., Golden-backed Honeyeater and Purple-necked Rock-wallaby) have been identified on the Project site. Under the NCWR, the Golden-backed Honeyeater is listed as Near Threatened and the Purple-necked Rock-wallaby is listed Vulnerable. No fauna species listed as threatened under the EPBC Act were identified on the Project site. Furthermore, no Back on Track Priority fauna species identified in the region were recorded on the Project site.

No essential habitat for threatened fauna was identified on the Regional Ecosystem mapping for the Project site.

A full list of the fauna species recorded in the Fauna survey (AARC, 2014c) of the Investigation Area, inclusive of ML 90241 is presented in 0.

2.2.10 Aquatic ecology

Two field surveys along with desk-based investigations were undertaken by AARC (2014) to determine the aquatic ecology of the Project area. Two field surveys were undertaken to further investigate the aquatic ecology of the Investigation Area, inclusive of ML 90241. Surveys were scheduled to fall within the wet season (February 2014) and the dry season (July 2014) (AARC, 2014b).

No aquatic flora species of conservation significance were identified by the desktop searches (AARC 2014b).

Aquatic fauna diversity and abundance were found to be low. This is thought to be due to the Project's location in the upper reaches of the catchment and the highly ephemeral nature of the Project waterways.

The only species of fish captured in the Investigation Area was the Spangled Perch (*Leiopotherapon unicolor*). Small numbers of juvenile Spangled Perch were captured at AQ1 in both surveys. No fish were captured at any other survey site. Large numbers of deceased and dying juvenile Spangled Perch were observed in a very small waterhole in the south-west of the Investigation Area in the dry season. The fish were severely affected by low oxygen availability in the drying waterhole (AARC, 2014b).

Desert Rainbowfish (*Melanotaenia splendida tatei*) were observed in waterholes across the Investigation Area at the end of the wet season.

Fish abundance and diversity at the Investigation Area were low. This is likely due to the fact that the waterways that run through the Investigation Area originate within or very close to the site. These low-order waterways are highly ephemeral and do not provide permanent fish habitat. It is thought that the fish observed in the Investigation Area are likely to have swum upstream onto the site in the wet season. Most fish are likely to die out during the dry season (AARC, 2014b).

Several Inland Freshwater Crabs (*Austrothelphusa transversa*) were captured in the waterways of the Investigation Area during the wet season. Both living and deceased crabs were observed in the dry season survey. No other crustacean species were observed in the investigation area.

2.2.11 Species of conservation significance

Aquatic and riparian species of conservation significance are known from the broad region but were not observed in the Investigation Area by AARC during the aquatic ecology surveys (AARC 2014b).

Database searches identified 20 species of threatened fauna and 40 species of marine and/or migratory animals (mostly birds) within the local region. No threatened ecological communities or threatened aquatic flora species were identified in the database searches.

Category B Environmentally Sensitive Areas are mapped in the west of the Investigation Area as Endangered Regional Ecosystem 1.3.7: River Red Gum (*Eucalyptus camaldulensis*) woodland on channels and levees. No Category A or C Environmentally Sensitive Areas are mapped in the Investigation Area.

Refer to 0 for the full aquatic ecology report.

2.2.12 Groundwater Dependent Ecosystems

Queensland Globe (2022) and BOM Groundwater Dependent Ecosystem Atlas (2022) mapping tools were used to identify if there was a presence of groundwater dependent ecosystems (GDEs) within or surrounding the Project site. The Queensland Globe (Queensland Government 2022) detected no presence of GDES within a 25 km radius of the site. The BOM GDE Atlas (2022) however identified terrestrial GDES's within a 5km radius of the project site. These are presented in Table 2-11 and Figure 2-21.

Table 2-11 Terrestrial GDEs within 5 km of the Project site (WMV Environmental, 2022)

GDE POTENTIAL	VEGETATION TYPE
High potential GDE – from national assessment	Eucalyptus spp. dominated open-forest and woodlands drainage lines and alluvial plains.
Moderate potential GDE – from national assessment	Eucalyptus spp. (E. leucophloia, E. leucophylla, E. persistens, E. normantonensis) low open-woodlands often with Triodia spp. dominated ground layer.
Low potential GDE – from national assessment	Eucalyptus spp. (E. leucophloia, E. leucophylla, E. persistens, E. normantonensis) low open-woodlands often with Triodia spp. dominated ground layer.

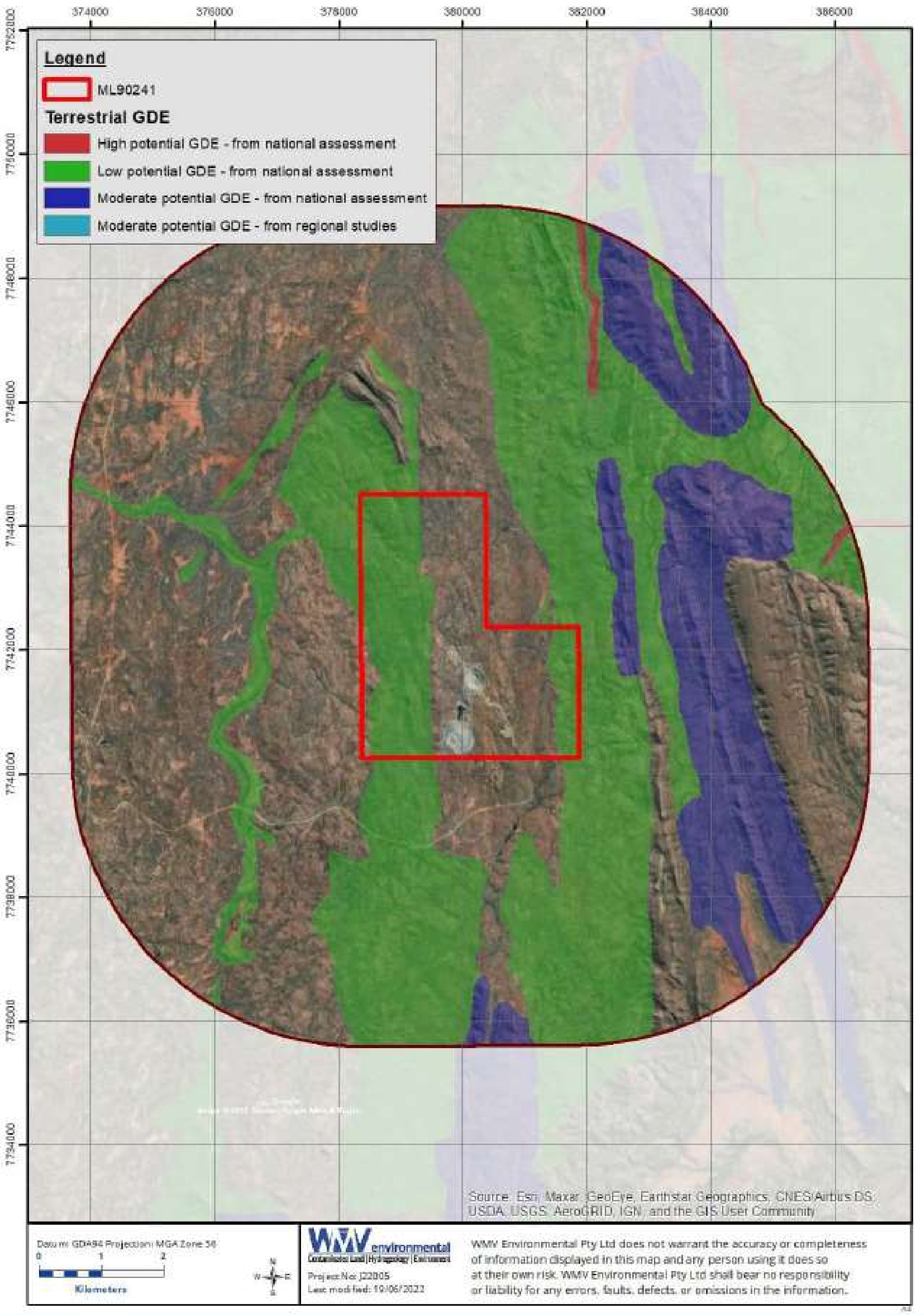


Figure 2-21 Terrestrial GDEs within 5 km of the Project site (BOM GDE Atlas, 2022)

2.2.13 Weed and pest species

Six weed species were recorded in low densities across the Project site (AARC, 2014c). None of the recorded weed species are listed as declared weeds under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002* or Weeds of National Significance.

Site surveys recorded a suite of five pest species consisting of the Cane Toad (*Rhinella marina)*, Wild Dog/Dingo (*Canis familiaris)*, Feral Pig (*Sus scrofa*), House Mouse (*Mus domesticus*) and domestic Cow (*Bos taurus/indicus*). The Wild Dog/Dingo and Feral Pig are both classified as Class 2 declared pest animals under the *Land Protection (Pest and Stock Route Management) Act 2002*.

2.2.14 Pre-mining land use

Current land uses on the Project site include low intensity cattle grazing and mineral exploration activities. Historically, mining activities and cattle grazing have been the predominant land use with evidence of this noted throughout the site, including fences, cattle grids, and disused mine shafts.

Pre- and post-mining land use as well as land suitability classification are included in in Section 4.1.3 and in the Post Mining Land Use Plan PMLUP (0).

2.2.14.1 Historical Indigenous land uses

The Project is located on the traditional lands of the Kalkadoon People who followed patterns of hunting and gathering, fishing and trade for many thousands of years before the arrival of the first Europeans. Kalkadoon craftsmen were known for the quality of their stone implements. Hand-crafted tools were traded by the Kalkadoon people with other Aboriginal groups across western Queensland, as far south as Birdsville.

During project development and operations, the Native Title Party for the land in which the Project is located is the Kalkadoon People #4 QC10/4 QUD579/2005. Kalkadoon Native Title claim (KNTC) status is fully determined as of 12 December 2011. An agreement was executed with KNTC in October 2015. The Project has continued to comply with the agreement with KNTC, duty of care guidelines under s28 of the *Aboriginal Cultural Heritage Act* 2003 and liaise with the Kalkadoon People regarding the Project.

Cultural Heritage Surveys have been completed on targeted areas of disturbance (exploration and mining) from 2008 to more recently in 2019. Surveyed artefacts have been identified, logged and relocated in accordance with the methodology in the executed agreement with KNTC.

2.2.14.2 Historical European land uses

Historical small-scale mining has previously occurred on the ML and in the surrounding landscape, evident through a number of disused mine shafts

A Heritage study was conducted by the JV partners CopperChem Ltd (renamed Round Oak Minerals) and Syndicated Metals Ltd (2014) for the Project. Findings from the study included the following:

- No significant discoveries of former mine machinery observed.
- No township remains observed (streets, buildings, foundations, cemeteries, etc.).
- No significant or rare artefacts such as bottles or personal effects.
- European names were discovered etched into a rock formation dating from the mid-1930s that is within the ML but outside the area of operations. This information was passed on by on-site Environmental staff and the site was visited and recorded by the consultant.
- The majority of artefacts fell into the category of the 1950s era, except for the remains of a c1940s Dodge Brothers truck and reused WW2 Marsden matting.

The site does not contain any elements of robust historical significance. Remains of European nature are at most only 70 years old. The site lacks the components (street layout, cemetery, significant artefacts or mining machinery) necessary to qualify as site of early 20th Century mining heritage.

2.2.15 Underlying landholders

The land tenure and land uses within ML 90241 are summarised in Table 2-12 below.

Table 2-12 Project property description

DESCRIPTION OF PROJECT	
Real Property Description	Mine, infrastructure, and access Road Located on West Leichhardt Station, Lot 1 on AA29 Landowner: West Leichardt Holdings
Native Title and Cultural Heritage	Kalkadoon Native Title Aboriginal Corporation (Native Title claimant group)
Current Land Use	Low intensity cattle grazing and mineral exploration activities
Sensitive Places	West Leichardt Station, Lot 1 on AA29, West Leichardt Holdings, Mt Isa, QLD 4825

The nearest sensitive receptor is West Leichardt Station Homestead as observed in Table 2-12. The location of the sensitive receptors is provided in Figure 2-22.

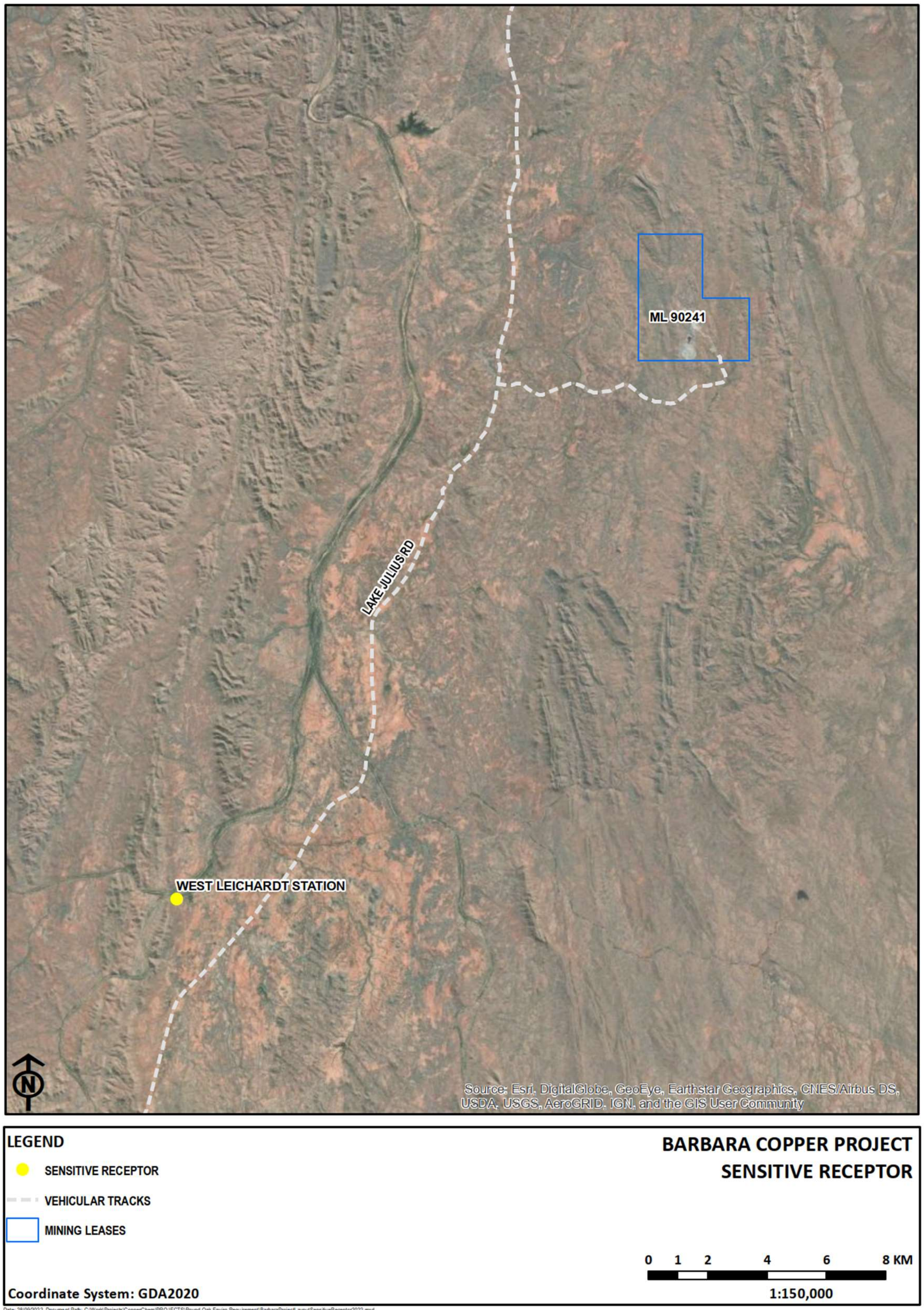


Figure 2-22 Location of sensitive receptor

2.3 PROJECT DESCRIPTION

2.3.1 Mining tenements

The extent of ML90241 is shown in Figure 2-2 and encompasses 1,170 ha in far north Queensland approximately 50 km north-east of Mount Isa. The operation is owned by Aeris (formerly Round Oak) and operated under EPML02840015.

2.3.2 Environmentally relevant activities

Under Schedule 2 of the *Environmental Protection Regulation 2019* (EP Regulation) an Environmental Relevant Activity (ERA) is an activity with the potential to release contaminants into the environment. The ERAs that have been conducted on site as a part of mining activities are listed Table 2-13.

Table 2-13 Environmentally relevant activities

ENVIRONMENTALLY RELEVANT ACTIVITY	PRESCRIBED ERA DESCRIPTION (REFER TO SCHEDULE 2, ENVIRONMENTAL PROTECTION REGULATION 2019)
Mining - 14	Mining iron ore
Mining - 16	Mining gold ore
Mining - 17	Mining copper ore
Mining - 18	Mining lead, silver or zinc separately or in any combination
Mining - 19	Mining metal ore, other than a metal ore mentioned in items 11, 12, 14, 15, 16,17 or 18
8(3)	Chemical Storage - Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)
15	Fuel burning Using fuel burning equipment that is capable of burning at least 500kg of fuel in an hour
33	Crushing, milling, grinding or screening Crushing, grinding, milling or screening more than 5000t of material in a year
63 (1) (a-i)	Sewage Treatment - Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of (a-i) 21 to 100EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme

2.3.3 Mine features

The current mine features and disturbance areas on the Project site subject to rehabilitation and as listed in EA EPML02840015 are presented in

Table 2-14 and illustrated in Figure 2-23. Table 2-14 is adapted from Table 2 EA Amendment Supporting Information provided to DES November 2021. Infrastructure to support underground (Stage 1) is wholly located within pre-disturbed areas. The portal and vent fan are located within the mine feature disturbance area for South Pit.

Table 2-14 Mine feature disturbance area

MINE FEATURE	ACTUAL AREAS OF DISTURBANCE (HA)
North Pit	3.3
South Pit	10.2
Waste Rock Dump (WRD)	23.4
WRD Sediment Dam	6.0
Run of Mine (ROM) Pad	3.0
ROM Pad Dam	0.0
Topsoil Stockpiles	0.0
Light Infrastructure Area	2.7
Sewage Treatment Facility	0.0
Explosive Magazine	0.0
Road Train Loading Area*	0.0
Access Road, Haul Roads and Tracks	11.0
Diversion Drains	1.4
Abandonment bunds	1.7
Total actual disturbance	**62.7**

*Located wholly within ROM Pad

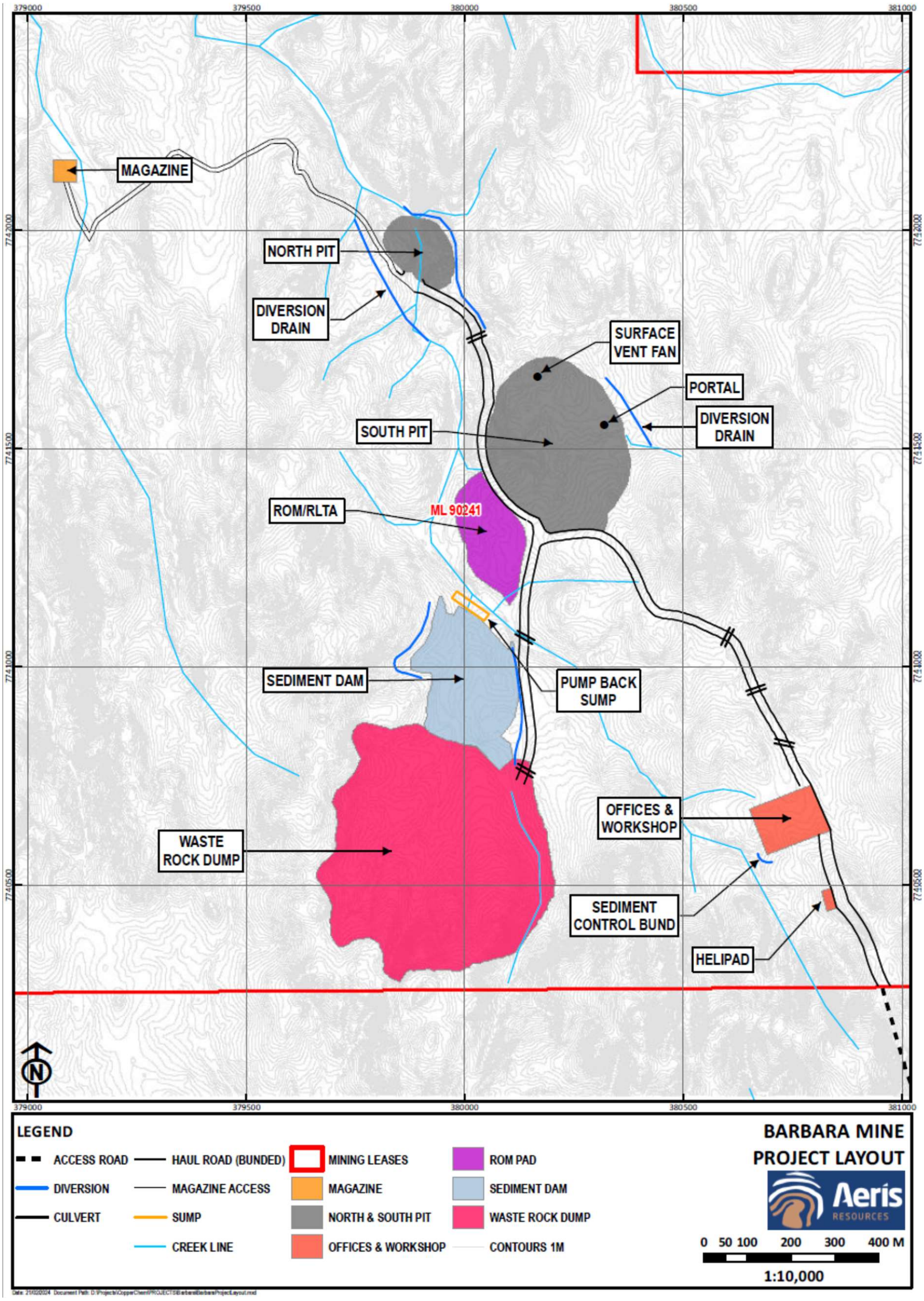


Figure 2-23 Project layout

2.3.4 Type of mining operation

The Project operated as an open cut copper mine. All ore excavated from the two mine pits was trucked to Mount Isa for third-party processing.

The Project includes two completed open pits. North Pit is approximately 60 m deep (295 m RL) and South Pit is approximately 150 m deep (205 m RL). Both were mined using a conventional truck and shovel operation with out of pit dumps for stockpiling overburden.

The Project will transition to underground mining via a decline in the South Pit. Mining will be Sub Level Open stope operation with waste backfill. Stopes have been designed with 25m sub-level intervals to a maximum stope height of 100 m. Sequence of mining will be in two stages in a bottom-up approach to provide a working platform for subsequent stopes following waste backfilling process. A crown pillar is planned to be left at the pit bottom and will be mined last in the sequence (Stage 2).

Stage 1 underground, which is predicated on the success of a Minor Amendment of the existing EA and PRCP, proposes:

- Underground mine development, surface and underground drilling for Mineral Resource definition, and stoping, refer to Figure 2-24;
- Waste from development (NAF) hauled to the existing waste rock dump (WRD) for temporary storage (250,000 tonnes), with PAF (40,000 tonnes) hauled to the RoM for temporary storage;
- No removal of the crown pillar (no complete dewatering of the South Pit & underground);
- No movement of waste rock from the existing WRD the waste generated by underground mine development will be sufficient for stope fill; and
- Rehabilitation Areas being available from December 2026 at the end of Stage 1. Aeris' assumed earliest start date for Stage 1 is January 2025.

Stage 2 would be subject to a second future amendment process that proposes:

- Underground mining (production) advancing upwards from the 1110 Level with the eventual removal of the crown pillar below the South Pit;
- Further open cut mining in North Pit and storage of waste rock in the WRD; and
- Extended PRCP timeframe and updated landform design on the WRD to accommodate an extended life of mine.

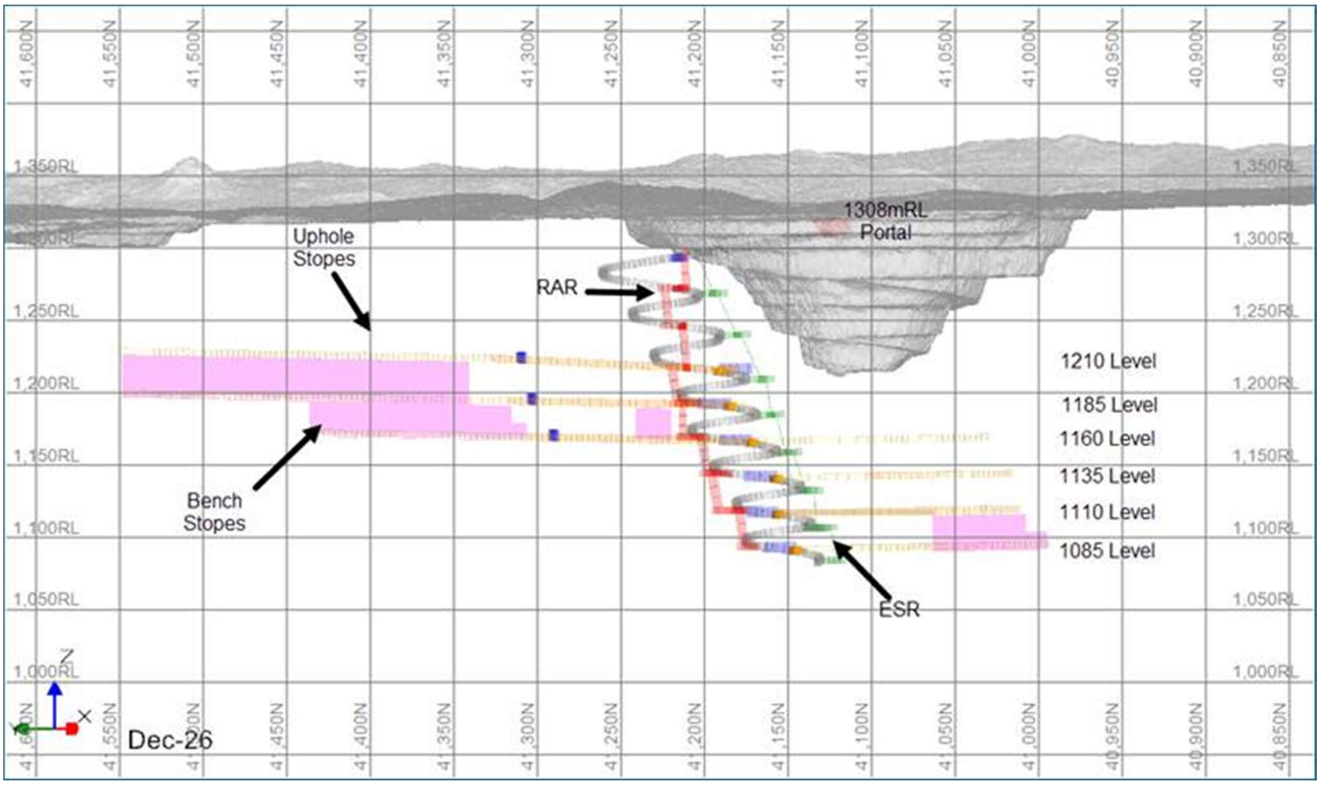


Figure 2-24 Barbara Mine, Stage 1 Long Section (Jan25-Dec 26)

2.3.5 Duration

The Project operated over 21 months, starting in June 2019 and finishing in March 2021. Minor delays occurred during periods of wet weather. The operation is in care and maintenance, having completed open pit extraction of the copper and gold ore. Underground mining is planned to occur over stages with Stage 1 commencing in January 2025 and will operate for approximately two years whilst a second future amendment for Stage 2 underground is prepared and assessed. In the event Stage 2 does not commence surface disturbances will become available for progressive rehabilitation in December 2026 at the end of Stage 1.

2.3.6 Design of mine features for closure

The mining operation at the Project was approved under an EA prior to the release of the PRCP Guideline on 1 November 2019. Section 3.1 of the PRCP Guideline states that transitional PRCPs are not required to demonstrate how aspects of the mine site have been designed for closure for existing or approved disturbance. Therefore, the design of mine features for closure is not a requirement for this transitional PRCP.

2.3.7 Progressive rehabilitation

As per condition G3, rehabilitation will be undertaken progressively within a reasonable timeframe. Each disturbance area within the mine footprint will form part of the RAs with a post-mining land use and defined rehabilitation goals, objectives, indicators, and milestone criteria, to ensure that rehabilitation works are completed in an appropriate manner.

Rehabilitation strategies and methods for the Project have been developed in accordance with the guideline *Rehabilitation Requirements for Mining Resource Activities* (DES, 2014), and reviewed and revised as necessary to align with the PRCP Guidelines.

The rehabilitation hierarchy, in order of decreasing capacity to prevent or minimise environmental harm, is as follows:

1. Avoid disturbance that will require rehabilitation
2. Reinstate a "natural" ecosystem as similar as possible to the original
3. Develop an alternative outcome with a higher economic value than the previous land use
4. Reinstate previous land use
5. Develop a lower value land use
6. Leave the site in an unusable condition or with a potential to generate future pollution or adversely affect environmental values.

The hierarchy allows for lower values to be acceptable when they will be appropriate to the stakeholders or when higher values are impractical. However, leaving the site in an unusable condition or with the potential to cause further environmental harm is not considered acceptable and has not been proposed for the Project.

3 COMMUNITY CONSULTATION

This section provides a description of the primary stakeholders to have an interest in the activities associated with the Project, and provides details of the consultation plan developed by Round Oak (now Aeris Resources) as well as outcomes from consultations that have already taken place. These consultations have been documented in the Consultation Register and are presented in this section.

3.1 PRIMARY STAKEHOLDERS

A successful community consultation program relies on identifying all community stakeholders, understanding the issues of interest or concern for each stakeholder, determining the appropriate level of engagement for each stakeholders, and using appropriate communication tools to engage with each stakeholder.

There is the potential for only a few or many community stakeholders to have an interest in the activities associated with a project or operation. These can include, but are not limited to:

- Affected landowners
- Landowners requiring access to the land related to the PRCP
- Traditional owner groups (and associated trustees)
- Local government
- Local community groups.

The key identified stakeholders for the Project are listed in Table 3-1.

Table 3-1 Key community stakeholders for the Project

STAKEHOLDER	CONTACT DETAILS
Adjoining landholder	Ron and Joan Croft – West Leichardt Station Lot 1 on AA29 West Leichardt Holdings Mt Isa, QLD 4825
Shire Council	Mount Isa City Council city@mountisa.qld.gov.au
Native Title claimant group	Kalkadoon Native Title Aboriginal Corporation 109 Barkley Highway MT ISA

3.2 COMMUNITY CONSULTATION REGISTER

A community consultation register (**Table 3-2**) has been formulated to electronically track the following:

- Consultation date
- Identification of each community member
- Description of consultation type
- Information provided
- Issued raised
- How issues have been considered
- Decisions and outcomes of the engagement
- Any commitments made by Round Oak.

Table 3-2 Community consultation register

CONSULTATION DATE	STAKEHOLDER/COMMUNITY MEMBER	CONSULTATION TYPE	INFORMATION PROVIDED AND ISSUES DISCUSSED	ISSUES RAISED BY COMMUNITY AND HOW ISSUES WERE CONSIDERED	DECISIONS/ OUTCOMES	COMMITMENTS
10/12/2020	Landholder - Croft (West Leichardt station)	Direct conversations	Discussions on mine rehabilitation progress and tender process for rehabilitation works. Discuss the process and agreement on the transfer of mine infrastructure to landholder. Verbal agreement to transfer responsibility of the following mine infrastructure once EA rehabilitation objectives have been met: *Sediment dam *Voids as water storages *Culverts (remain along roads to allow clean water movement across site). *All roads (4m in width) ○ All polypipe (leave on site) ○ All concrete slabs ○ Fenced storage areas (magazines)	Discussions regarding the agreement and the process for formalising.	Draft legal agreement provided to landholder for comment and signing.	Continue engagement and discussions with landholders and follow up on agreement

CONSULTATION DATE	STAKEHOLDER/COMMUNITY MEMBER	CONSULTATION TYPE	INFORMATION PROVIDED AND ISSUES DISCUSSED	ISSUES RAISED BY COMMUNITY AND HOW ISSUES WERE CONSIDERED	DECISIONS/ OUTCOMES	COMMITMENTS
			○ All groundwater bores *Water tanks at admin			
26/05/2021	Landholder - Croft (West Leichardt station) and DES	Direct conversations	Landholder raised concerns regarding the capping design of the waste rock dump and about the water level in the WRD Sediment Dam.	• Fortnightly meetings at the landholder's property, when landowner availability and weather allows • Site inspections with the landholder to provide a visual understanding of site conditions • Provision of Round Oak documentation, including the WRD Column Trial Setup that will inform a site specific cover system design, Post Mine Land Use Plan document, Waste Rock Management Plan • Telephone updates on topics such as exploration drilling program progress and	Addressed the landowner's concerns with a telephone call and the site visit. Regular communications by means of additional site visits, meetings at West Leichardt Station, emails and phone calls have occurred. Round Oak will continue to maintain regular communications with the landowner, to ensure both parties are up to date on occurrences within the local area.	Continue engagement

CONSULTATION DATE	STAKEHOLDER/COMMUNITY MEMBER	CONSULTATION TYPE	INFORMATION PROVIDED AND ISSUES DISCUSSED	ISSUES RAISED BY COMMUNITY AND HOW ISSUES WERE CONSIDERED	DECISIONS/ OUTCOMES	COMMITMENTS
				DES pre-wet season inspection outcomes • Provision of Sediment Dam water quality results • Provision of letter to address issues		
15/02/2021	Landowners - Crofts	Written Communication	Landowner/Operator Agreement for infrastructure retainment upon closure	• Pit water volume and quality available at end of mine life for stock?	Both parties agreed on sampling regime	Round Oak to collect and analyse pit water quality when available
25/03/2021	Department of Enviro and Science (DES)	PRCP Planning	Transition letter provided	• -	-	Round Oak to submit PRCP document by 30 June 2022
2/05/2021	Landowners - Crofts	Personal Communication	PRCP introduction, Sediment Dam water quality	• Sediment Dam water quality for stock	Provision of water quality data to landowner	Round Oak to collect and analyse Sediment Dam water quality when available
19/06/2021	Landowners - Crofts	Site Visit	Inspection of waste rock dump, pits, site infrastructure	• Waste Rock Dump rehabilitation method	Provision of waste rock dump column trial report to landowner	Round Oak to ensure PMLU of native ecosystem met at closure
19/09/2021	Landowners - Crofts	Personal Communication	Pit and Sediment Dam water quality results	• Water quality results to date provided	Water quality in structures meets ANZECC Stock Drinking Water Guidelines	Ongoing sampling to continue
20/12/2021	Landowners - Crofts	Personal Communication	Waste Rock Dump Progress Update	• Three column trials underway to determine	Discussion of results to date	

CONSULTATION DATE	STAKEHOLDER/COMMUNITY MEMBER	CONSULTATION TYPE	INFORMATION PROVIDED AND ISSUES DISCUSSED	ISSUES RAISED BY COMMUNITY AND HOW ISSUES WERE CONSIDERED	DECISIONS/ OUTCOMES	COMMITMENTS
				most effective, practical cap		
26/02/2022	Department of Environment and Science (DES)	Email Communication	PRCP progress update	• PRCP Prelodgement Meeting	No concerns identified	Round Oak provision of extension letter
28/02/2022	Landowners - Crofts	Personal/written Communication	Water Infrastructure Agreement	• Round Oak request to extend agreement for water infrastructure on property	No concerns identified	Ongoing engagement agreed upon
1/06/2022	Landowners - Crofts	Personal Communication	Update on PRCP progress and upcoming works	• Upcoming meeting date	No concerns identified	Awaiting Council response
8/06/2022	Mount Isa Council	Personal Communication	Site / PRCP introduction and request for appropriate Council contact		No concerns identified	Ongoing engagement agreed upon
10/06/2022	Landowners - Crofts	Personal Communication	Update on upcoming works and infrastructure agreement	• Meeting date postponed	No concerns identified	Return phone call at later time
13/06/2022	Mount Isa Council	Personal Communication	Council contact followup			Return to Kalkadoon office at a later time
13/06/2022	Traditional Owners - Kalkadoon	Personal Communication	Introduction of Round Oak and PRCP in Mount Isa		Extension granted to 28/07/2022	PRCP submission 28/07/2022
15/06/2022	Department of Environment and Science (DES)	Email Communication	PRCP progress update	• Request for PRCP document submission	No concerns identified	Provision of information to Council email

CONSULTATION DATE	STAKEHOLDER/COMMUNITY MEMBER	CONSULTATION TYPE	INFORMATION PROVIDED AND ISSUES DISCUSSED	ISSUES RAISED BY COMMUNITY AND HOW ISSUES WERE CONSIDERED	DECISIONS/ OUTCOMES	COMMITMENTS
27/06/2022	Mount Isa Council	Personal Communication	Council contact followup		No concerns identified	Ongoing engagement agreed upon
8/07/2022	Landowners - Crofts	Personal Communication	Update on upcoming works and infrastructure agreement	• Meeting date postponed	No concerns identified	Ongoing engagement agreed upon
12/07/2022	Landowners - Crofts	Site Visit	Upcoming exploration program, any concern to date	• Nil, ongoing communication requested	PMLU communicated	Follow-up consultation on 22/07
20/07/2022	Traditional Owners - Kalkadoon	PMLU Letter	Notification of change of ownership (Round Oak to Aeris), notification of proposed PMLU	• Nil, written communication	PMLU communicated	Follow-up consultation on 22/07
20/07/2022	Mount Isa Council	PMLU Letter	Notification of change of ownership (Round Oak to Aeris), notification of proposed PMLU	• Nil, written communication	No concerns identified	Round Oak provision of extension letter
27/02/2024	Landowners - Crofts	Face to face meeting	Feasibility and timing of Underground Mining, no changes in PMLU	• Maintenance of road and management of dust on road	Supportive of UG and timely development	Ongoing consultation and dust management on roads
27/02/2024	Mount Isa Council – Director Community Services and Economic Development	Face to face meeting	Plans to permit Underground Mining and no changes to PMLU	• Supportive of UG for potential employment opportunities. Road maintenance agreement	Review road maintenance agreement	Ongoing consultation and follow up on road maintenance agreement

3.3 COMMUNITY CONSULTATION PLAN

Aeris understands that effective consultation with the communities within which it operates is central to its social licence to operate. The purpose of this Community Consultation Plan (0) is to set out how Aeris identifies and engages with community stakeholders relevant to the PMLUs, as part of the PRCP. It is also designed to ensure that Aeris achieves compliance with the intent of its Social Responsibility Policy.

3.3.1 Consultation objectives

Aeris sets the following objectives for the Project Community Consultation Plan:

- Comply with all legal obligations and company commitments in effect for the Project, as outlined in the PRCP Guideline (DES, 2019).
- Maintain effective means of communication between Round Oak and its community stakeholders with regards to PMLUs, rehabilitation progress and any change in the Project's operational status.
- Deal promptly and transparently with any community complaints or grievances.
- Look for opportunities to support the development of community organisations within the communities where Round Oak operates.
- Seek to understand how Round Oak can minimise any negative social impacts of its activities on communities, while maximising the benefits, and act on those opportunities.
- The principles of community engagement are further detailed in Round Oak's Community Consultation Plan for the Project (ROM, 2021; 0).

3.3.2 How the community will be engaged

There is a wide range of community engagement tools that can be, and are, employed by Aeris to engage with its communities. Selecting the right engagement tool to reflect the nature of the engagement is an important aspect of supporting a successful engagement process.

The types of community engagement tools used in the PRCP process are as follows:

1. Tools to inform
2. Tools to consult
3. Tools to collaborate.

3.3.3 Tools to inform

The first tier of community members is those who will be 'informed'. These community members are typically local individuals / landowners with general interest in the Project. These community members only want to know what is going on, with direct communication to each landowner being undertaken. If available, newsletters and updates are also suitable communications media. Round Oak will provide objective and balanced information to inform community members on what is planned, and the progress being made with these plans.

3.3.4 Tools to consult

The second tier of community members is those who will be 'consulted'. They will have a direct interest and will want to both be informed and be able to provide feedback. This tier includes selected neighbouring operators and most government agencies (including DES and Mount Isa City Council). Meetings or forums will be held with these community members so that concerns and issues can be identified, and practical solutions or actions imposed. Targeted supplementary email updates may also be used.

3.3.5 Tools to collaborate

The third tier is community members who need to be 'engaged' and who have the potential to be directly impacted. This tier is those who have a direct and influential role in local government, key state government agencies, cultural heritage groups, landholders, and landholders of land necessary for access to the land in the proposed PRCP. The best method of consultation for this tier is regular, face-to-face meetings to enable candid discussions.

3.3.6 Consultation frequency

Consultation will occur prior to any PRCP Schedule amendments that are likely to impact the community. The register will be updated when this consultation is finished.

Ongoing community consultation will continue throughout completion of proposed milestones so that progressive rehabilitation and mine closure activities can be discussed with the community.

3.3.7 Information released for community consultation

Annual updates will be provided to community stakeholders identified in Table 3-1. This will include a description of any significant activities that have occurred on-site and a summary of the key monitoring outcomes. Annual updates will include a summary of rehabilitation progress for the year.

Any changes to PMLUs or operational status will trigger 'tools to inform' within an appropriate timeframe (prior to any PRCP or EA amendments).

An open invitation for site visits to review rehabilitation progress will continue for all community stakeholders listed in Table 3-1 on a biannual basis.

3.3.8 Communication channels

Aeris will maintain a range of channels by which stakeholders associated with the Project can communicate with the business to make inquiries, raise complaints, or to express grievances. These channels will include sufficient options so that community members are not restricted in their ability to provide feedback due to technological or other limitations.

3.3.9 How feedback and comments will be considered

When an inquiry is received from a stakeholder, the inquiry will be directed to the Aeris staff member best able to provide a response. A response to the inquiry will be made via the most appropriate form (telephone, email, etc.) for the nature of the inquiry, or as requested by the stakeholder. An inquiry will only be recorded as an event as set out in Section 3.3.10 if it is a complex issue that cannot be answered within several days.

Upon receiving feedback from a stakeholder, it will be directed to the most relevant Aeris staff member for consideration. That staff member will identify how the feedback will be taken into consideration by the business, and this will be communicated to the stakeholder, with a discussion regarding how feedback was addressed. Depending on the circumstances, the feedback, and Aeris's response, it may be recorded as an event as set out in Section 3.3.10.

In the event that a complaint is received from a stakeholder, the details will be recorded as an event as set out in Section 3.3.10. All relevant Aeris staff will be notified of the complaint, and an investigation reflective of the nature of the complaint will be undertaken. Based upon the outcomes of the investigation, appropriate corrective actions will be identified. The outcomes of the investigation, and the proposed corrective actions, will be communicated to the complainant. Any further feedback from the complainant will be taken into consideration when finalising the corrective actions. The investigation findings and corrective actions will be recorded in the event management system, with corrective actions tracked until completion. The complainant will be informed when the corrective actions are completed, where this is relevant or requested.

3.3.10 Record keeping

All complaints and grievances will be recorded as Health, Safety, Environment and Community (HSEC) events in the InControl® event management system. If requested, a complaint or grievance can be made anonymously. General inquiries may be recorded as an InControl® event where it is felt that a record of the inquiry might be appropriate, or where any follow up actions will take some time to complete, and their progress needs to be tracked.

A community consultation register has been formulated to electronically track the following:

- Consultation date
- Identification of each community member
- Description of consultation type
- Information provided
- Issued raised
- How issues have been considered
- Decisions and outcomes of the engagement
- Any commitments made by Round Oak.

3.3.11 Reporting escalation

Any feedback received in relation to potential criminal activity will be managed in accordance with relevant local laws and regulations, as well as applicable Aeris procedures.

Any report of potentially inappropriate behaviour by a Aeris employee, contractor, visitor, or volunteer will be directed to the Aeris Human Resources team for investigation and management.

Escalation of feedback from the community within the Aeris organisation will occur in accordance with the timeframes set out in Table 3-3. Escalation is to be based on a risk assessment of the issue that has been raised. Risk assessment occurs as part of the standard process for entering a HSEC event into InControl®.

Table 3-3 Internal escalation of community feedback based upon risk

RISK LEVEL	E&C COORDINATOR	HSEC MANAGER	GENERAL MANAGER	COO AND CEO
Low	Within 2 days	-	-	-
Medium	By the end of shift	Within 2 days	Within 2 days	-
High	Within 2 hrs	By the end of shift	By the end of shift	Within 2 days
Critical	Immediately	Within 2hrs	Within 2 hrs	By the end of shift

4 POST MINING LAND USE

The Project site's current land uses include low intensity cattle grazing and mineral exploration activities. Historically, mining activities and cattle grazing have been the predominant land use.

The following PMLUs are proposed for the site:

- Water storage - North Pit, South Pit (including underground), and WRD sediment dam
- Native ecosystems - Waste Rock Dump
- Low intensity grazing - Ancillary infrastructure, Run of Mine (ROM) pad, roads and exploration
- Water management infrastructure - Diversion drains and levees (Refer Section 6.10.2 for details on retention and removal).

Specific infrastructure items will remain at closure for the landholder as specified in the consultation register (See Section 3.2). Infrastructure to remain at closure is summarised in Section 4.2.3

The proposed PMLUs for the Project are consistent with outcomes identified in the consultation register (see Section 3.3).

The PMLUs support regional landscapes and production values for agriculture which is aligned with objective 2 from the North-West Regional Plan (See Section 4.1.1).

4.1 CLOSURE PLANNING

The mine closure process begins with planning during the design, assessment and permitting phases of the Project prior to its construction and continues throughout the life of the Project. Closure planning aims to reduce the residual liability and risk of a project. The aim of closure planning is to have a structured and systematic mine closure and completion process to:

- Achieve acceptable environmental outcomes
- Reduce the financial burden of mine closure and rehabilitation
- Avoid the site becoming hazardous and a source of pollution for legacy in the future.

This mine closure concept has been developed to demonstrate that the Project can be adequately closed, and the plan is technically, economically and socially feasible.

The goal of mine closure for the Project is to prevent and minimise adverse long-term impacts from mining and to create PMLUs based on an agreed set of objectives, as identified in Section 4.

Closure of the mine will ensure the site is:

- Safe to humans and wildlife
- Non-polluting
- Stable
- Able to sustain the relevant PMLU.

These overarching goals have been considered when planning the decommissioning and closure of the mine. Both progressive rehabilitation during the mining operations and final rehabilitation will meet the closure and rehabilitation goals.

4.1.1 Local government planning

The Department of State Development, Infrastructure, Local Government and Planning's *North-West Regional Plan, August 2010* outlines the vision for the north-west region. The north-west region has a robust, diverse, and sustainable economy and well-planned and coordinated infrastructure and services, built through the economic benefits of mining and agricultural industries. It is a place where people choose to live and visit due to its liveability, well-managed natural resources, and the community's strong sense of cultural identity.

The PMLUs for the Project are consistent with the overarching themes and visions within the *North-West Regional Plan.* Strategic directions outlined in the *North-West Regional Plan* include:

1. Creating a more sustainable future – by protecting biodiversity, building and maintaining community identity, improving transport, information technology and infrastructure and managing future demands on water and energy.
2. Protecting regional landscapes and supporting regional production values – distinctive rural and natural landscapes which support a range of uses and provide significant environmental, economic, cultural, and social benefits to the region.
3. Creating liveable communities – protecting the heritage character and improving the visual amenity of existing towns, while maintaining and enhancing services in line with government and private sector priorities.
4. Promoting a dynamic, robust, and diversified economy – the plan supports mining and rural production to ensure they are not adversely affected by other land use activities, while encouraging diversification of the economy and the raising of productivity by addressing skills gaps and shortages.
5. Providing infrastructure and services – supports improved access to workplaces, essential services and recreation, and encourages stronger connections throughout the region to improve the liveability of regional communities.
6. Integrating land use, economic activity, and transport infrastructure – the plan integrates land use and transport planning to (a) improve the efficiency of existing transport networks, (b) influence future transport infrastructure, (c) explore opportunities to align transport needs to land use to assist the region's economic growth and (d) link dispersed regional communities.
7. Adapting to climate change – focus on the need to develop planning strategies to reduce the region's climate change vulnerability.
8. Managing mining growth – focus on improving the gathering of quantitative information about the mining industry to support regional planning, address land use implications of individual projects, and build capacity and capability at a local government level to help to manage these impacts.

4.1.2 State and Commonwealth legislation

State and Commonwealth legislation which are relevant to the PMLU and the region are summarised in Table 4-1, including how the legislation relates to the Project.

Table 4-1 Legislation relevant to the Project

LEGISLATION	GENERAL DESCRIPTION AND HOW IT RELATES TO THE PROJECT
Planning Act 2016	Where land is included on a mining lease (ML) pursuant to the *Mineral Resources Act 1989*, closure and rehabilitation activities done under an EA do not require a planning approval from the local government.
EP Act 1994	Development of this PRCP in accordance with the EP Act and the related guidelines.
Aboriginal Cultural Heritage Act 2003 which give rise to *Duty of Care Guidelines, 2004*	All practical measures need to be taken to make sure closure activities do not harm Aboriginal cultural heritage, i.e., demonstrate 'cultural heritage duty of care'. The *Aboriginal Cultural Heritage Act 2003* (ACH Act) requires that, when carrying out an activity, all reasonable and practicable measures are taken to make sure that the activity does not harm Aboriginal cultural heritage. This is referred to as the cultural heritage duty of care. Aeris executed an agreement with the KNTC in October 2015. The Project has continued to comply with the agreement with KNTC, duty of care guidelines under s28 of the *Aboriginal Cultural Heritage Act* 2003 and liaise with the KNTC regarding the Project.
Water Act 2000 *Water Resource (Gulf) Plan 2007*	Rehabilitation of boreholes. No make-good agreements associated with disturbance to water quality, volume or water supply infrastructure were undertaken as part of mining within ML90241 and therefore do not impact on the proposed PMLU. Water bores will be handed to the landholder at closure.

4.1.3 Considerations in determining the PMLU

Land suitability classes refer to the capacity of the land resources to sustain land use such as cattle grazing, broadacre cropping, and conservation. These classes are derived through qualitative and quantitative interpretation of the data collected on the physical, chemical, and nutritional characteristics of the soil. The classification system ranks land suitability according to a five-class system. The classes are described in the Technical Guidelines (QDME, 1995) as:

Class 1 Suitable land with negligible limitations which is well suited to a proposed use.

Class 2 Suitable land with minor limitations which is suited to a proposed use, but which may require minor changes in management to sustain use.

Class 3 Suitable land with moderate limitations which is moderately suited to a proposed use, but which requires significant inputs to ensure sustainable use.

Class 4 Marginal land with severe limitations which is marginally suited for a proposed use and would require major inputs to ensure sustainability. These inputs may not be justified by the benefits to be obtained in using the land for a particular purpose and is hence considered presently unsuitable.

Class 5 Unsuitable land with extreme limitations which preclude its sustainable use for the proposed purpose.

Land suitability for the Project area was determined from the Soil and Land Suitability Assessment (SLSA) conducted by AARC in 2014. The most significant limitation to beef cattle grazing on the Project site is the soils' plant available water capacity (PAWC) and general nutrient deficiency of the soils within the study area. PAWC limitations stem from shallow soil resources. All soil management units were assessed as having a suitability class of 4 for grazing (Table 4-2).

Notwithstanding the classification derived from this assessment, grazing has been carried out on the lands within the area for many years.

Table 4-2 Land suitability classes for beef cattle grazing

SOIL MANAGEMENT UNIT	MOST LIMITING FACTOR/S	LAND SUITABILITY CLASS
SMU1	PAWC, Nutrient deficiency	4
SMU2	PAWC, Nutrient deficiency	4
SMU3	PAWC, Nutrient deficiency	4

This information was considered when proposing the PMLUs for the Project Area. Land will be returned to be a pre-mining land use of low intensity grazing in alignment with a Land Suitability Class 4 as identified in Table 4-2. No cropping will be undertaken in the area.

4.2 REHABILITATION AREAS

Each disturbance area requires a specific approach to rehabilitation with consideration for both the rehabilitation hierarchy and rehabilitation goals and the proposed PMLU.

Disturbance areas associated with the Project site are defined in Table A1 (Authorised Mining Activities) of the EA outlined in

Table 4-3. In total, there are four main types of disturbance associated with the Project, which have been transitioned to the RAs in the PRCP Schedule.

The following sections outline the summary of the RAs to be undertaken to achieve the PMLUs.

Table 4-3 Disturbance areas to be rehabilitated for Project (adapted from EA Amendment application supporting information Table 2)

REHABILITATION AREA	DISTURBANCE DETAILS	ACTUAL DISTURBANCE AREA (HA)
Voids	North Pit	3.3
	South Pit (includes Portal and vent shaft)	10.2
Waste Rock Dump	WRD	23.4
Ancillary Infrastructure, ROM, Exploration	ROM Pad, ROM pad dam & stockpiles	3
	Abandonment bunds	1.7
	Site Roads	11
	Light infrastructure area: Administration buildings, fuel storage, power facility, workshop area, concrete mixing, rail loading, sewage treatment facility	2.7
	Explosives Magazine	0
	WRD Sediment Dam	6
Water Management Infrastructure	Diversion Drains[1]	1.4
Total Disturbance		**62.7**

4.2.1 Pits and Underground

Both pits (including underground workings) have a proposed PMLU of water storage for livestock. Leaving the voids as water storages was considered most suited to the PMLU of low intensity grazing for the surrounding mining area. Water availability for grazing is limited at the site and the voids will provide a source of drinking water for livestock. Site access to the pits by the public is restricted by existing infrastructure.

A verbal agreement to transfer responsibility of the pits for use as water storage to the landholders is in place. A legal agreement has been provided to the landholder for comment and signing, see Section 3.2.

The portal and vent fan for underground mining are located within the South Pit. Each pit will have a combination of perimeter earthen bunding or fence with locked gate at entry to the pit for private access by the landholder only. High-density polyethylene pipes between the mine pits and sediment dam will be retained in order to transfer water from the pits to the surface of the dam as required. The entry ramp to each of the pits is via locked gates which provides the landholder flexibility in how he chooses to directly access and pump the water for the livestock (i.e., direct access down the ramp, pump to dam or holding tank and trough).The landholder, who is aware of the bunds, underground activities, fencing, gates, pit depths and water quality, will determine their preferred method to access water within the voids for stock watering.

4.2.2 Waste Rock Dump

During operations the WRD was constructed as a permanent landform based on known material characteristics and consequent placement, so that all identified potential acid-forming (PAF) material was placed in the centre, encapsulated by Non-acid forming (NAF) material.

[1] The total area for all diversion drains (1.4 ha) has been included in the schedule for rehabilitation, however it is planned that some will be retained in agreement with the landholder. Detail on drains to be retained or removed is provided in Section 6.10.2.

The WRD has been designed to be safe, stable, and non-polluting post-closure. To achieve the rehabilitation goals and objectives the closure design consists of an engineered cover system to prevent infiltration which could potentially generate acidic conditions and mobilise metals and / or metalloids. The preferred cover system has been designed based on cover trials set up and run in columns, by a suitability qualified environmental soil scientist, (refer to section 6.5.2). In addition, the installation of monitoring infrastructure, such as volumetric water content (VWC) and Matric suction sensors buried at different depths within the cover will be used to monitor water infiltration (Refer to 0 (SGM, 2023).

The WRD sediment dam and diversion drain to the east of the WRD sediment dam will be retained post closure (refer to section 6.10.2).

The total disturbance footprint of the WRD is approximately 23 ha. The angle of repose of the side batters at closure will be ≤37 degrees. The natural rill of the batters will create natural rock armouring / outcropping and potential habitat for fauna, to assist in achieving a PMLU of Native Ecosystem, comparable to the surrounding rock hills.

During Stage 1 underground mining all PAF material temporarily stored on the ROM Pad and NAF temporarily stored on the WRD will be returned back underground as backfill.

4.2.3 Ancillary infrastructure, roads, and ROM pad

All crushing plant associated buildings and equipment will be dismantled and removed from the site upon cessation of the Project, unless required by the landholder.

The following mine infrastructure will be transferred to the landholder once EA rehabilitation objectives have been met:

- Sediment dam
- Voids as water storages
- Culverts (remain along roads to allow clean water movement across sites)
- All roads (4 m in width)
- All HDPE pipe (leave on-site)
- All concrete slabs
- Fenced storage areas (magazines)
- Water tanks at administration.

All access tracks and haul roads on the Project will be ripped and revegetated unless they are 4 m in width or greater as these will be transferred to the landholder.

The ROM pad will be excavated to a depth of 0.5 m, or refusal, to ensure the removal of ore and any potentially contaminated materials. Contaminated material from the ROM will either be placed underground as backfill or in the south pit, under the return pit lake level. The minor contaminated material will be underwater and therefore not exposed to oxidation processes. Contaminated material from infrastructure areas will be placed in the voids and not in the WRD. Benign material will be used either as capping material or regraded and revegetated (Section 0).

Sediments from the ROM dam (currently undisturbed) would be removed and dumped in the South Pit. The area will be reshaped and revegetated for low intensity grazing.

The remaining disturbed areas will be reshaped where required, deep ripped to remove compaction, and revegetated using the methods described in Section 0 of this document.

The PMLU for ancillary infrastructure, ROM pad and roads will be low intensity grazing.

4.2.3.1 Exploration areas

The PMLU for exploration areas is the same as for the ancillary infrastructure, roads and ROM pad disturbed areas. The PMLU will be low intensity grazing. It is proposed that the roads and tracks greater than 4 m width will remain for the landholder.

Exploration disturbances have been rehabilitated in accordance with the Code of Environmental Compliance for Exploration and Mineral Development Projects:

- Drill holes have been immediately capped.
- Once dry the sump has been backfilled.
- Holes are grout filled or capped at a depthless than 0.5 m.
- Disturbed areas have been scarified to encourage revegetation.

Exploration areas are to naturally regenerate. In the event this is not successful, native seed will be sown prior to the wet season.

4.2.4 Diversions and Levees

As part of the closure planning and remediation works the following infrastructure is to be retained post-closure:

- Diversion drain (and levee) to the west and south of the North Pit
- Diversion drain to the north of the North Pit
- Diversion drain to the east of the WRD Sediment Dam

The diversion drain to the east of the North Pit will be removed to facilitate inflows to the North Pit, with the final land use being stock water storage for the property owner.

The Sediment Dam Western drain and levee will be removed and rehabilitated. Refer to Section 6.10.2 for further descriptions on diversions to be retained and removed post-closure.

4.3 PRCP SCHEDULE

The PRCP Schedule has been prepared for submission to DES using the DES spreadsheet template ESR/2019/5103.xls.

The PRCP schedule has been updated to include the portal and vent fan for underground in the South Pit as Rehabilitation Area 1 (RA1) and rehabilitation activities in RM1 as per the methods presented in section 6.8.2.

Underground mining is planned in two stages: Stage 1 will commence in January 2025, pending approval and last for approximately two (2) years. Pending a future amendment and approval Stage 2 is a proposed continuation of operations and underground mining. All surface mining infrastructure will be utilised during underground mining of Stage 1 therefore areas will not become available for rehabilitation until the end of Stage 1 in Dec 2026,. The 'Date area is available' has been updated for all RA's (RA1-RA4) with completion of decommissioning, remediation, surface preparation and seeding being completed at the end of Stage 1, in the event Stage 2 is not approved and commenced. It is planned that this work would occur as a campaign towards the end of Stage 1 and with appropriate forward planning the achievement of milestones can be achieved within approved PRCP timeframes.

The timestep in Table 4-4 visually shows when rehabilitation will occur over a 12-year period at the end of Stage 1.

The PRCP schedule does not prevent the RM activities from being undertaken sooner than proposed should areas become available.

Table 4-4 Stage 1 Visual Timestep for Operations and Rehabilitation

Project Stage	Activities	Years													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
		Dec-25	Dec-26	Dec-27	Dec-28	Dec-29	Dec-30	Dec-31	Dec-32	Dec-33	Dec-34	Dec-35	Dec-36	Dec-37	Dec-38
Operating	Underground Mining Stage 1														
Closure and Rehabilitation	RMs 1, 2, 3, 4, 5, 6, 7, 14														
	RMs 10 and 11														
	RMs 12 and 13														

4.3.1 Final site design

Figure 4-1 shows the PMLU across the Project Area. This figure shows the total area disturbed by mining (maximum disturbance footprint approved under the EA) the permanent infrastructures and the PMLU (low intensity grazing, water storages, native ecosystems).

There are no non-use management areas (NUMAs) proposed.

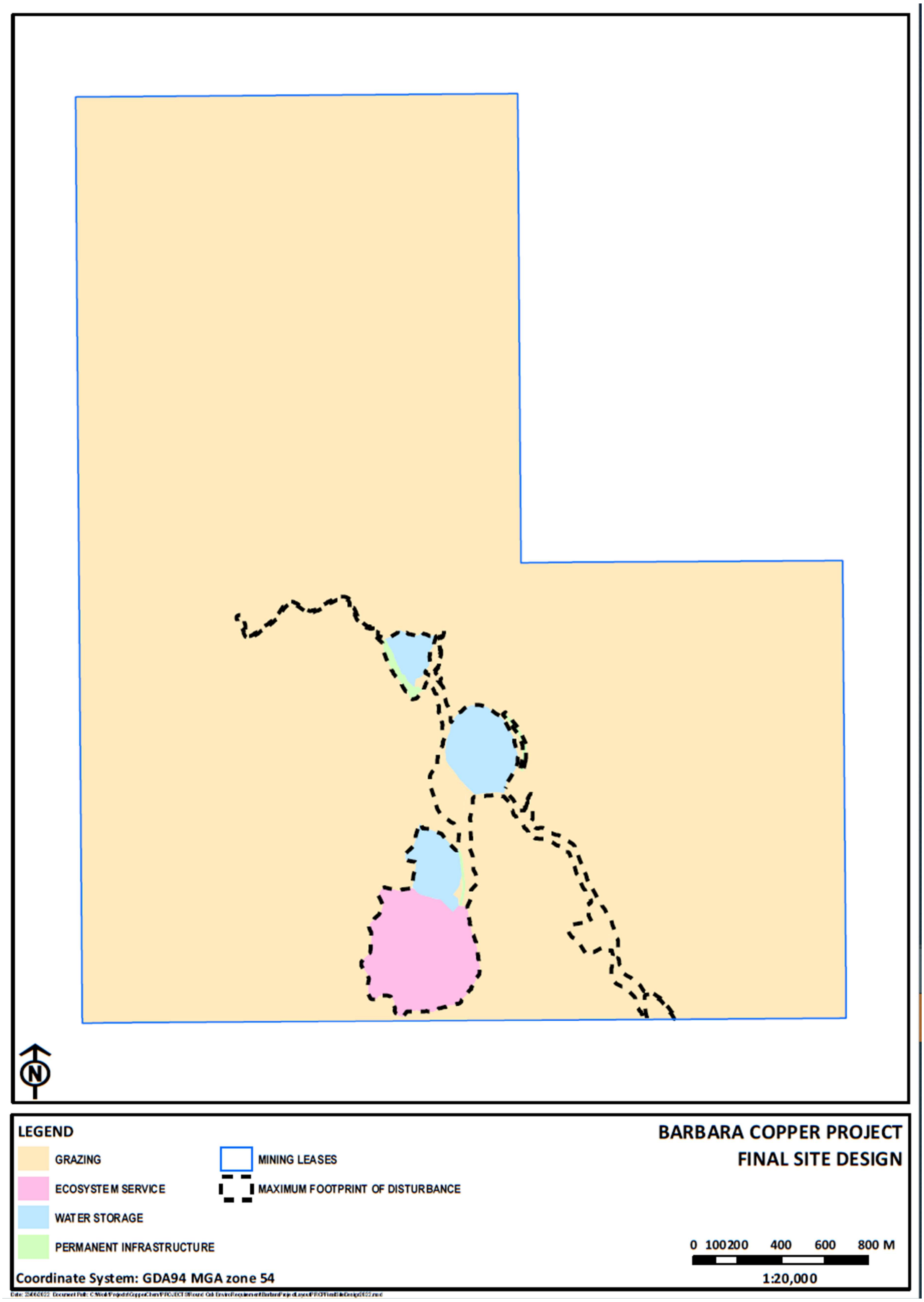


Figure 4-1 Final site design and conceptual PMLU

5 NON-USE MANAGEMENT AREA

No NUMAs are proposed in this PRCP.

6 REHABILITATION MANAGEMENT METHODOLOGY

Historically, mining activities and cattle grazing have been the predominant land use. The proposed PMLU for the Project area is to return to the pre-mine land use of low intensity grazing for all Mine Infrastructure areas including roads, exploration areas and ROM pad.

The residual voids (North and South Pit), and the WRD sediment dam will have a PMLU stock water storage for livestock. The WRD will have a PMLU of native ecosystem. Some of the diversions drains and levees identified in Section **Error! Reference source not found.** will remain as water management infrastructure. Diversion infrastructure that is not being retained will be rehabilitated to PMLU of low intensity grazing.

An understanding of the existing environment prior to mining is important to obtain baseline characteristics of the site. This baseline can then be used for a comparison to the post-mining environment and assist in developing suitable rehabilitation milestone criteria. Further detail of the existing environment is included in Section 2.2.

The groundwater, surface water, soil, geology, and geochemistry properties play an important role in the mine planning and closure processes. The baseline characteristics of the area, such as the physical and chemical properties of the soil can be used to consider potential impacts of the differing soil properties on rehabilitation (e.g., soil pH, limited topsoil).

The geology and geochemistry properties at the site have been studied to plan the mining sequence and determine if there is potential for any acid generating material over the life of the mine and post closure.

The existing soil at the Project site includes three different SMUs according to the SLSA classification: SMU1 identified as River Red Gum Sands; SMU2 identified as Cloncurry Box Drainage Terraces and SMU 3 identified as Snappy gum slopes. All three SMU soils constitute a Tenosol under the Australian Soils Classification. This type of soil is characterised by having a weak and shallow profile (Isbell, 2016).

Characterisation of Net Acid Producing Potential (NAPP) and Net Acid Generation (NAG) properties of the samples was undertaken to examine the potential for Acid Mine Drainage (AMD) (EGi, 2014). Based upon the acid forming properties of the material, water which remains in contact for medium to long-term durations, may exhibit AMD. NAPP and NAG characterisation demonstrates most waste rock samples are non-acid forming (NAF), while ore samples are distributed between NAF and potentially acid forming (PAF). Kinetic column leach testing was undertaken for one year under conditions amenable to sulphide oxidation on waste rock and ROM oxide samples (EGi, 2020). Long-term leach results indicated that overall, the leachate was slightly alkaline, low in soluble salts and, apart from copper or arsenic in some samples, only had trace concentrations of metals. The PAF waste rock sample did not acidify during the 12-months period, indicating a lag period of at least a year for this type of material.

Baseline flora and fauna surveys recorded both feral and pest animals and flora species (see 0 and 0). No fauna species listed as threatened under the EPBC Act were identified in the Project area. Furthermore, no Back on Track Priority fauna species identified in the region were recorded. No essential habitat for threatened fauna was identified on the Regional Ecosystem mapping for the Project site. Database searches also revealed that no threatened ecological communities and species occur in the region in which the Project is located. One Environmentally Sensitive Area identified as an Endangered Regional Ecosystem is mapped at the Project site.

The existing environment does not highlight any major restrictions for the proposed PMLUs of low intensity grazing for Ancillary infrastructure, ROM pad, roads and exploration, water storage (for the pits and sediment dam), water management infrastructure for the diversion drains (North Pit creek diversion and levee, South Pit diversion and WRD Sediment Dam eastern diversion), and Native Ecosystem for the WRD.

Rehabilitation milestone criteria proposed for the Project are described in the PRCP Schedule will be used to demonstrate disturbed and constructed landforms meet the PMLUs.

The final WRD landform will be constructed based on design using drawing and verification of construction methods by suitably qualified engineers (SQE). The Quality Assurance/Quality Control (QA/QC) will be completed by Aeris Resources and other third parties, with verification by SQEs, whereby the construction method is validated through surveys at each constructed layer and compaction field testing for optimum moisture content, moisture variation and density ratio. Field tests and material testing will confirm suitability of cover material.

6.1 HYDROGEOLOGY

Groundwater at the Project site is primarily associated with the ore body. Groundwater exists in fractured rock aquifer systems in the rhyodacite, schist and amphibolite units. Monitoring in exploration holes in October 2013 (pre-mining) suggested a median depth to groundwater of approximately 12 m below the ground surface (Rob Lait & Associates, 2013).

The North and South pits (including underground workings) will remain as a PMLU of water storage.

ATC Williams (2023a) modelled the groundwater inflows post closure using the GoldSim Pro water balance model. The model used climate parameters ranges and catchment runoff processes to calculate storage volumes. ATCW (2024) updated the WBM assessing the impacts of groundwater into the underground working and surface water from the pit to the underground workings via the stopes at the base of the Pit and backfilled portal, refer to Appendix X .

6.1.1 Groundwater Conceptual Model

The description of the groundwater environment and detailed groundwater conceptual model is provided in the report "*Barbara Copper Project Progressive Rehabilitation and Closure Plan. Groundwater Technical Report.*" (WMV Environmental, 2023), attached as 0, and discussed in Section 2.2.6.

A summary of the conceptual groundwater model is provided in Table 2-6.

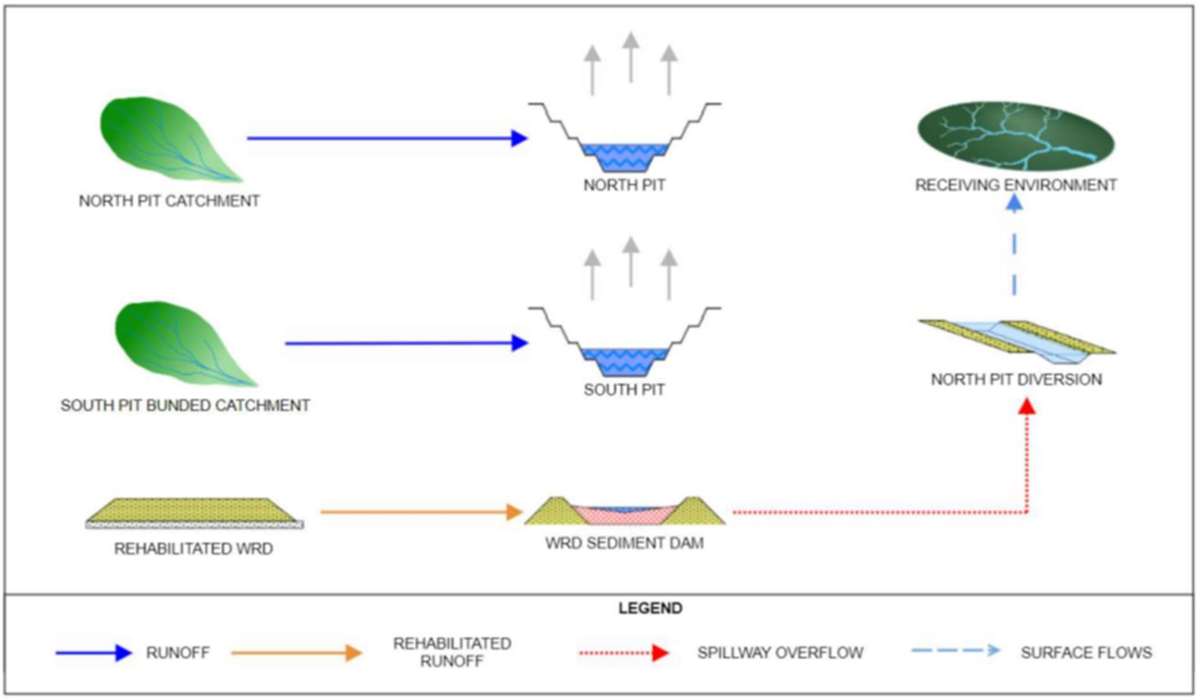
Final void water quality modelling by ATC Williams (2023) and further water quality assessment by WMV Environmental (2023) indicate that the water quality within the open pits and sediment dam will remain below ANZECC livestock drinking water quality guidelines and that potential stratification in the open pits and seepage of potentially AMD-impacted groundwater will not adversely affect storage water quality. Stage 1 Underground Mining will not require dewatering of the South Pit therefore the assumptions for the post closure water balance and long-term water quality for the Open Cut are applicable to Stage 1, refer to Sections 6.1.2.1.

Stage 2, not yet approved, requires dewatering the South Pit to allow safe mining within proximity of the bottom of the Pit (removal of the crown pillar). The Stage 2 final voids, underground workings and Sediment Dam water quality post-closure is not considered to adversely impact the groundwater environment, refer to Section 6.1.2.2.

6.1.2 Water Balance Models (WBM)

6.1.2.1 Open Cut WBM

ATC Williams developed a water balance model (WBM) for the BCP Project using GoldSim Pro (GoldSim v14) (0). The WBM was used to assess the impact of surface water runoff (mine impacted and non-impacted), evaporation and groundwater in/outflows on water levels within the North Pit, South Pit and WRD Sediment Dam. The outcomes of the WBM are presented in ATC William's report "*Aeris Resources - Barbara Copper Project - Progressive Rehabilitation and Closure Planning – Water Management Plan and Water Balance Model. Ref: 118131.12.R03 – dated 17 February 2023*".



Error! Reference source not found. **provides a conceptual flow diagram of the hydrological setting used to develop the water balance model.**

The GoldSim WBM uses the Australian Water Balance Model (AWBM) as the rainfall-runoff model to simulate runoff within catchments based on precipitation and potential evaporation time series. A stochastic model was adopted to represent future climatic conditions (i.e. daily precipitation and evaporation) based on existing historical rainfall data.

The model assumes that all previously disturbed areas have been successfully rehabilitated and removed from the mine water management system. Modelling inputs and assumptions are as follows:

Based on details of the groundwater monitoring bores outlined in Rob Lait & Associates (2016) groundwater inflow rates have been calculated using the Dupuit-Forchheimer approximation and outflows to the pit voids have been estimated through 'Darcy's Law for Flow in Confined Aquifers'. Groundwater outflows from the North Pit to the South Pit have been estimates to be approximately 0.0028 L/s based upon the guidance of Woessner and Poeter.

The pit and sediment dam configurations as at the end of mining were adopted with the storage characteristics detailed in Table 6-1 and illustrated in **Figure 6-1**. Two different scenarios were adopted for the South Pit, to determine the best configuration of the bund/fence arrangement surrounding the South Pit, i.e. Scenario 1 with a catchment area of 14.1 h and Scenario 2 with an area of 21.7 ha.

Table 6-1 Pit and sediment dam parameters (ATC Williams, 2023a)

PARAMETER	NORTH PIT	SOUTH PIT	SEDIMENT DAM
Pit Rim Elevation	RL 313.0 m	RL 334.0 m	RL 338.0 m
Pit Base Elevation	RL 295.0 m	RL 211.5 m	RL 329.3 m
Total Pit Capacity to Rim	112.7 ML	3,272 ML	131.9 ML
Approximate Pit Depth or Depth to Spillway	18 m	122.5 m	7.5 m
Pit Water Level*	RL 304.53 m	RL 232.30 m	RL 332.24 m
Pit Extents	3.3 ha	10.2 ha	3.0 ha

* As of 4 September 2022

Climatic data used for the model was sourced from Scientific Information for Landowners (SILO) and is summarised in Table 6-2.

Table 6-2 Rainfall and evaporation inputs (ATC Williams, 2023a)

CLIMATE DATA	DATA SOURCE	COMMENTS
Daily Rainfall Rate (mm/day)	Rainfall data obtained from the SILO Data Drill Program for the Site Location (1889 - 2023)	Applied over dam surface areas, and as an input parameter for the estimation of surface runoff (AWBM).
Daily Evaporation Rate (mm/day)	Continuous record from SILO Data Drill formed by conjoining: CLIMARC estimates (1889 – 1957) and Class A Evaporation Data from proximate weather stations within the region (1889 – 2023).	Evaporation Data is scaled by evaporation factors for each site storage to reflect water storage conditions and expected water quality.
Daily Evapotranspiration Rate (mm/day)	As calculated by the FAO short crop reference methodology, assuming a wind speed of 2 m/s.	PET is calculated based on temperature, vapour pressure and solar global exposure parameters derived from climatic data and is adopted as a reasonable estimate of potential evapotranspiration losses from ground surfaces within the model.

The Australian Water Balance Model (AWBM) was used to simulate runoff volume post rainfall events. Details relating to catchment types on site and additional AWBM input parameters adopted for the model are detailed in Table 6-3 and Table 6-4.

Table 6-3 Water balance parameters - Rainfall and evaporation data

AWBM PARAMETERS	SPLIT AREAS (SUM =1)			STORAGE CAPACITIES (MM)			SURFACE RECESSION CONSTANT (KS) DAY^{-1}	BASE FLOW INDEX (BFI)	BASEFLOW RECESSION CONSTANT (KB)
	A1	A2	A3	C1	C2	C3			
Natural	0.13	0.43	0.43	12	120	250	0	0	1
Hardstand	1.00	0.00	0.00	3	0	0	0	0	1
Waste	0.20	0.80	0.00	10	300	300	0	0	1
Open Cut	0.10	0.90	0.00	5	20	20	0	0	1
Rehab waste	0.10	0.30	0.60	20	55	100	0	0	1
Stockpiles	0.10	0.90	0.00	5	50	50	0	0	1

Table 6-4 Total catchment areas

SURFACE RUNOFF TYPE	NORTH PIT	SOUTH PIT	WRD SEDIMENT DAM
Natural	10.1	-	7.8
Rehabilitated	-	-	20.3
Hardstand	0.5	3.2	4.6
Open cut	3.1	8.2	-
Surface Water Area (at full supply)	1.5	8.2	3.0
Total catchment area	**10.2**	**Scenario 1 – 14.1** **Scenario 2 – 21.7**	**35.7**

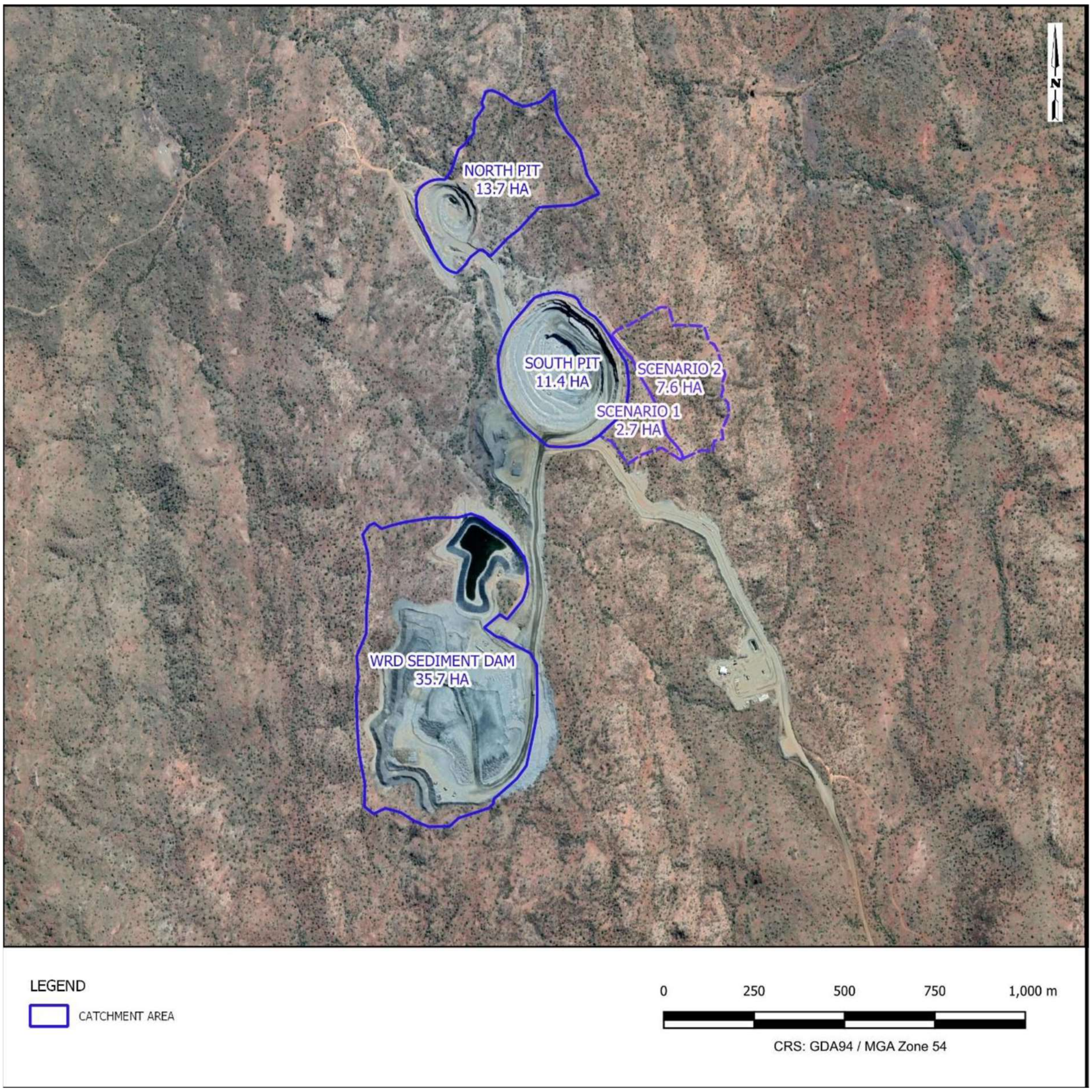


Figure 6-1 North and South pits post-closure catchment areas (ATC Williams, 2023a)

The water balance modelling results can be summarised as follows.

North Pit

- Rapidly accumulates water to 2033/2035, after which it reaches a state of 'dynamic equilibrium'. The 'dynamic equilibrium' has minor variations throughout the year to account for periods of rainfall and evaporation.
- The mean (average) water level in the North Pit reaches a level of approximately RL 308.5 m to RL 309.5 m, with variations throughout the calendar year during periods of rainfall and evaporation. The water level in the North Pit reaches the spill level of RL 313m in years where the rainfall exceeds the 85th percentile.
- In any given year, the spill risk from the North Pit is approximately 9%.
- Whilst the North Pit overtops in events greater than the 85th percentile climate conditions, the pit remains a net groundwater sink most of the time.

- The maximum modelled water level is approximately RL 313 m. The minimum modelled water level is approximately RL 303 m. These values represent the historically 'wettest' and 'driest' years occurring consecutively through the simulation.

The results of water balance modelling for the North Pit are displayed in Figure 6-2 to Figure 6-3

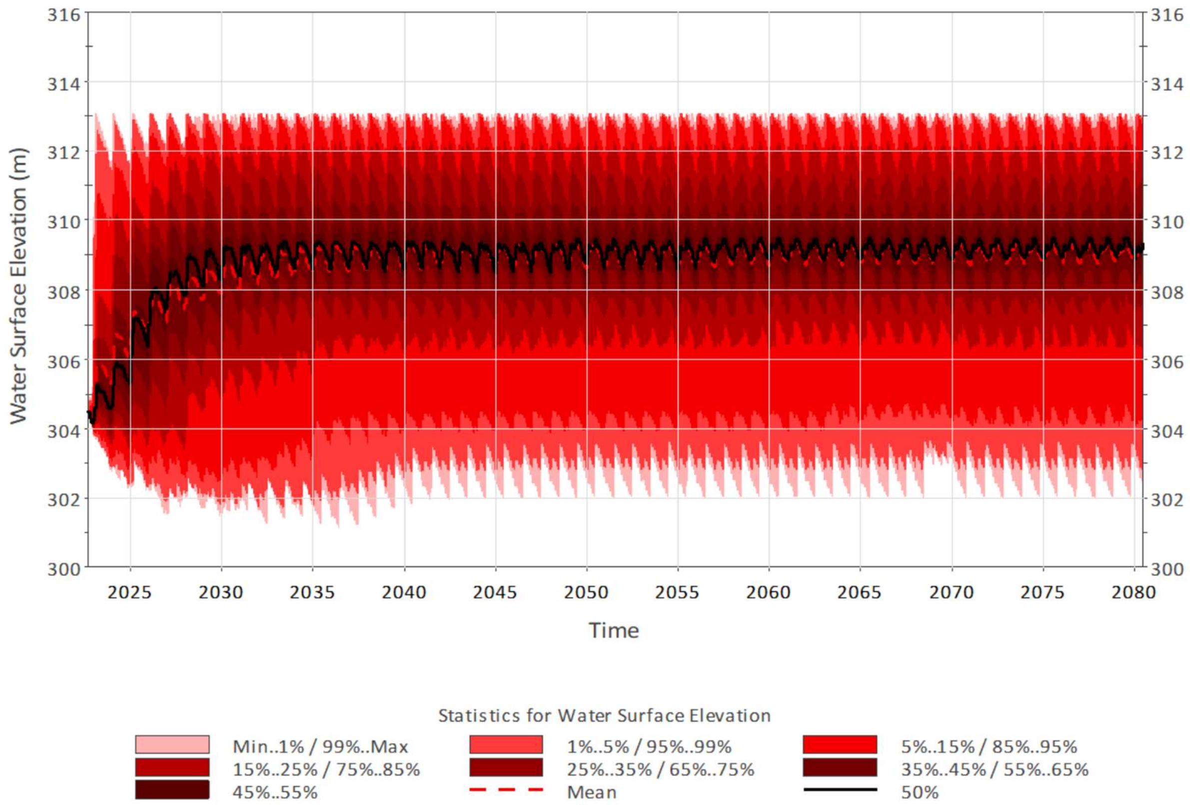


Figure 6-2 North Pit Water Surface Elevation (ATC Williams, 2023a)

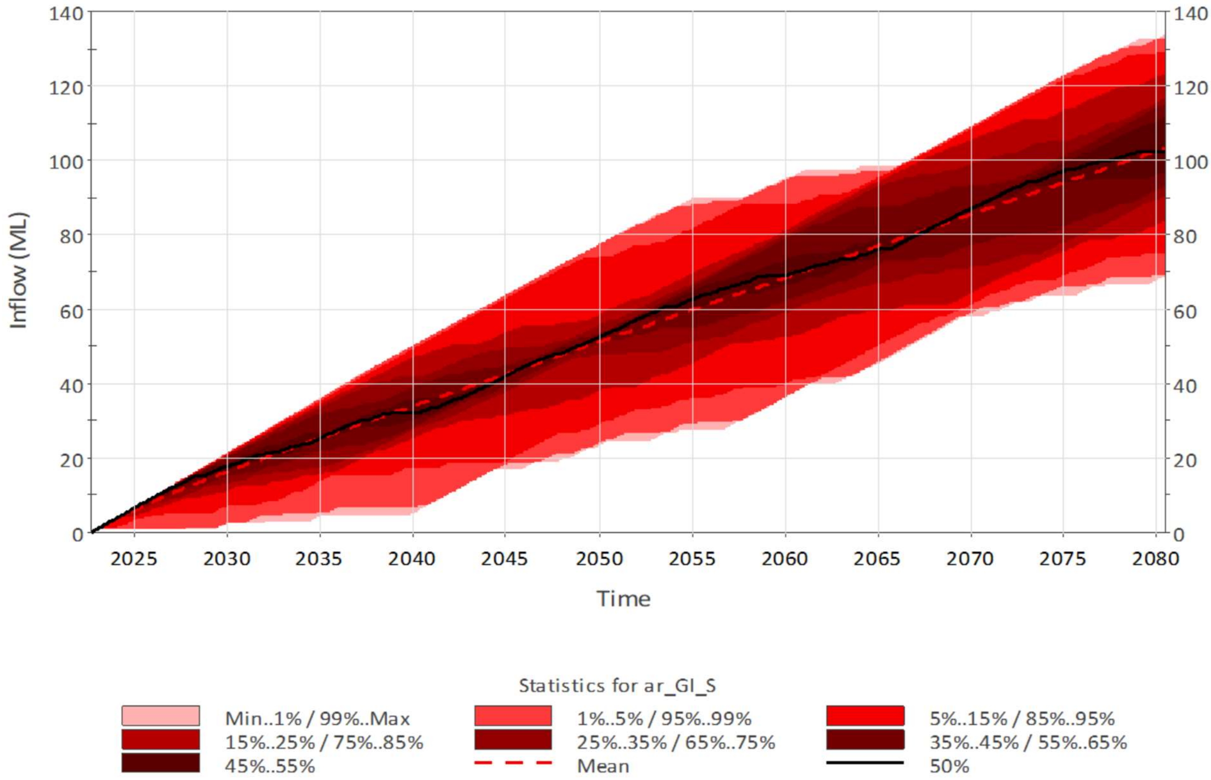


Figure 6-3 North Pit Accumulated Groundwater Inflows (ATC Williams, 2023a)

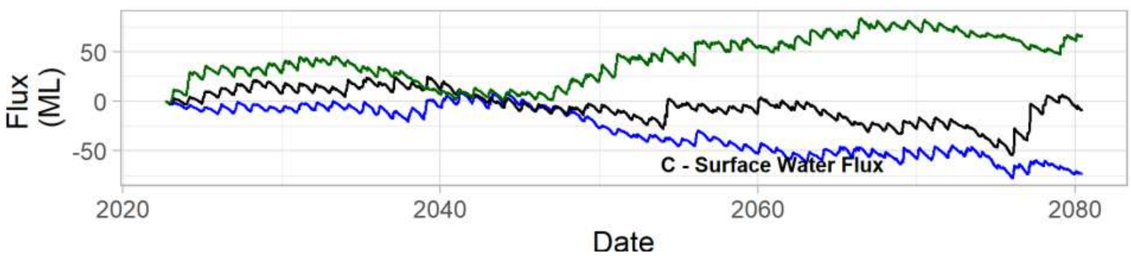


Figure 6-2 North Pit Accumulated Surface Water Inflows (ATC Williams, 2023a)

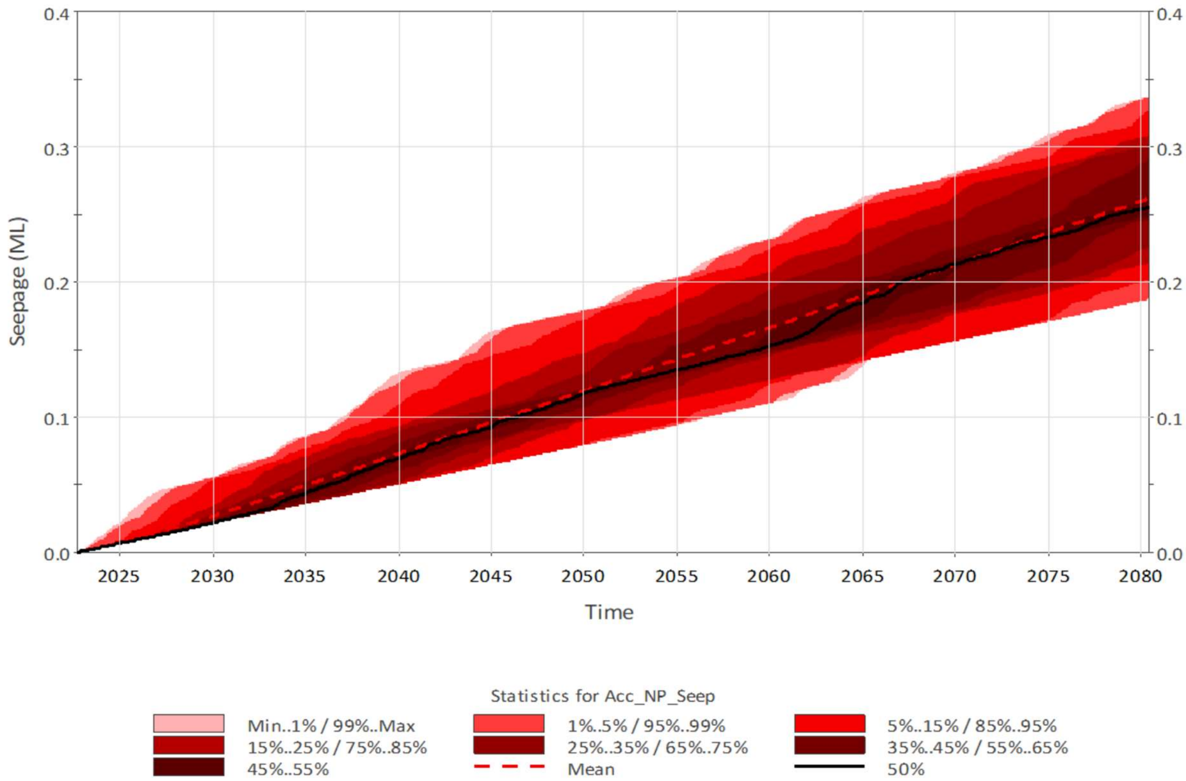


Figure 6-3 North Pit Accumulated Groundwater Outflows (including to flow to South Pit) (ATC Williams, 2023a)

South Pit (Stage 1 underground only)

- Rapidly accumulates water to the year 2040, with the rate of accumulation reducing by 2060 (under Scenario 1) or 2065 under Scenario 2, after which the pit reaches a state of 'dynamic equilibrium'. The 'dynamic equilibrium' has minor variations throughout the year to account for periods of rainfall and evaporation.
- The mean (average) water level in the South Pit reaches a level of approximately RL 286.5 m to RL 287.5 m (under Scenario 1) or approximately RL 290 m to RL 291 m (under Scenario 2).
- The water level in the South Pit never reaches the rim level of RL 334 m under both scenarios. As such, there are no modelled spills or overtopping events. This indicates the South Pit achieves long-term containment.
- The minimum and maximum modelled water levels are approximately RL 295 m and RL 280 m under Scenario 1 and RL 282 m and RL 300 m under Scenario 2. The minimum modelled water level is approximately RL 280 m. These values represent the historically 'wettest' and 'driest' years occurring consecutively through the simulation.
- The South Pit remains a net groundwater sink. As such, there were no modelled groundwater outflows.

The results of water balance modelling for the South Pit are displayed in Figure 6-4 to Figure 6-9.

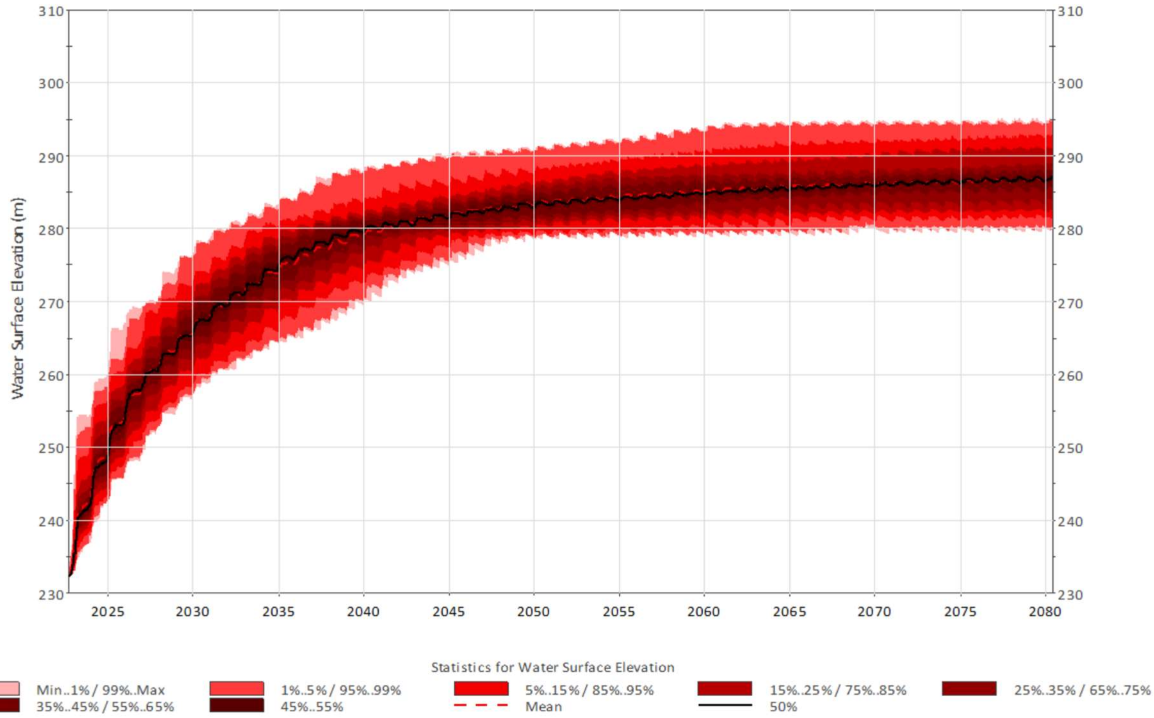


Figure 6-4 South Pit Water Surface Elevation – Scenario 1 (ATC Williams, 2023a)

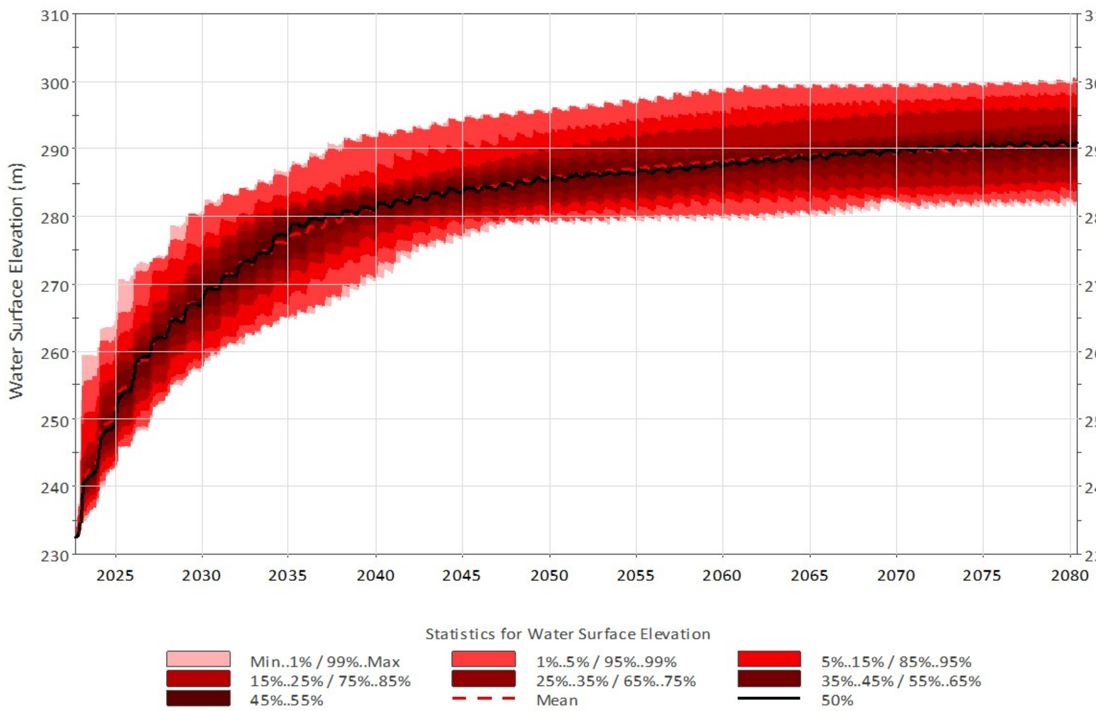


Figure 6-5 South Pit (Scenario 2) Water Levels (ATC Williams, 2023a)

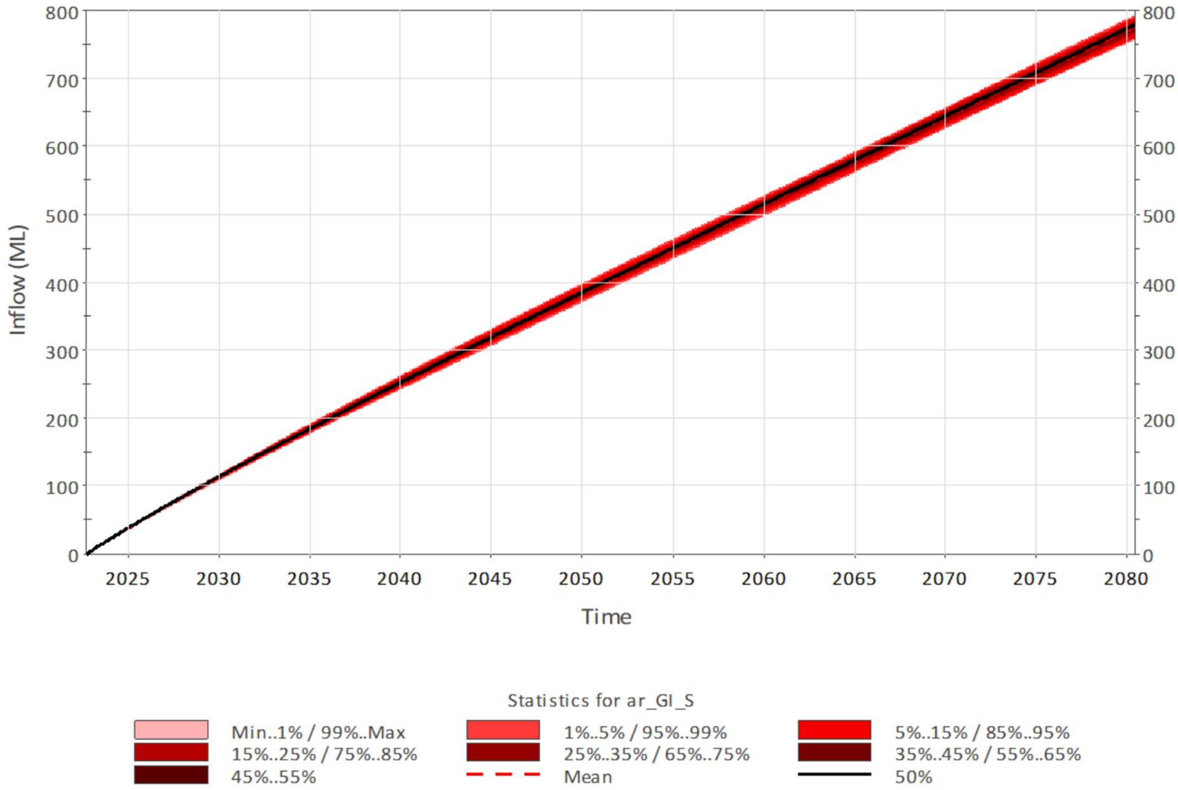


Figure 6-6 South Pit accumulated groundwater inflows – Scenario 1 (ATC Williams, 2023a)

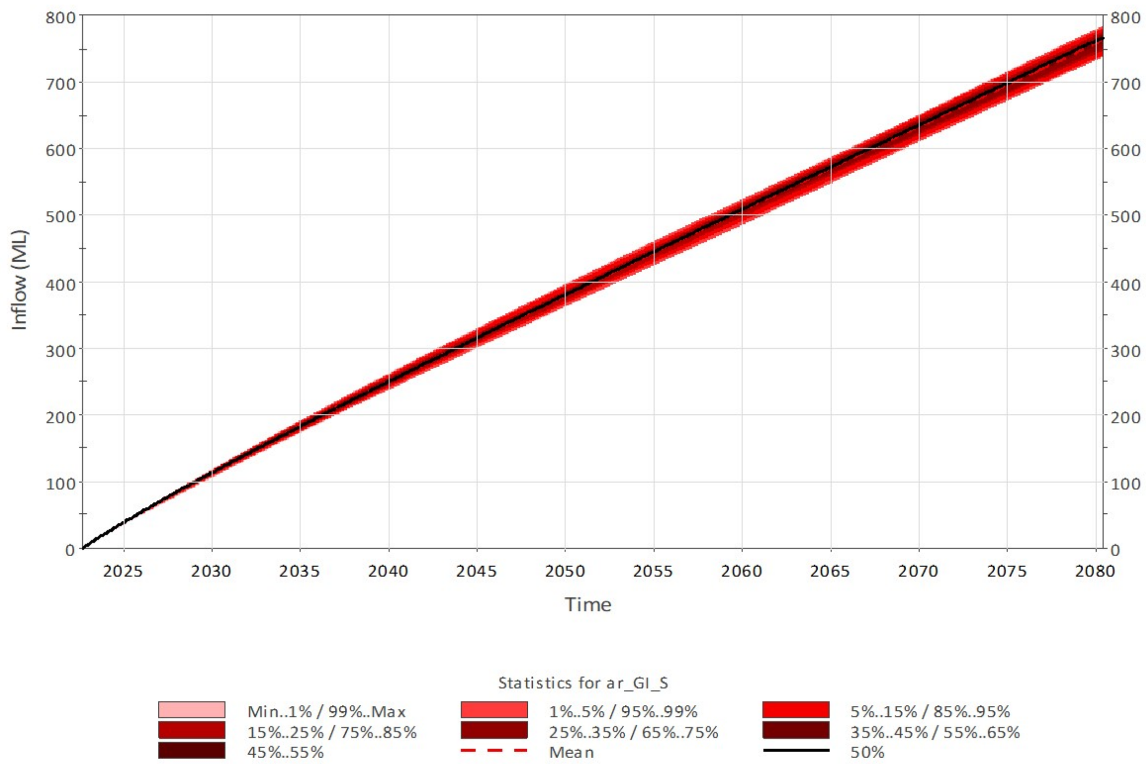


Figure 6-7 South Pit (Scenario 2) Accumulated Groundwater Inflows (ATC Williams, 2023a)

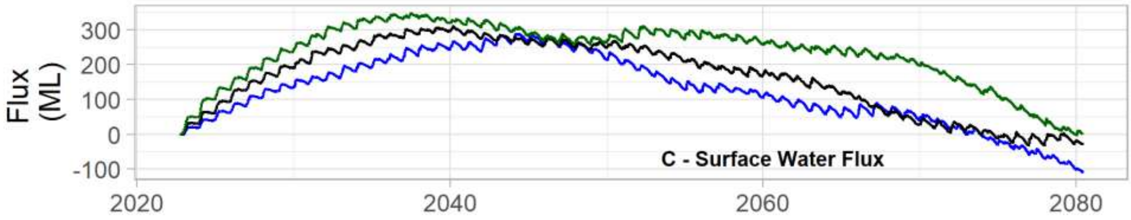


Figure 6-8 South Pit (Scenario 1) Accumulated Surface Water Inflows (ATC Williams, 2023a)

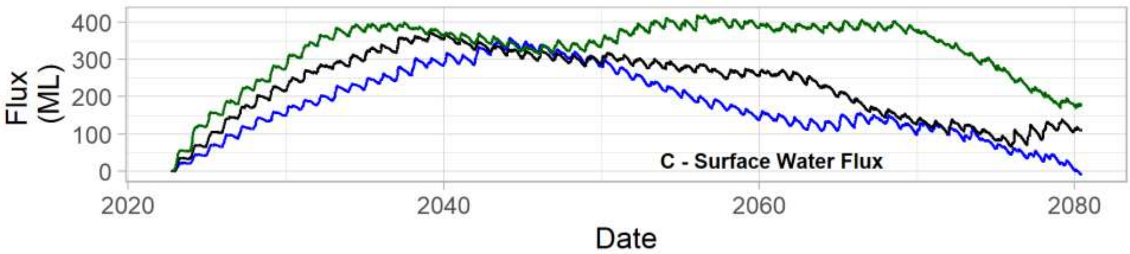


Figure 6-9 South Pit (Scenario 2) Accumulated Surface Water Inflows (ATC Williams, 2023a)

WRD Sediment Dam

- Rapidly accumulates water to 2027, after which it reaches a state of 'dynamic equilibrium'. The 'dynamic equilibrium' has minor variations throughout the year to account for periods of rainfall and evaporation.
- The mean (average) water level in the WRD Sediment Dam reaches a level of approximately RL 333 m to RL 334 m.
- The water level in the WRD Sediment Dam reaches the spillway level of RL 337 m each year, equivalent to rainfall exceeding the 95th percentile.
- Due to the presence of the HDPE liner on the WRD Sediment Dam, no groundwater inflows or outflows were included or modelled.

The results of water balance modelling for the WRD Sediment Dam are displayed in Figure 6-1012 and Figure 6-1113.

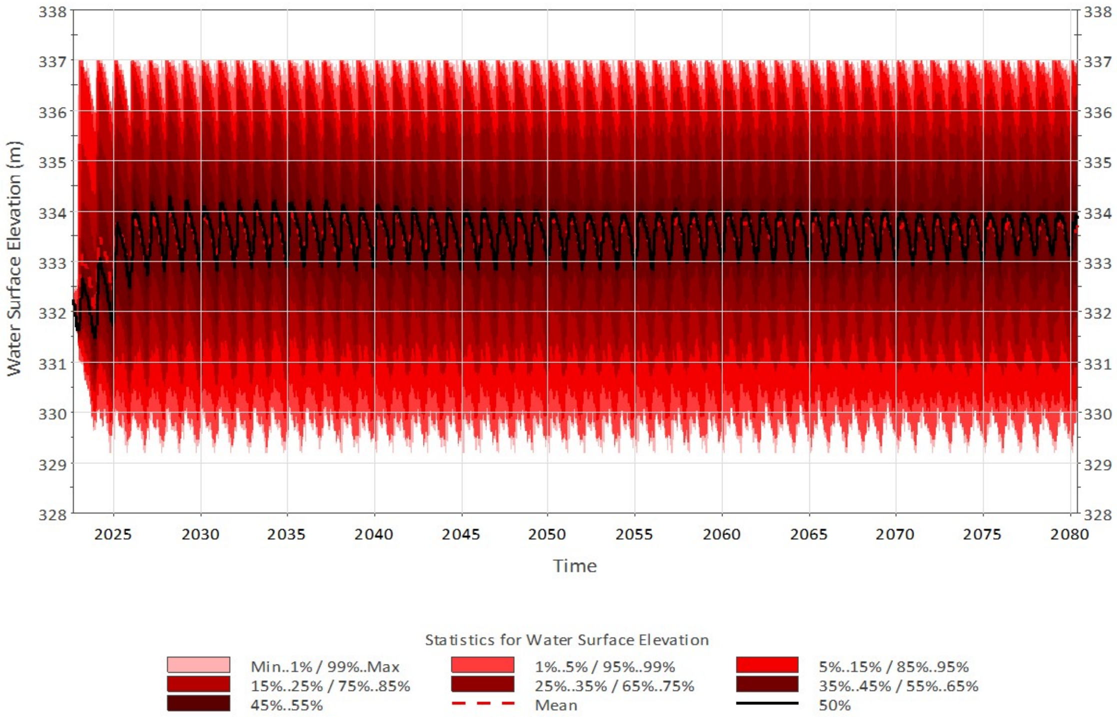


Figure 6-10 WRD Sediment Dam Water Levels (ATC Williams, 2023a)

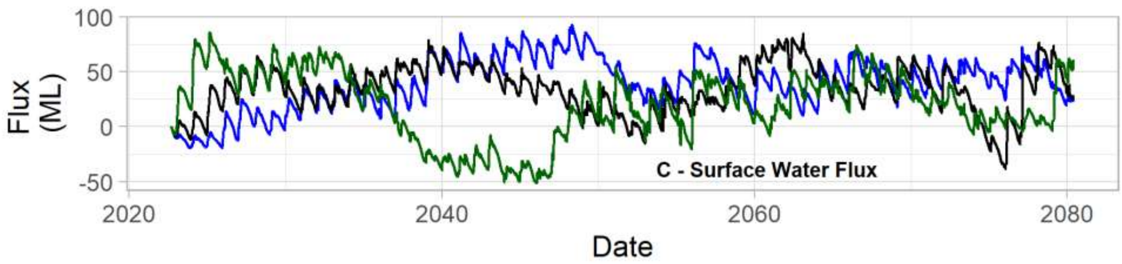


Figure 6-11 WRD Sediment Dam Accumulated Surface Water Inflows (ATC Williams, 2023a)

Pit lake water levels in the voids post-closure were estimated by ATC Williams (2023a) between RL 308.5 and 309.5 m for the North Pit and between RL 286.5 m and RL 287.5 m for the South Pit.

6.1.2.1.1 Stage 1 Underground WBM

The impact of the Stage 1 underground development on the water balance of the existing voids (WRD Sediment Dam, North Pit and South Pit) is considered negligible as:

- The Stage 1 underground development does not require dewatering of the South Pit.
- There is negligible hydraulic connectivity between the underground development and the South Pit, as the portal for the underground development is at RL 1308mRL (above the water level in the pit) and as the crown pillar will remain in place.
- Given the limited size of the underground development, groundwater inflow and radius of drawdown are considered minimal and are not considered to affect the water levels in the South Pit and North Pit.
- The water demand for the Stage 1 underground development (e.g. for dust suppression is minimal and estimated to be 10ML/month, i.e. ±120ML/year. Based on the South Pit storage curve (see Figure 4 in Appendix U(c)), this volume can be sourced from the South Pit without significantly affecting the water level in the South Pit.

- There is no requirement to transfer/use water from the North Pit or WRD Sediment Dam for the Stage 1 underground development.

Based on the above, it can be concluded that the Stage 1 underground development will not affect the water balance of the WRD Sediment Dam, the North Pit and the South Pit. Therefore, the results of the water balance for the Open Cut in Section 6.1.2.1 and the water quality studies for the open cut Section 6.1.4.1, both which assumed no underground development, and the timings relating to the voids remain valid. Refer to Appendix U(c) BCP UG Stage 1 and 2 Water Balance and Water Quality Modelling (WMV 2024).

6.1.2.2 Open Cut with Stage 2 Underground WBM

The Water Balance Model (WBM), using GoldSim Pro was updated to incorporate underground workings that require the dewatering of the South Pit. Based on the staged approach Stage 2 will not commence, once approved, until January 2027. The Water Balance Model Process Flow is shown in Figure 6-14 (ATCW, 2024 in Appendix X). The Water Balance Model (WBM), was extended to a period of 200 years (Appendix U(b)).

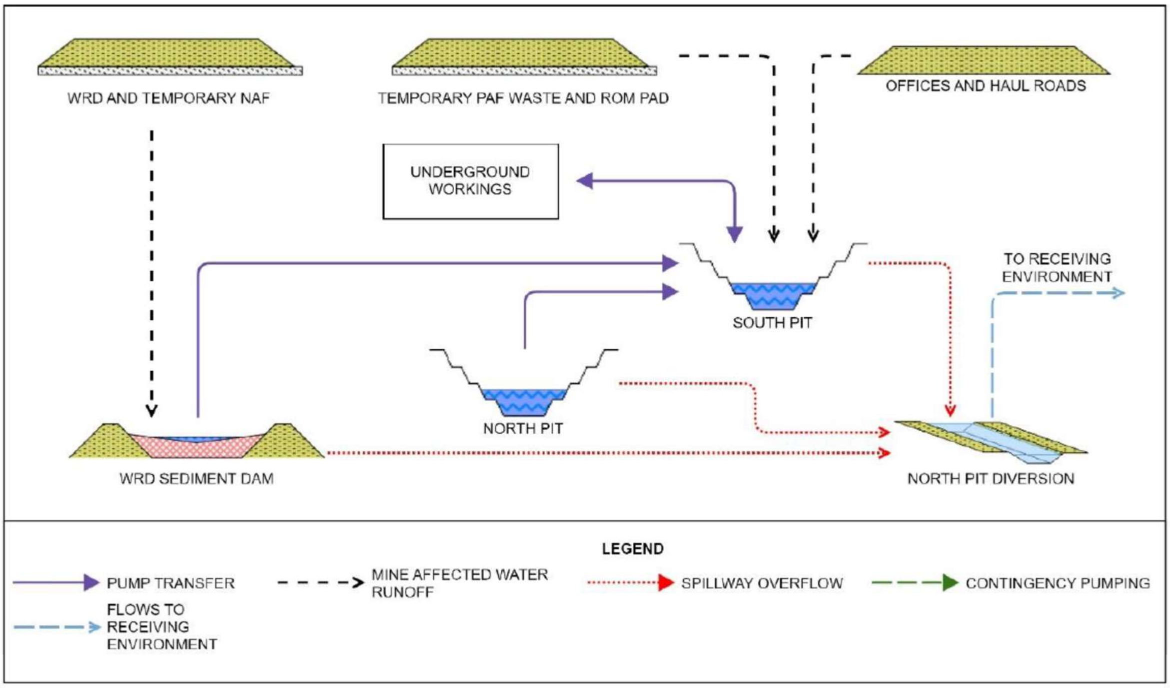


Figure 6-12 Water Balance Model Process Flow Diagram (ATCW, 2024)

South Pit (Stage 2 underground)

- Under mean climatic conditions, the South Pit is rapidly dewatered by October 2025 to meet site water demands.
- Under mean rainfall conditions, the South Pit does not store any water until February 2041, as all rainfall and runoff enters the underground workings as the crown pillar has been removed.
- The average water level in the South Pit at the end of the 200-year simulation is 292m AHD, reaching a maximum elevation of 299m AHD (35.3 m below the crest). The pit does not overtop or spill (Figure 6-15)
- The South Pit remains a net groundwater sink. As such, there were no modelled groundwater outflows.

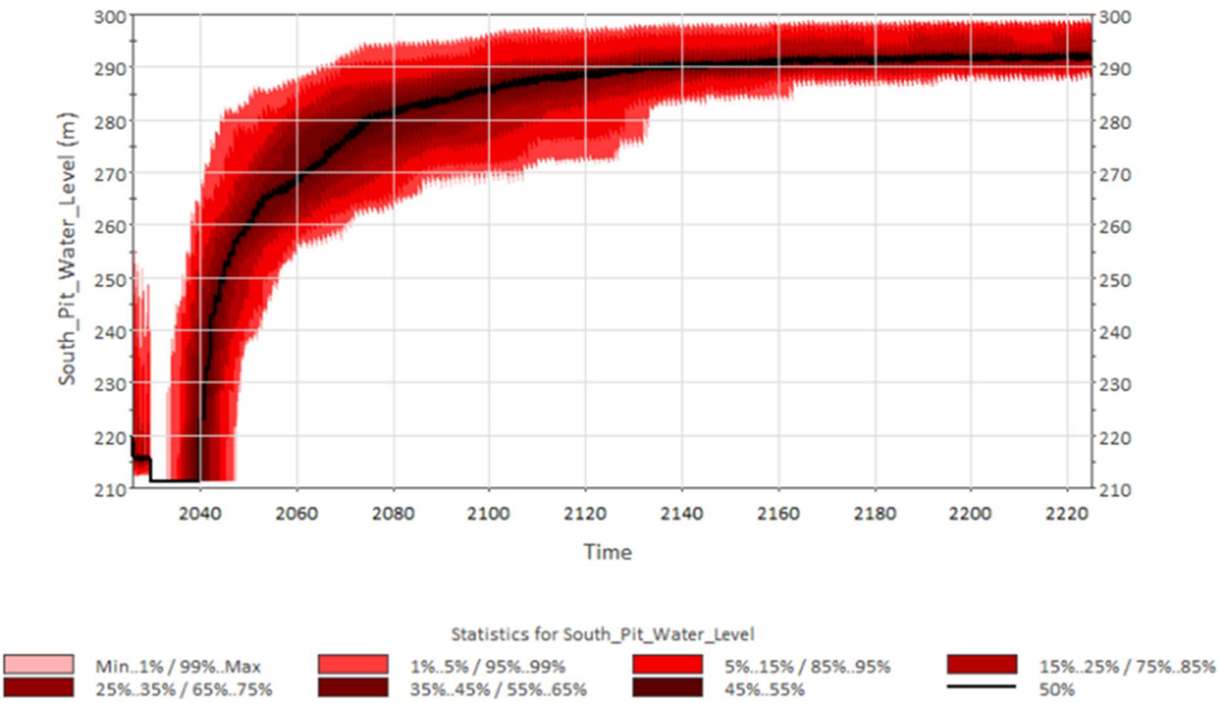


Figure 6-13 Long Term (200 yrs) South Pit Water Levels (ATCW as cited in WMV, 2024b)

Underground Workings (Stage 2)

- Under operational conditions the Underground Workings do not store any water between 2025 and 2029, as they are being actively dewatered.
- The mean accumulated groundwater inflow into the Underground Workings between 2025 and 2050 is approximately 20 ML, or 4.11 ML/year. The remainder of the water required to fill the Underground Workings is supplied by inflows from the South Pit.
- Under mean climatic conditions the Underground Workings commence filling in 2030 and are completely filled by 2041 (Figure 6-16). This is primarily driven by water ingress from the South Pit, connected to the Underground Workings via the removal of the crown pillar.

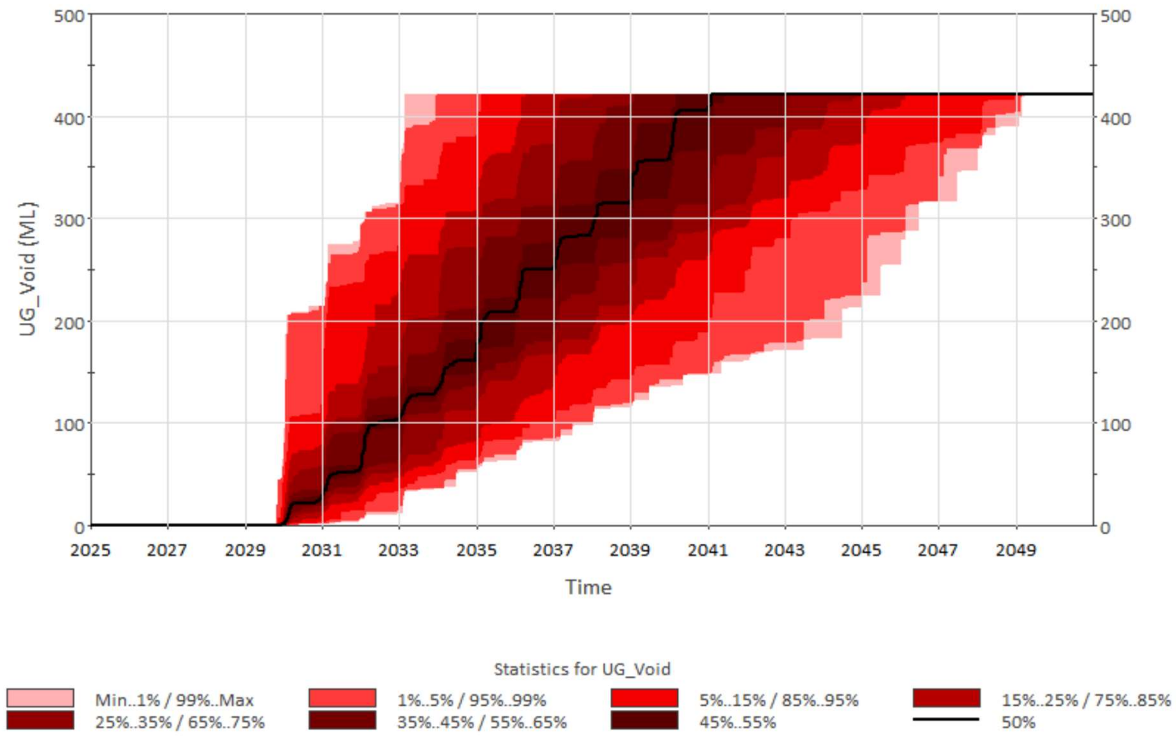


Figure 6-14 Underground Workings Accumulated Volumes (2025 to 2050) ATCW 2024

North Pit

- Under mean climatic conditions, the North Pit is rapidly dewatered by March 2026 to meet site water demands.
- Under mean climatic conditions, between March 2026 and October 2029 (excluding the January-March period each year), the North Pit is dry, indicating the site may be in a net water deficit.
- The average water level in North Pit at the end of the 200-year simulation is 302m AHD, reaching a maximum elevation of 307.6 m AHD (8.4 m below the crest) (Figure 6-17).

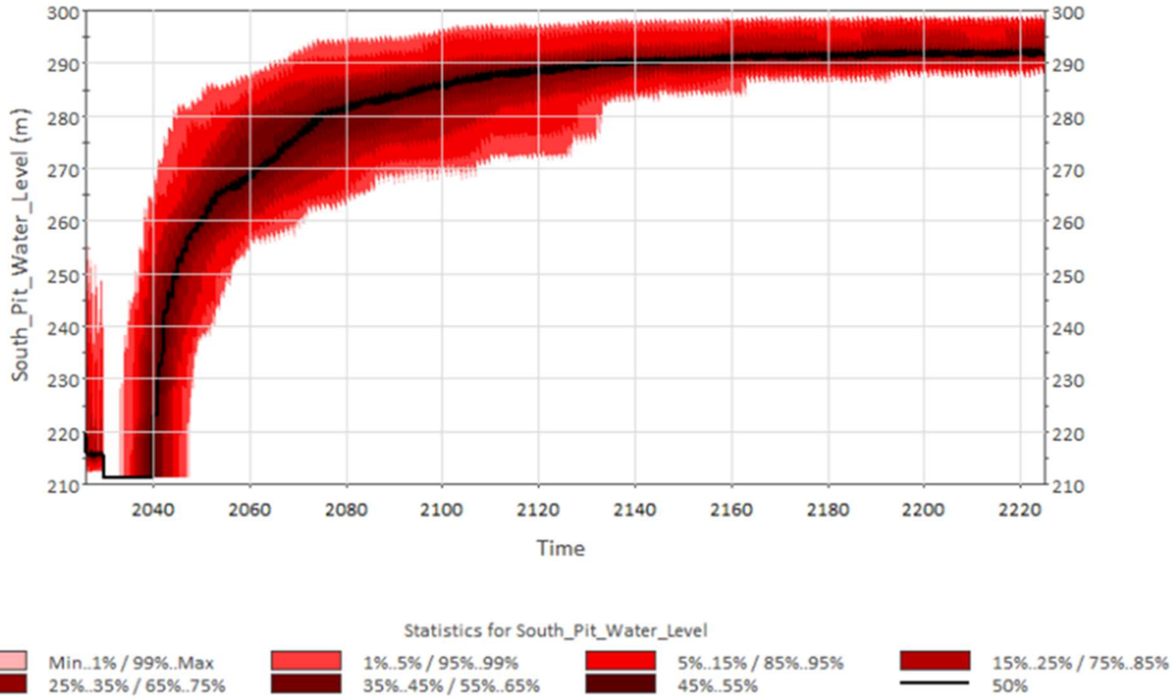


Figure 6-15 Long term (200 yrs) North Pit Water levels (ATCW as cited in WMV,2024(b))

WRD Sediment Dam

- The water level in WRD sediment dam reaches an average elevation of 332 m AHD, spilling on average once every 30 years (Figure 6-18).

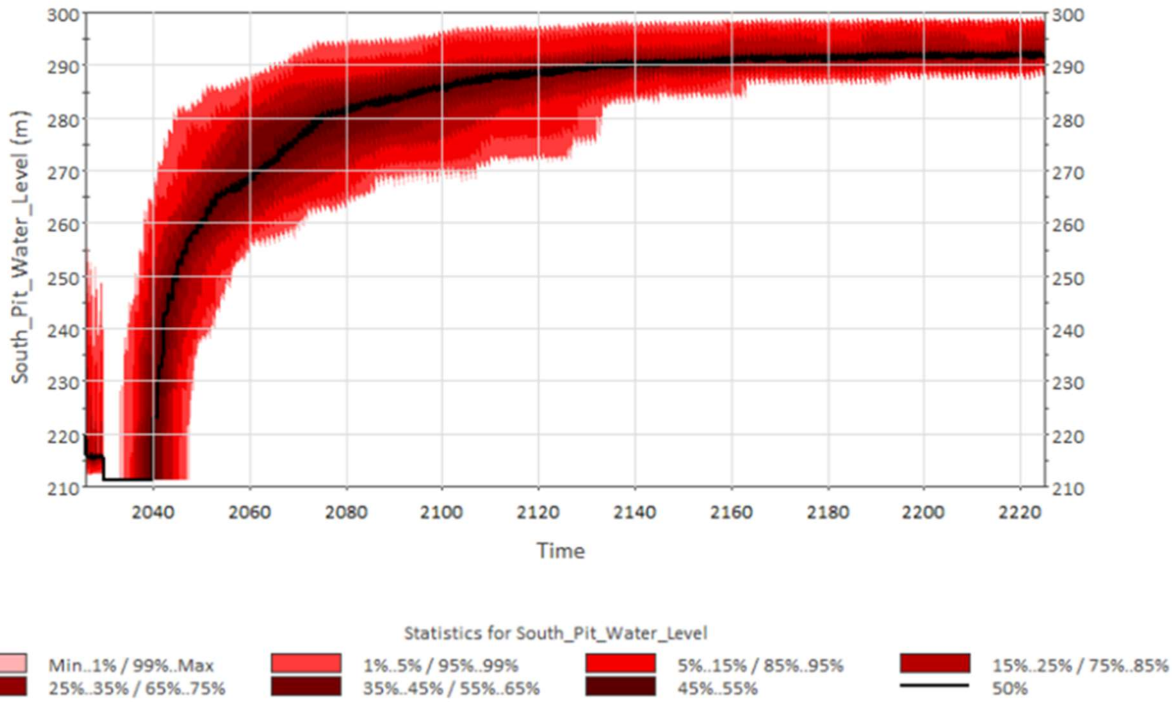


Figure 6-16 Long term (200 yrs) WRD Sediment Dam Water Levels (ATCW as cited in WMV, 2024(b))

6.1.3 Waste Rock Dump Geochemistry

Characterisation of the waste rock dump indicates that rainwater encountering the WRD will most likely interact with NAF material with low sulphur content (EGI, 2014). Given, the high ratio of NAF to PAF waste rock, problematic material is accommodated within the core of the waste rock dump in a manner that provides long-term geochemical stability and limits the potential for sulphide oxidation or metals leaching. A few samples were slightly saline but most were non-saline. Some waste rock is significantly enriched with cobalt, copper, and selenium. Minor enrichment of some samples with bismuth. Arsenic occurred at concentrations approximating background soils.

During operations the waste rock was classified into PAF and NAF with the PAF material being covered progressively with NAF to reduce percolation. The external batters were also formed with NAF material.

Closure activities will involve ensuring all PAF material is encapsulated and that there is a constructed landform and cover on the WRD (Section 6.5). It is expected that drainage from run-of-mine NAF waste rock will be neutral to slightly alkaline and have low concentrations of soluble salts and environmentally important metals and metalloids. The cover design will aim to prevent adverse surface water quality runoff from entering the environment, including the pits.

Detailed geochemistry details for the WRD are provided in Section 6.4.

6.1.4 Final void water quality and potential impacts on groundwater

6.1.4.1 Water quality modelling – Open Pit and Stage 1 UG

The scenario summarised herein relates to both the Open Pit and Stage 1 Underground (no dewatering of the South Pit). Based on the assumptions in Section 6.1.2.1.1, it can be concluded that the Stage 1 underground development will not affect the water balance of the pits. Therefore, the results of the water balance for the Open Cut in Section 6.1.2.1 and the water quality studies for the open cut in Section 6.1.4.1, remain valid for Stage 1.

Solutes enter the open pits/sediment dam in rainfall runoff and groundwater inflow and may be removed from the voids in groundwater outflow and through geochemical reactions (0**Error! Reference source not found.**). The solute concentrations in the pit voids and sediment dam are defined by the fractions and solute concentrations of inflow water (from surface water runoff and groundwater inflow), the existing pit void/sediment dam water volumes and solute concentrations, evaporative processes and the occurring geochemical reactions (Figure 6-17).

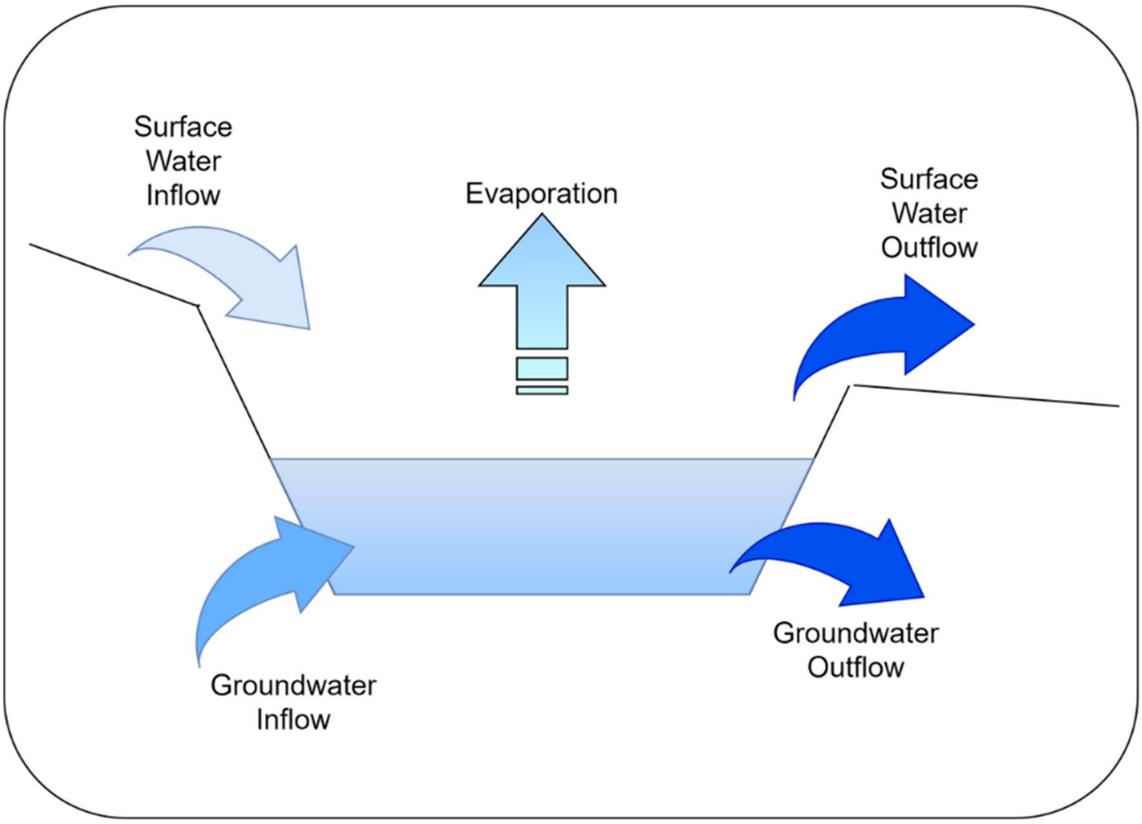


Figure 6-17 Water quality model components for open pit voids (ATC Williams, 2023b)

Water quality models (WQMs) for the final voids and sediment dam were developed by linking the output of the Goldsim WBM with a PHREEQC (USGS, ver. 3.6.2.15100) geochemical model. PHREEQC is based on the equilibrium chemistry of aqueous solutions interacting with minerals, gases, solid solutions, exchangers, and sorption surfaces. The model is designed to perform a wide variety of aqueous geochemical calculations, including speciation, batch-reaction, one-dimensional reactive-transport, and inverse geochemical calculations.

Given the complexity of linking the Goldsim probabilistic output to PHREEQC, only selected scenarios were adopted to model water quality in the voids and sediment dam.

Three different water balance scenarios were evaluated, corresponding with the following Goldsim™ WBM stochastical results:

- The median climatic conditions, corresponding with an occurrence probability of 50% (i.e. 50th percentile or P50).
- Interquartile climatic conditions, corresponding with 25th percentile ant 75th percentile climatic conditions.
- Higher probabilities were not considered since increased rainfall, groundwater discharge into the pit void, and lower evaporation rates would result in improved water quality and represents a lower risk to the downstream environment or closure condition.

With respect to the geochemical process, two main scenarios were considered to evaluate the mixing of the different water types:

- A first scenario/model that only included mixing of different water types (in terms of volumes and water quality) followed by evaporative processes in the voids/sediment dam. This model is denoted as the "mixing" model.
- A second scenario/model included speciation equilibrium modelling, i.e. the process of precipitation/dissolution of minerals from/into solution when the different water types are mixed. In the first instance, only the mineral phase considered was gypsum, whereby

gypsum precipitation could occur if calcium and sulfate concentrations in the mixed water were sufficiently elevated. This model is denoted as the "equilibrium" model.

In the first instance, inflow water is mixed with existing pit voids/sediment dam water and solute concentrations are calculated though a mixing process, before evaporative losses increase the solute concentrations in the pit voids/sediment dams due to a reduction in water content. This mixed solution can be assessed without any equilibrium phases or equilibrated with gypsum. The resulting solution represents the pit void/sediment dam water quality that can outflow to either surface water or groundwater.

A detailed description of the WQMs together with an interpretation of the modelling results is provided in the report "*Barbara Copper Project Progressive Rehabilitation and Closure Plan. Water Quality Assessment of North Pit, South Pit and WRD Sediment Dam.*" (WMV Environmental, 2023b), provided as 0. The results of the final void water quality modelling can be summarised as follows.

<u>Overall results</u>

- Overall, the effect of gypsum precipitation on water quality in the open pits and sediment dam is evident. Concentrations of total dissolved solids, calcium and sulfate in the equilibrium model are markedly less than in the mixing model. Precipitation of gypsum in the final voids is considered likely.
- The long-term temporal changes in solute concentrations generally approximate a power or logarithmic trend, especially once concentrations have stabilised during the initial years. Power and logarithmic trends are characterised by an initial rapid change, which then trails off slowly over time.
- The solute concentrations in the open pits and sediment dam at all times and for both models (i.e. mixing and equilibrium models) remain below the applicable ANZECC 2000 Water Quality Guideline values for livestock watering.
- Long-term water quality in the pits and voids is determined by climatic conditions and geochemical reactions and tends to stabilise. The net flow balance between rainfall runoff plus groundwater inflow and evaporation determines short-term variations.

<u>North Pit results</u>

- The solute concentrations at all times and for both models (i.e. mixing and equilibrium models) remain below the applicable ANZECC 2000 Water Quality Guideline values for livestock watering.
- The main physical processes that impact solute levels in the open pit are dilution due to rainfall runoff, groundwater inflow into the pit, and concentration due to evaporation from the open pit. Groundwater inflow only plays a minor role, with long-term groundwater inflows comprising only ±10% of total inflows into the open pit. Short-term variations in solute concentrations are related to the net flow balance between inflows and evaporation. Whilst groundwater inflow is only a minor component of pit inflows, it does buffer the effect of evaporation on solute concentrations.
- Physico-chemical parameters
  - pH levels: pH levels stabilise relatively quickly and trend towards near neutral/slightly alkaline conditions in the mixing and equilibrium models. pH levels are higher in the equilibrium model, due to the geochemical gypsum equilibrium reactions and trend towards the pH of the runoff entering the open pit.
  - Total Dissolved Solids: Long-term TDS concentrations trend towards stable levels in both models, with short-term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation). The influence of the gypsum equilibrium is evident, with TDS concentrations lower in the equilibrium model than in the mixing model.
- Major ions:
  - Calcium and sulfate: concentrations differ between the mixing and equilibrium models, with lower concentrations in the latter model due to gypsum equilibrium reactions.

  - Magnesium, sodium, potassium, chloride and fluoride: Gypsum equilibrium reactions do not affect solute concentrations. Concentrations are determined by the concentrations in the inflow water and evaporation from the open pit.
  - Long-term major ion concentrations trend towards stable levels in both models, with short-term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation) and the effect of evaporation buffered by groundwater inflow.
- Metals/metalloids
  - Modelled concentrations of meals/metalloids are not affected by gypsum speciation/equilibrium processes.
  - Solute concentrations in the pit are determined by the concentrations in the inflow water and evaporation from the open pit.
  - Long-term concentrations trend towards stable levels in both models, with short-term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation) and the effect of evaporation buffered by groundwater inflow.

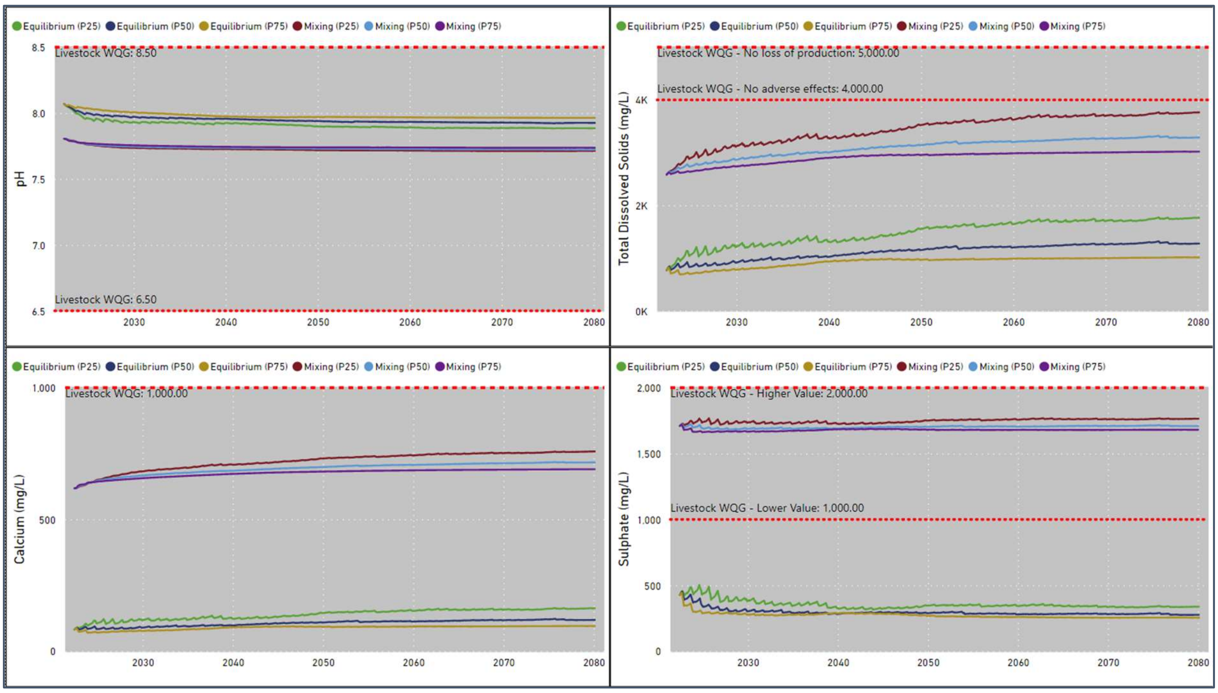


Figure 6-18 North Pit modelled water quality – pH, TDS, calcium and sulfate (WMV Environmental, 2023b)

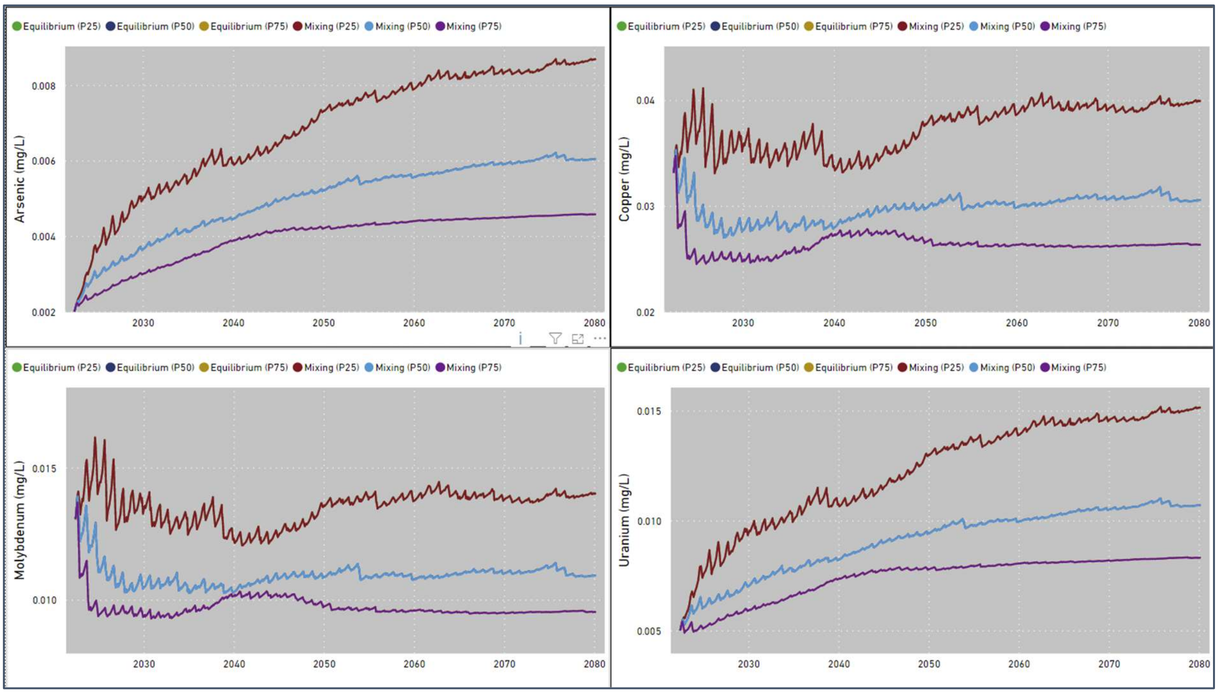


Figure 6-19 North Pit modelled water quality – arsenic, copper, molybdenum and uranium(WMV Environmental, 2023b)

South Pit results

- There is little difference in modelled water quality between both scenarios. Water quality under scenario 2, which includes a larger amount of rainfall runoff from a large catchment area, is better than under scenario 1.
- The solute concentrations at all times and for both models (i.e. mixing and equilibrium models) and scenarios remain below the applicable ANZECC 2000 Water Quality Guideline values for beef cattle livestock watering.
- The main physical processes that impact solute levels in the open pit are dilution due to rainfall runoff, groundwater inflow into the pit, and concentration due to evaporation from the open pit. Groundwater inflow plays a moderate role, with long-term groundwater inflows (combination of regional inflow and seepage from the North Pit) comprising ±20% of total inflows into the open pit. Short-term variations in solute concentrations are related to the net flow balance between inflows and evaporation. Groundwater inflow buffers the effect of evaporation on solute concentrations.
- Physico-chemical parameters
  - pH levels: pH levels in the South Pit stabilise relatively quickly and trend towards near-neutral/slightly alkaline conditions in the mixing and equilibrium models. pH levels are higher in the mixing model due to the geochemical gypsum equilibrium reactions and trend towards the pH of the runoff entering the open pit.
  - Total Dissolved Solids: Long-term TDS concentrations trend towards stable levels in both models, with short-term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation). The influence of the gypsum equilibrium is evident, with TDS concentrations lower in the equilibrium model than in the mixing model.
- Major ions:
  - Calcium and sulfate: concentrations differ between the mixing and equilibrium models, with lower concentrations in the latter model due to gypsum equilibrium reactions.
  - Magnesium, sodium, potassium, chloride and fluoride: Gypsum equilibrium reactions do not affect solute concentrations. Concentrations are determined by the concentrations in the inflow water and evaporation from the open pit.
  - Long-term major ion concentrations trend towards stable levels in both models, with short-term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation) and the effect of evaporation buffered by groundwater inflow.
- Metals/metalloids
  - Modelled concentrations of meals/metalloids are not affected by gypsum speciation/equilibrium processes.
  - Solute concentrations in the pit are determined by the concentrations in the inflow water and evaporation from the open pit.
  - Long-term major ion concentrations trend towards stable levels in both models, with short-term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation) and the effect of evaporation buffered by groundwater inflow.

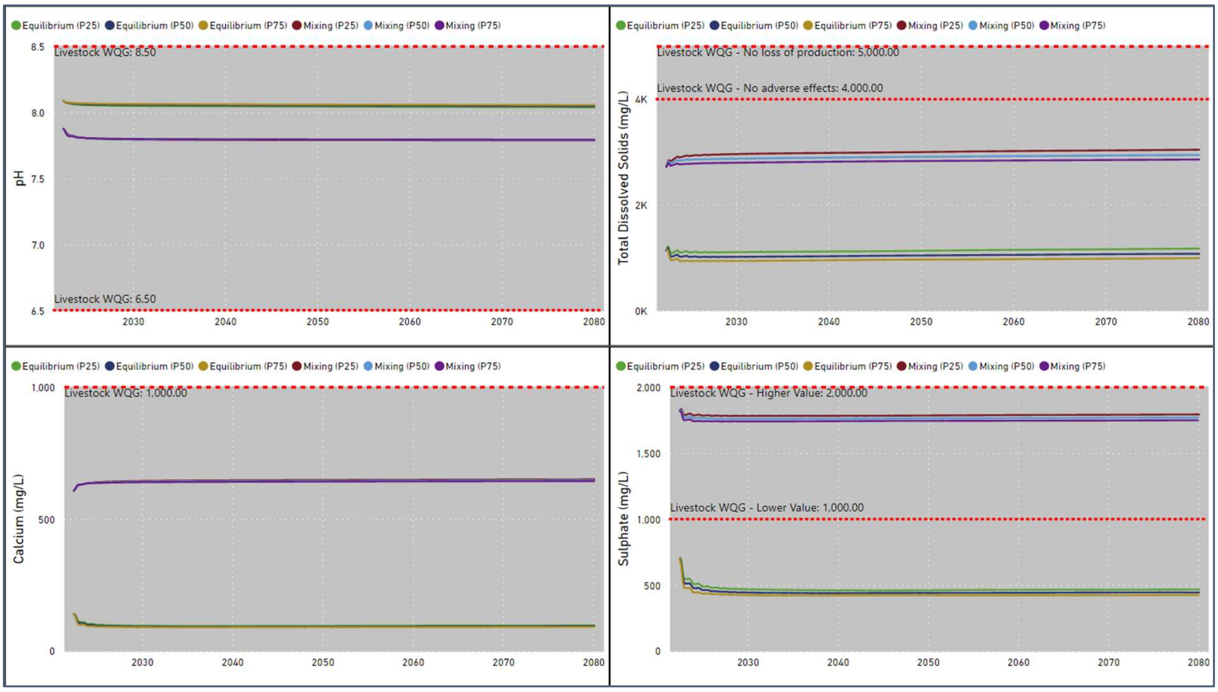


Figure 6-20 South Pit (Scenario 2) modelled water quality – pH, TDS, calcium and sulfate (WMV Environmental, 2023b)

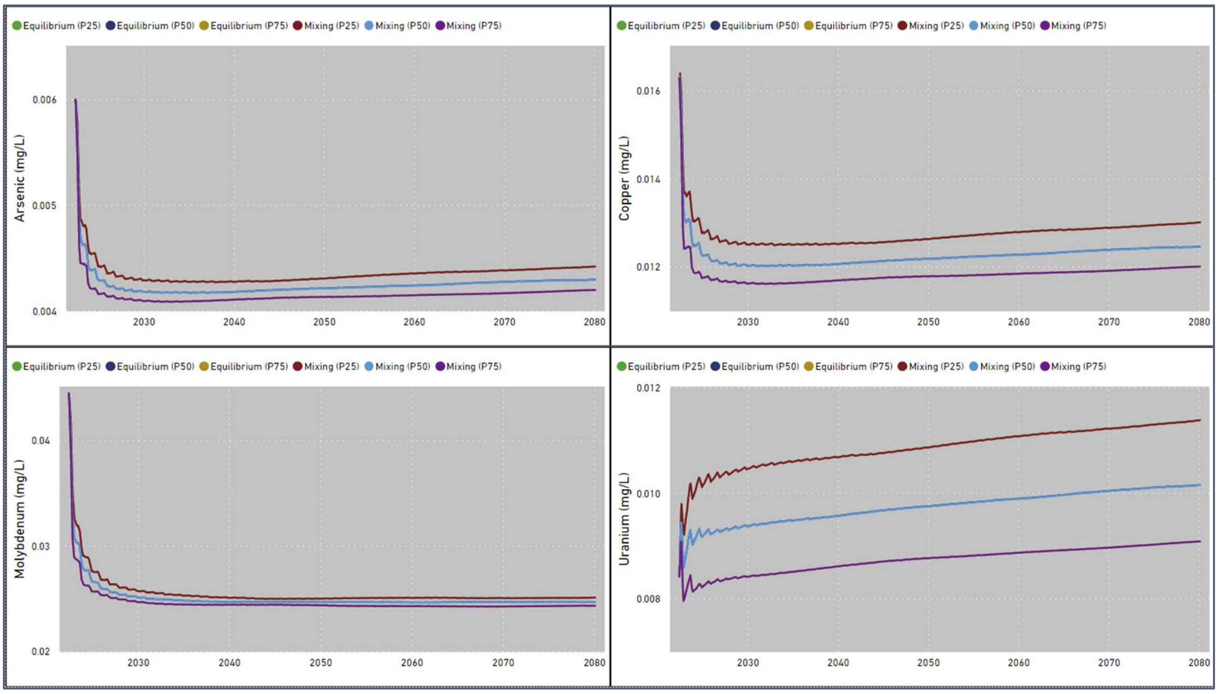


Figure 6-21 South Pit (Scenario 2) modelled water quality – arsenic, copper, molybdenum and uranium(WMV Environmental, 2023b)

WRD Sediment Dam results

- The solute concentrations at all times and for both models (i.e. mixing and equilibrium models) remain below the applicable ANZECC 2000 Water Quality Guideline values for livestock watering (cattle).
- The main processes that impact solute levels in the sediment dam are dilution due to rainfall runoff into the pit and concentration due to evaporation from the open pit. Due to the presence of the HDPE liner, groundwater inflow or outflow does not occur. The short-term or seasonal variations in solute concentrations can be correlated with the net balance between rainfall and evaporation.
- Under the 75th percentile climatic conditions, the WRD sediment Dam runs dry between early-2040 and end-2045. This affects the water quality in the WRD Sediment Dam.
- Physico-chemical parameters
    - pH levels: Long-term pH levels in the sediment dam stabilise relatively quickly and trend towards slightly alkaline conditions in the mixing and equilibrium models. pH levels are higher in the equilibrium model due to the geochemical gypsum equilibrium reactions and trend towards the pH of the runoff entering the sediment dam.
    - Total Dissolved Solids: Long-term TDS concentrations trend towards stable levels in both models, with short-term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation).
- Major ions:
    - Calcium and sulfate: concentrations differ between the mixing and equilibrium models, with lower concentrations in the latter model due to gypsum equilibrium reactions.
    - Magnesium, sodium, potassium, chloride and fluoride: Gypsum equilibrium reactions do not affect solute concentrations. Concentrations are determined by the concentrations in the inflow water and evaporation from the open pit.
    - Long-term major ion concentrations trend towards stable levels in both models, with short term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation).
- Metals/metalloids
    - Modelled concentrations of meals/metalloids are not affected by gypsum speciation/equilibrium processes.
    - Solute concentrations in the pit are determined by the concentrations in the runoff water and evaporation from the open pit.
    - Long-term concentrations trend towards stable levels in both models, with short term variations defined by seasonal climatic conditions (i.e. rainfall runoff versus evaporation).

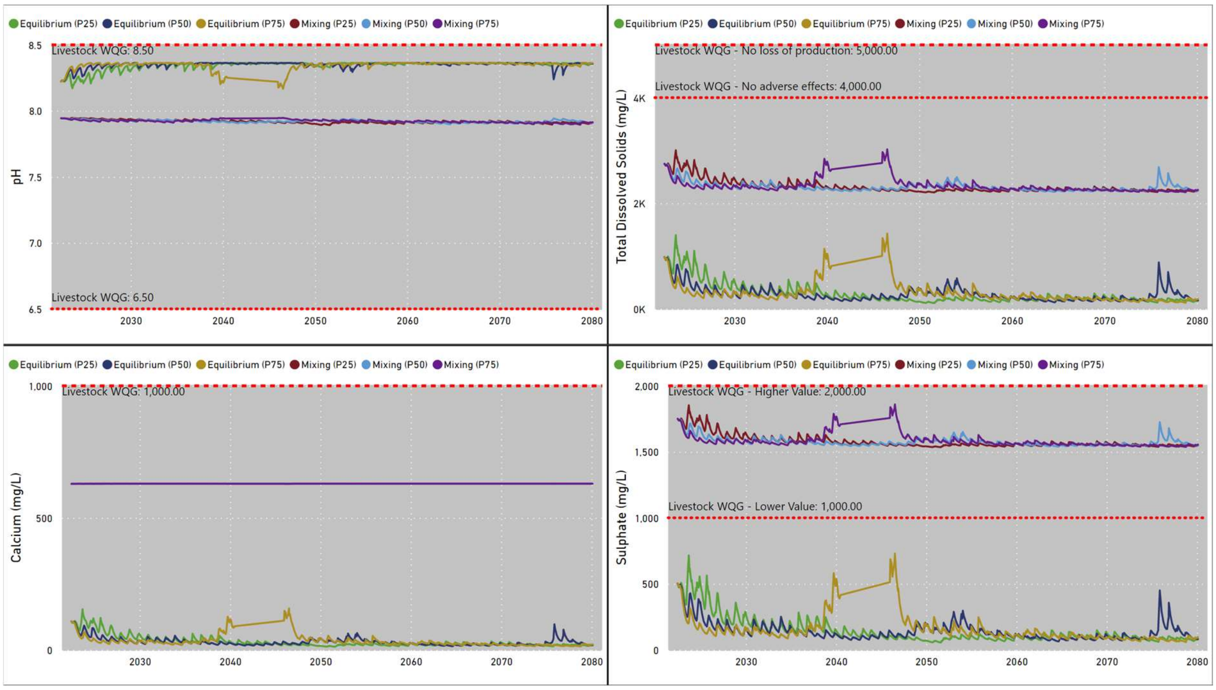


Figure 6-22 WRD Sediment Dam modelled water quality – pH, TDS, calcium and sulfate (WMV Environmental, 2023b)

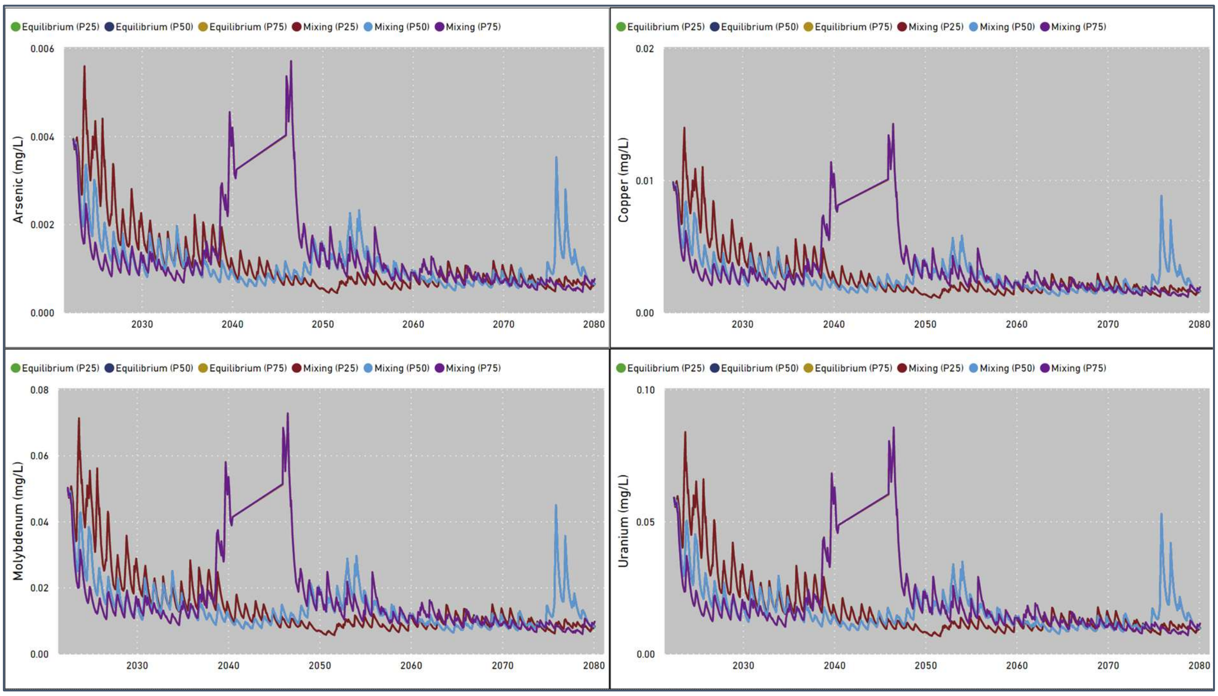


Figure 6-23 WRD Sediment Dam modelled water quality – arsenic, copper, molybdenum and uranium (WMV Environmental, 2023b)

6.1.4.2 Underground Workings Long Term Void Water Quality

This section herein summarises long term void water quality for the Underground scenario that requires dewatering of the South Pit (i.e. future Stage 2).

To assess the long-term water quality in the underground void, the 200-year WBM (section 6.1.2.2) was used to simulate the underground void water balance under five (5) climate scenarios representing the 5%, 25%, 50%, 75% and 100% rainfall and evaporation time series, as follows:

- Rainfall and evaporation time series/scenarios representing the 5th, 25th, 50th, 75th and 100th percentile (a.k.a. the P05, P25, P50, P75 and P100 scenarios) were generated using the probabilistic 200-year WBM developed by ATC Williams.
- ATC Williams ran the 200-year WBM model in a deterministic mode for each scenario to obtain detailed water balance volumes (i.e. inflows, storages and outflows) for the underground workings.
- A mixing model was developed for each scenario, using the water balance volumes and water quality characteristics of the different components to calculate the long-term water quality in the underground workings.

The time series of the modelled results indicate the following:

- Initial water quality is determined by the water quality of the water transferred into the UG voids (i.e. initial transfer of water from the North Pit, transfers from the WRD Sediment Dam and semi-regular transfers of water from the South Pit).
- Mid- to long-term water quality is governed by the mixing of the transferred water with groundwater inflow.
- Water quality in the underground void reaches long term stability after approximately 16 years.

The results indicate that long-term stability in underground void water quality is reached after ±2041 when the underground void is completely filled with groundwater. The results show that long-term water quality within the UG workings remains below the ANZECC Livestock Water Quality Guidelines and the PRCP schedule PRCP EPML02840015 – Water quality limits for North and South Pits and WRD Sediment Dam. these guideline values.

The results of the mixing modelling indicate that groundwater quality in the UG voids remains below the relevant water quality guidelines values (livestock watering and PRCP criteria for voids) and that the underground workings are suitable for a livestock watering PLMU, refer to Appendix U(b).

Validity of 2023 Water Quality Model

In 2023 and as part of the preparation of the PRCP for the BCP Project, ATC Williams developed water quality models (WQMs) for the North Pit, South Pit and WRD Sediment Dam by linking the output of the Goldsim WBM with a PHREEQC (USGS, ver. 3.6.2.15100) geochemical model (section 6.1.4.1). It is noted that these WQMs did not include the proposed underground workings. However, the results of these WQMs are still considered relevant and representative.

Given the complexity of linking the Goldsim probabilistic output to PHREEQC, three different water balance scenarios were evaluated, corresponding with the following Goldsim™ WBM stochastical results:

- The median climatic conditions, corresponding with an occurrence probability of 50% (i.e. 50th percentile or P50).
- Interquartile climatic conditions, corresponding with 25th percentile ant 75th percentile climatic conditions.

Higher probabilities were not considered since increased rainfall, groundwater discharge into the pit void, and lower evaporation rates would result in improved water quality and represent a lower risk to the downstream environment or closure condition.

With respect to the geochemical process, the modelling included speciation equilibrium modelling, i.e. the precipitation/dissolution of minerals from/into solution when the different water types are mixed. In the first instance, only the mineral phase considered was gypsum, whereby gypsum precipitation could occur if calcium and sulphate concentrations in the mixed water were sufficiently elevated. This model is denoted as the "equilibrium" model. Appendix T (2023).

The timeframe of the 2023 water balance and quality models was 58 years (i.e. from mid-2022 to early-2080). The water levels in the South Pit for each climate scenario obtained from the long-term (200 yrs) water balance model are presented in Figure 6-26. The modelling results indicate that for most climate scenarios, the water levels in the open pits and WRD sediment dam reach long-term stability (i.e. water levels only influenced by the interaction between rainfall and evaporation) after ±50 years (i.e. by 2075-2080).

The inclusion of the underground void in the recent model does not affect the long-term water balance and water quality in the North Pit, South Pit and WRD Sediment Dam. The only interaction between the South Pit and the underground void consists of dewatering the pit to gain access to the underground void. Once the underground mining is complete, such dewatering is no longer required, and the water levels in the South Pit will recover, as per the original 2023 water balance/quality models (Appendix U(b)). In summary:

- The results of the 2023 water quality model are considered relevant and representative of the post underground mining operations given that:
- the long-term water balance modelling results indicate stabilisation of water levels in the open pits and sediment dam after ±50 years
- the underground mining only has a minor impact on the mid- to long-term water levels in the open pits and WRD sediment dam
- the 2023 water quality model demonstrates that water quality in the pits and sediment dam remains below the ANZECC livestock drinking water guidelines.

The 2023 water quality modelling indicates that the modelled solute concentrations at all times and for both models (i.e. mixing and equilibrium models) remain below the applicable ANZECC 2000 Water Quality Guideline values for livestock watering.

Long-term water quality in the pits and voids is determined by climatic conditions and geochemical reactions and tends to stabilise. The net flow balance between rainfall runoff plus groundwater inflow and evaporation determines short-term variations.

Based on the WQM results, the North Pit, South Pit and WRD Sediment Dam are considered suitable as PMLUs for livestock watering (Appendix U(b)).

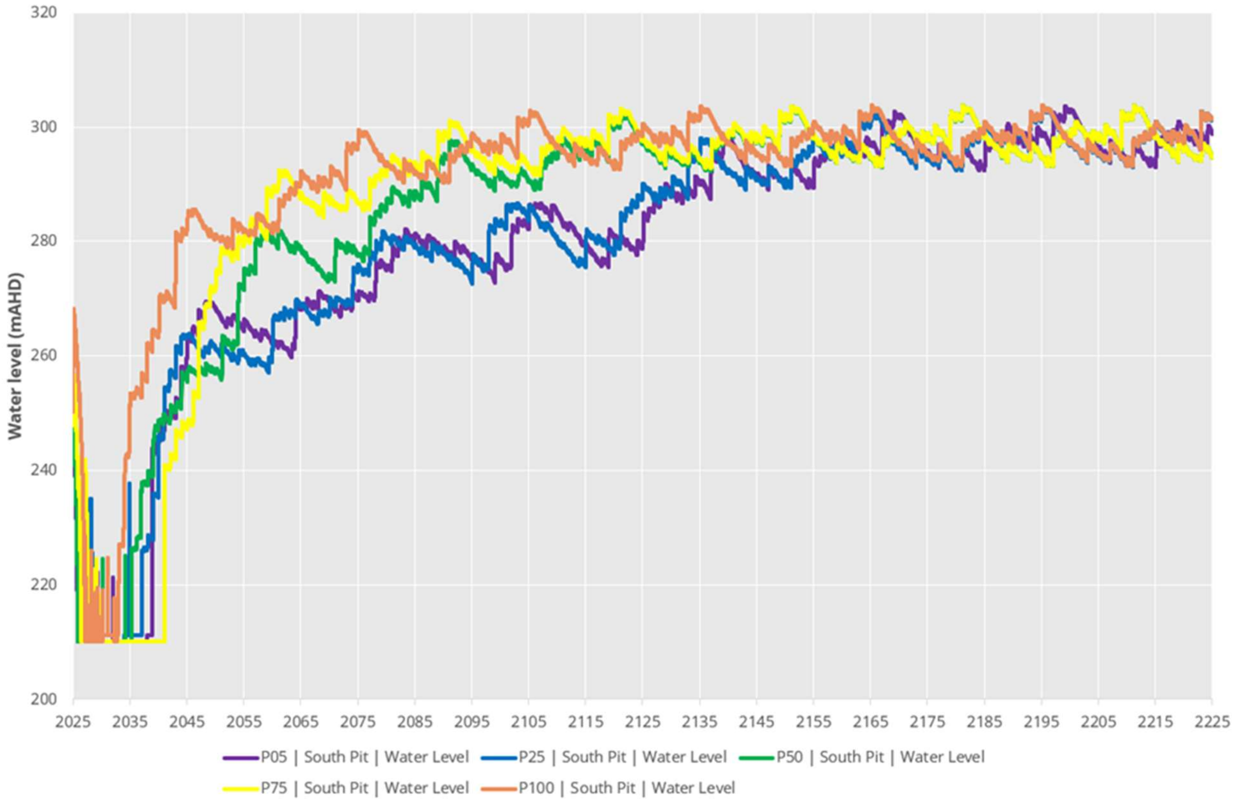


Figure 6-26 Long term (200 years) South Pit water levels (5 climate scenarios)

6.1.4.3 Final void stratification assessment

All pit lakes are subject to physical and chemical processes that will determine the water quality of the pit lake, whether the pit lake can support aquatic life and terrestrial food webs, and the impact of the release of water to the receiving environment.

Some processes, such as wind forcing and convective mixing are common to all pit lakes, while other factors (e.g., site-specific geochemistry, hydrology and mine pit morphology) will be specific to the mine pit and its mineralogical character.

Pit lakes undergo annual water temperature cycles due to heat exchange between water and the atmosphere. Heat exchange occurs through longwave radiation, shortwave radiation, conduction and evaporation, as well as through temperature exchanges between the different vertical layers in the lake and the sediments. Temperature gradients in lakes can result in a water column with two or more stratified layers. Some shallow pit lakes may be perpetually mixed by wind and never stratify (Castendyk et al., 2015).

A one-dimensional model was developed for the North Pit and South Pit to further assess the potential for stratification, using "*The General Lake Model*" (GLM). GLM has been developed by the Aquatic EcoDynamics Research Group team at the University of Western Australia (http://aed.see.uwa.edu.au) in collaboration with the Lake Ecosystem Restoration research group at the University of Waikato (http://www.lernz.com) (WMV Environmental, 2023b).

GLM is a 1D lake water balance and vertical stratification model that computes vertical profiles of temperature, salinity and density by accounting for the effect of inflows/outflows, mixing and surface heating and cooling, including the effect of ice cover on heating and mixing of the lake.

A detailed discussion on the stratification assessment is provided in the report "*Barbara Copper Project Progressive Rehabilitation and Closure Plan. Water Quality Assessment of North Pit, South Pit and WRD Sediment Dam.*" (WMV Environmental, 2023b), provided as 0.

The preliminary stratification assessment indicates that:

- Thermal, density and salinity stratifications may develop over time on a seasonal basis within the North Pit and South Pit.
- Three stratification zones may develop within the open pits during the dry, hot seasons. However, the stratifications dissipate during the wet season.
- As there is a uniform density and temperature distribution during at least one period of each year, the open pit lakes could be classified as a "holomictic" lake.
- As the open pits generally acts as a terminal groundwater sink and as the stratification in the pit is seasonal, the PMLU of the pit as "water storage for livestock watering" is not adversely affected by the seasonal stratification.
- Based on the investigation and modelling results, the North Pit, South Pit, WRD Sediment Dam and underground workings are considered suitable as PMLUs for livestock watering.

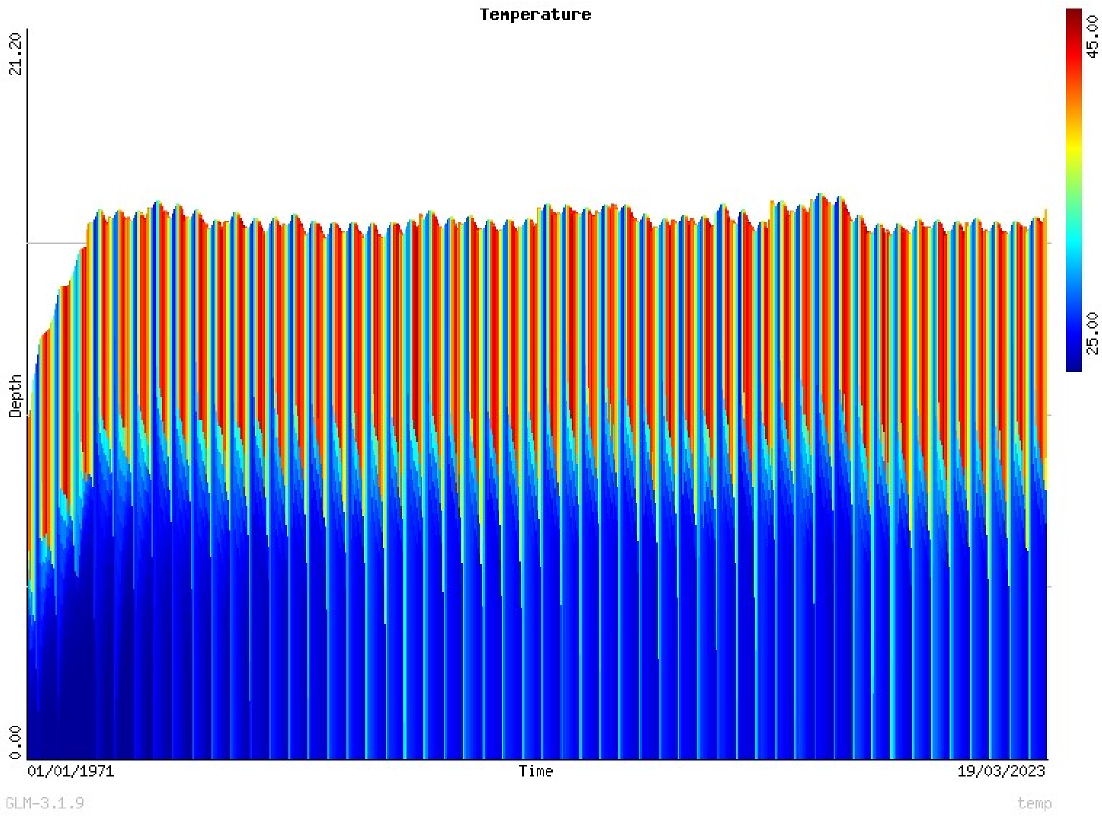


Figure 6-24 Modelled seasonal thermal stratification in the North Pit (WMV Environmental, 2023b)

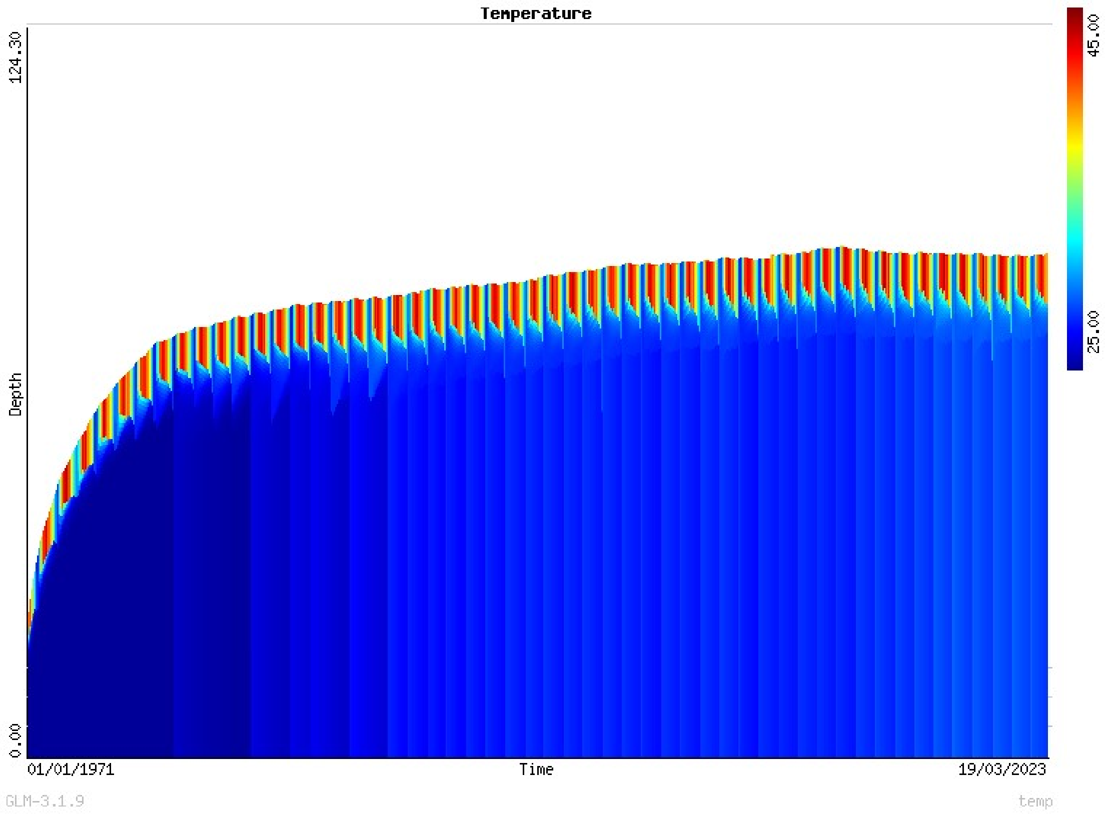


Figure 6-25 Modelled seasonal thermal stratification in the South Pit (WMV Environmental, 2023b)

6.1.4.4 Assessment of Potential AMD Seepage on Final Void Water Quality

The presence of some potentially acid forming (PAF) rock within the open pit shells has potential implications for final void water quality. Some sulphide mineralisation will be exposed on the final pit floor and footwall benches as these final surfaces will be close to ore zones. Direct runoff from the open pit walls that come in contact with PAF rock wall material or groundwater seepage through PAF pit wall material could affect the evolution of final void water quality over time.

The semi-quantitative assessment of potential impacts of AMD on final void water quality presented further below was based on the results of geochemical investigations into the waste rock and oxide ore and the results of the water balance modelling.

The results and the findings of a kinetic column leach testing program are provided in EGi's report "*Kinetic Column Leach Testing of Waste Rock and ROM Oxide. Final Report - September 2020. Round Oak Mineral. Barbara Copper Project. Ref S4405/J000325/R1382*" (EGi, 2020) , included as 0 of the BCP PRCP Report. The findings of this report are summarised in Section 6.4.2.

The potential for AMD to impact on the final void water quality depends on several factors, including:

- the area within the pit shells with exposed PAF material
- the proportion of this leachate water relative to total inflows in the open pits (i.e. the dilution effect)
- the solute concentrations within the leachate water from the exposed material
- the solute concentration and mass balance in the open pits.

Exposure to PAF material from pit walls

Exposure of some PAF rock around the pit shell has implications for pit water quality, especially late in mine life and closure. At closure, some sulphide mineralisation will be exposed on the final pit floor and footwall benches as these final surfaces will be close to ore zones.

Classification of waste rock and ore material undertaken by EGi in 2014 indicates that:

- the majority (89%) of the waste rock from the open pits will have a low sulfur content and will be non-acid forming (NAF). It follows that most exposed waste rock in the pit shells will be NAF.
- whilst most of the ore samples tested had high to very high sulphide content, only ±56% were classified as PAF.

A waste rock and ore block model were developed to provide the basis for initial mine planning, as presented in "*Waste Rock Management Plan*" developed by URS Australia in 2014. This management plan includes several cross-sections through the North Pit and South Pit, depicting the occurrence of PAF waste, NAF waste and ore within the proposed open pits. These cross-sections demonstrate that only a minor part of the pit shell would contain exposed PAF waste or ore.

Proportion of AMD leachate relative to total inflows in the open pits

Exposed PAF rock may produce localised AMD from seepage of groundwater through the exposed PAF material. If PAF rock represents only a small fraction of total pit wall area, then it is likely that any AMD produced would be diluted and neutralised to some extent by the much larger volume of alkaline runoff from NAF rock around the pit and by non-AMD impacted groundwater inflow.

Water balance modelling undertaken by ATC Williams (ATC Williams, 2023) indicate groundwater inflow into the open pits is minor compared to total inflow and existing pit volume. Cumulative groundwater inflow as percentage of total inflow are as follows:

- North Pit: ±10% of the total cumulative inflow
- South Pit: ±20% of total cumulative inflow

Assuming that only half of the groundwater inflow would pass through the PAF material in the pit shell, this potentially AMD impacted seepage water would only comprise ±5% and ±10% of total inflow, for North Pit and South Pit respectively. When considering the total inflow from rainfall runoff and the buffering effect of the water volume already present in the open pits, the volume of AMD impacted groundwater seeping into the open pits is sufficiently diluted to alleviate its potential adverse impacts on open pit water quality.

Solute concentrations within the AMD leachate

Representative AMD solute concentrations have been obtained through the kinetic column leach testing undertaken in 2020 (EGi, 2020), as discussed in Section **6.4.2**. The results indicate the following:

- Long-term kinetic column leach results (at week 52 of the test program) are below the adopted livestock drinking WQG values.
- Long-term kinetic column leach results (at week 52 of the test program) are below the modelled long-term solute concentrations (average of modelled concentrations/levels after 50 years) in the open pits, except for aluminium, arsenic, calcium, chromium and copper in one or more column samples. However, leach results of these solutes are below the livestock drinking WQG (where specified).
- As the AMD impact groundwater inflow constitutes only a minor component of the total inflow into the open pits, the mass load of the AMD solutes will be diluted by rainfall runoff and the pit water volume already in storage.

6.1.5 Potential impacts from final voids

6.1.5.1 Potential impacts on groundwater levels

The time series of measured groundwater levels (from 2018 to 2022) in the EA compliance monitoring bores indicated that:

- Since 2019, groundwater levels in the bores have declined, reflecting the open-cut mining operations and dewatering of the aquifers due to groundwater seepage/inflow into the open pits. The decline rate slowed down since mining started in June 2019.
- Since mining finished in March 2021, groundwater levels seem to be slowly recovering to pre-mining levels (WMV Environmental 2022).

Hydrogeological cross-sections for the Project area, show the underlying geology/lithology and groundwater levels in June 2018 and April 2022, and are presented in Figure 6-26 and Figure 6-27 respectively.

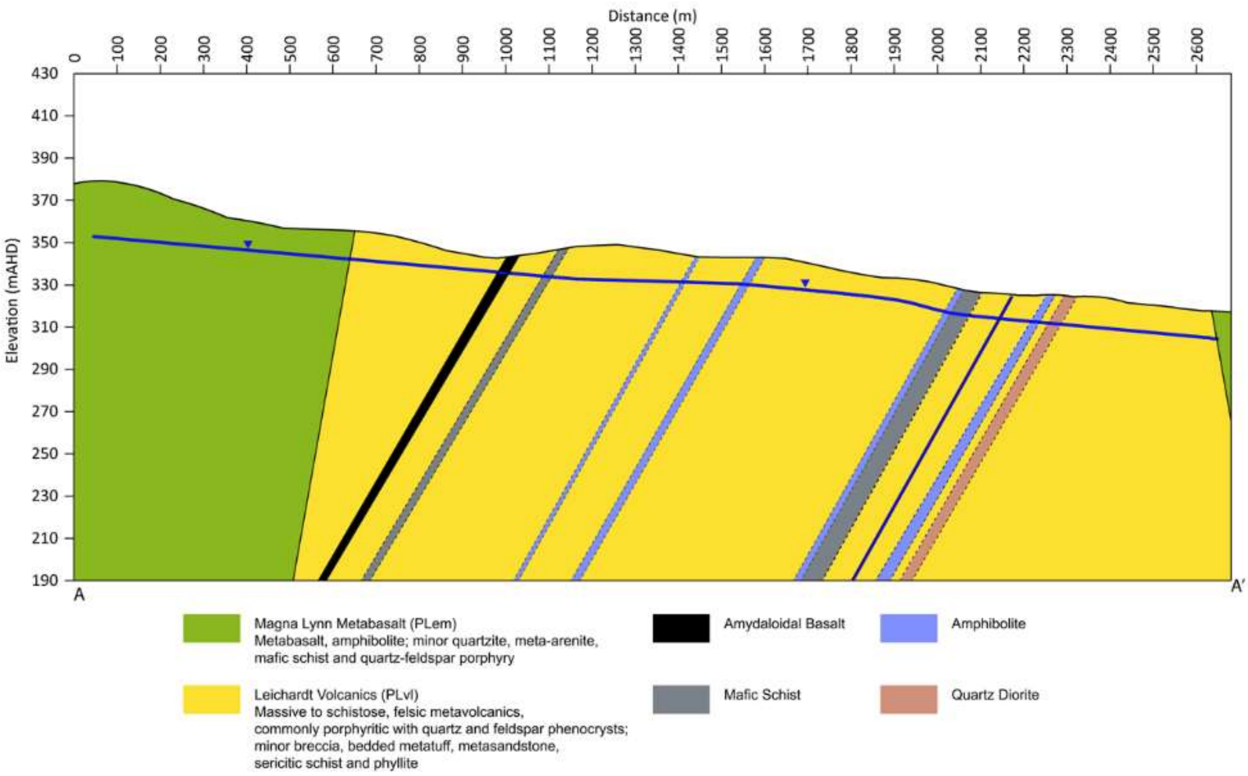


Figure 6-26 Hydrogeological cross-sections with June 2018 groundwater levels

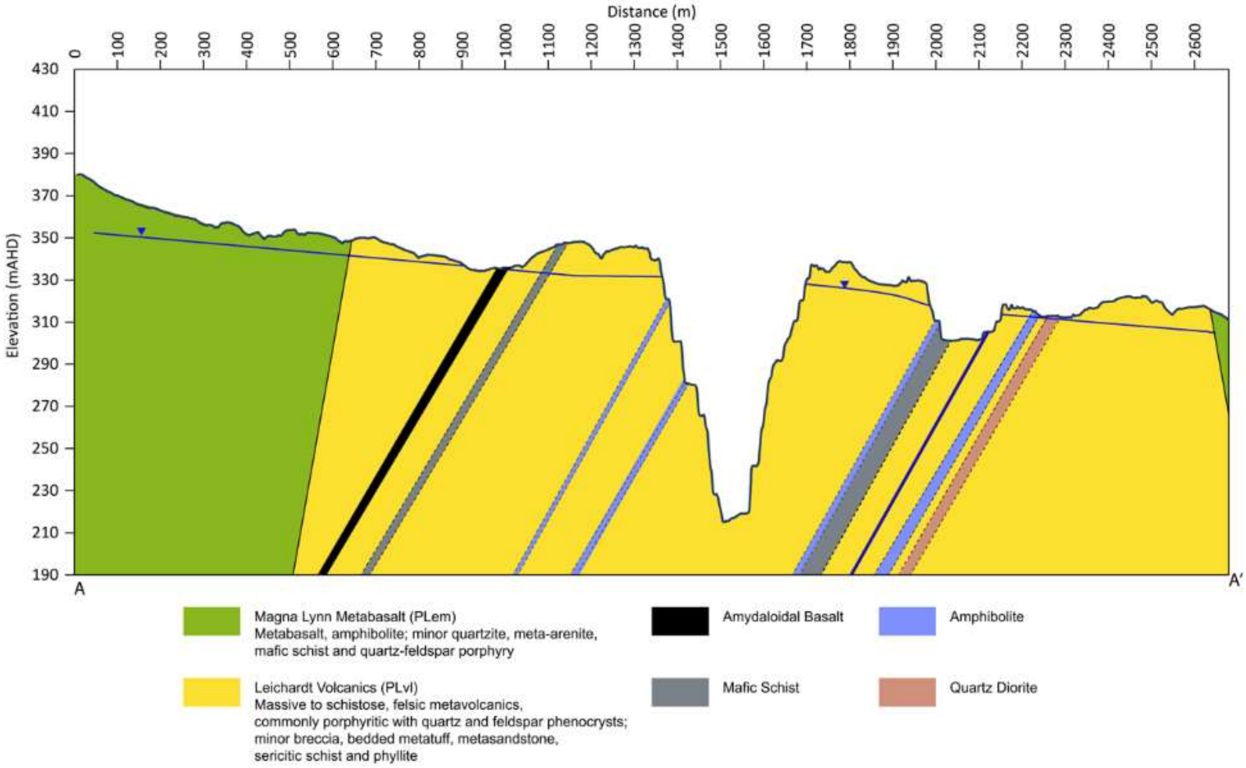


Figure 6-27 Hydrogeological cross-sections with April 2022 groundwater levels

Water balance modelling undertaken by ATC Williams (2023a) indicate that the North Pit and south Pit will act as terminal sinks for groundwater post-closure. As such, the final void water quality will not adversely impact the local and regional groundwater quality.

6.1.5.2 Impacts on groundwater and surface water quality from open pits

Water quality modelling undertaken by ATC Williams (2023b) indicate that solute concentrations at all times and for both models (i.e. mixing and equilibrium models) remain below the applicable ANZECC 2000 Water Quality Guideline values for livestock watering .

Preliminary stratification modelling indicates that stratification will occur seasonally (i.e. during the dry season), but will dissipate during the wet season.

With respect to potential AMD impacts:

- Saline drainage: Based upon the EGi (2014) results, it is concluded that saline drainage was not considered a significant water quality issue, with respect to waste rock materials (Section 0).
- Metalliferous drainage (Section **Error! Reference source not found.**): Long-term kinetic column leach results (at week 52 of the test program) are below the adopted livestock drinking WQG values. The results are below the modelled long-term solute concentrations (average of modelled concentrations/levels after 50 years) in the open pits, except for aluminium, arsenic, calcium, chromium and copper in one or more column samples. However, leach results of these solutes are below the livestock drinking WQG (where specified). As the AMD impact groundwater inflow constitutes only a minor component of the total inflow into the open pits, the mass load of the AMD solutes will be diluted by rainfall runoff and the pit water volume already in storage. Therefore, it is considered that the seepage of AMD groundwater will not adversely impact the long-term water quality in the open pits.

Conclusion

The nearest privately owned stock watering bore (RN 70146) is at a distance of 1.5 km from the proposed North Pit. It is also in a different aquifer formation (the Kalkadoon Granite) from the Barbara orebody (Leichhardt Metamorphics) and is separated from the orebody shear zone by a fault.

Based on the investigations and modelling results, the predicted water quality in the final voids is not considered to adversely impact the PMLU for livestock watering for the North Pit, South Pit and WRD sediment Dam.

The potential for pit water overtopping from the North and South pit water is low and therefore the potential for surface water to reach surface water systems is unlikely.

Monitoring will be undertaken to demonstrate suitable water quality in the void is maintained post closure (Section 8.2.7).

6.2 FLOODING

6.2.1 Flood risk profile

A flood risk profile was developed by ATC Williams (2023b) (see 0) to identify whether any mine voids will remain in the floodplain post-closure; and to assess the flood risk to remaining infrastructure.

Flood risk profiles were developed for key infrastructure that will remain at the Project site. Flood mapping was generated for maximum flood depths and maximum velocities for the Probable Maximum Flood (PMF), 0.1% Annual Exceedance Probability (AEP) and 1% AEP design storm events.

Hydraulic analysis indicated that neither the North Pit nor the South Pit will be impacted by flows from the unnamed tributary of the Leichardt River. The North Pit retains an external catchment of approximately 10 ha. An alternate bund is proposed to divert surface runoff from this external catchment into the North Pit, where it will be used for stockwater. Flows will only enter the North Pit from this catchment in events greater than the 1% AEP design storm event. The diversion drain to the west of the North Pit maintains hydraulic connectivity towards the Leichardt River. As such, the pre-mining hydraulic regime will be maintained post-closure.

When assessed against the PRCP Guidelines [1], the South Pit void has been shown to be located outside the extents of the PMF and 0.1% AEP flood plain extents of the unnamed tributary of the Leichardt River.

When assessed against the PRCP Guidelines [1], the North Pit void has been shown to be located outside the extents of the 0.1% AEP flood plain extents of the unnamed tributary of the Leichardt River. The North Pit receives flows from a small catchment to the east and the north wall is overtopped in the 1% AEP, 0.1% AEP and PMF design storm events. This is intentional and the addition of the clean water to the pit will bring the stored water to within stock water quality for use by the local farmer. The North Pit is not hydraulically connected to the unnamed tributary of the Leichardt River. The retained diversion drain to the west of the North Pit has sufficient capacity to convey flows up to and including the PMF event and 0.1% AEP events.

Any rainfall over either the North Pit or South Pit extents will be retained within the voids and will evaporate during the dry season.

Hydraulic modelling shows at the North pit, the water level does not reach the spill over height until rainfall reaches the 85th percentile. At the South pit modelling shows the water level never reaches the spill over height.

A small gully connecting to the existing diversion drain to the east of the south pit is to be constructed to divert water away from the pit.

The WRD Sediment Dam is to be retained for stockwater use by the landowner. Hydraulic modelling indicates the WRD Sediment Dam spillway has sufficient capacity so that the embankment will not be overtopped in design storm events up to and including a 95th percentile event.

All other areas of the site, with the exception of the pit voids, drain freely to the unnamed tributary of the Leichardt River.

A flood profile for the unnamed tributary of the Leichardt River has been derived from the results of the hydraulic modelling for the PMF, 0.1% AEP and 1% AEP design storm events. The flood profile demonstrates that the unnamed tributary of the Leichardt River does not impact any of the retained site infrastructure or the pit voids.

Refer to Section 6.10.2 for details on this infrastructure.

Figure 6-28 shows the model domains assessed as part of the flood assessment for Barbara Copper Mine.

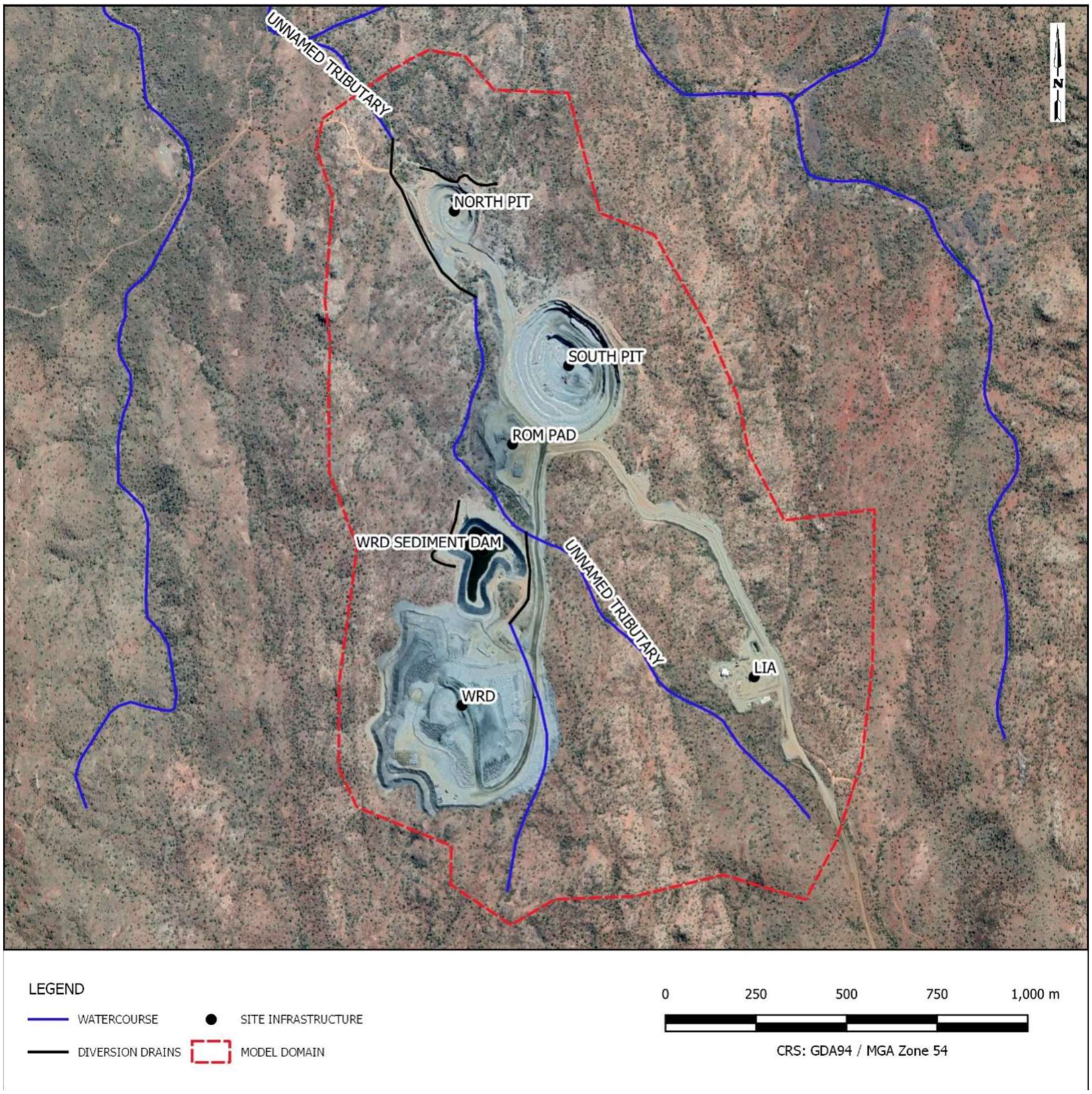


Figure 6-28 Model domains (ATC Williams, 2023b)

6.3 SOILS AND CAPPING MATERIAL ASSESSMENT

Growth media resources within the Project area typically have poor nutrient availability and very low levels of organic matter. Notwithstanding this, their suitability for topsoil stripping and re-use in rehabilitation efforts will be most limited by the practicality of removal and stockpiling, given the degree of rock outcropping and the inherently shallow soil resource.

Soils within SMU1 consist primarily of coarsely textured material of low water holding capacity and poor nutrient availability. These soils are, therefore, less suited to pre-stripping and stockpiling.

Soils within SMUs 2 and 3 are more suitable for stripping and stockpiling for later use in rehabilitation efforts due to their physicochemical properties. Soils of SMU2 report higher levels of major soil nutrients, however, application of a suitable soil ameliorants is necessary to improve these soils as a growth medium.

Minor variation in topsoil characteristics occur within the soil types of each of the management units particularly in respect to the location of rocky outcrops and shallow rock substrate.

In practice, there is insufficient topsoil at the Project site, crushed rocky substrate that is readily available on site will be used as growth media for rehabilitation.

Capping material is required to adequately rehabilitate the WRD on the Project site (refer to Table 6-5). The capping surface area for the WRD will be 12.5 ha, covering the top surface and berms of the WRD. The preferred cover option comprised of a 0.5 m reduced permeability layer (RPL) of fine compacted waste rock; a 1.0 m infiltration storage layer (ISL) of coarse waste rock above the fine compacted waste rock; and a 0.3 m layer of fine waste rock above the coarse waste rock layer.

Table 6-5 Capping volumetric requirements

AREA (M2)	TYPE	THICKNESS (M)	DENSITY (T/M^3)	VOLUME (M^3)
125000	Fine waste	0.3	1.6	37,500
125000	ISL	1	1.8	125,000
125000	RPL	0.5	2.1	62,500
Total				**225,000**

Further details regarding the geochemical assessment of cover material are provided in Section 6.4.

Based on the outcomes of the cover design for the Project WRD (SGM, 2023) and the related risk assessment, the cover design objectives are as follows:

- Limit rainfall infiltration into the WRD to prevent seepage and mobilisation of oxidation products from encapsulated PAF waste rock that may form AMD potentially impacting on surface water and / or groundwater. For semi-arid Australian environments, seepage should be less than 10% of cumulative rainfall.
- Provide long term geotechnical and erosional stability.

The cover design will achieve these objectives through:

- Limiting the potential for seepage into the WRD (for semi-arid Australian environments, seepage should be less than 10% of cumulative rainfall or 8.64 x 10-4 m/day; and
- Including an engineered RPL or a CB layer to limit seepage (if required).

The cover design objectives and attributes are consistent with the PRCP guidelines which requires:

- Land to be returned to a condition similar to the pre-existing condition or to an agreed PMLU;
- Land to be returned to a stable condition that is not compromised by surface instability and erosion and is safe;
- That the final landform is geochemically stable to the extent that it does not impact surface water and / or groundwater quality;
- the PMLU has regard for the land use in the surrounding region; and land to be able to sustain the PMLU.

6.4 CHARACTERISATION OF WASTE

6.4.1 Geochemical characterisation – Waste rock

A waste rock geochemical assessment (0) has been completed (EGi, 2014) which defines the geochemistry of waste rock materials. The assessment involved the analysis of 121 drill core samples from 14 diamond drill holes, representing the range of waste rock lithologies that were intersected during open pit mining operations across the North and the South Pit footprint.

Geochemical investigations were completed to assess the acid forming potential of waste rock and the potential release of metals and metalloids (particularly copper and sulphur) from the waste rock. This informed the environmental risk associated with waste rock and advise on appropriate waste rock management to ensure rehabilitated landforms achieve the required rehabilitation outcomes.

Standard geochemical analyses of drill samples were undertaken by EGi, with outcomes categorised based upon a 0.5% Copper (Cu) grade cut-off threshold for ore. In total, 27 samples were classified as ore, and 94 samples were classified as waste. The full report is provided within 0 and the Waste Rock Management Plan is provided in 0.

Additional geochemical characterisation of waste rock and ROM oxide was undertaken by EGI in 2020. Several geochemical analyses including kinetic column leach testing were conducted on a total of six samples collected from the South Pit. The outcome of the kinetic column leach testing from 2020 is summarised in Section 6.4.2 and the full report is in 0.

Characterisation of NAPP and NAG properties of the samples was undertaken to examine the potential for AMD. Regarding the acid generation capacity of waste rock, most samples tested were NAF. However, approximately 10% of samples tested were classified as PAF. Lag times for significant acid generation to occur (based on 3 samples) are expected to exceed one year. Additionally, suspended sediment levels of runoff generated from waste surfaces is likely to become elevated.

With respect to the acid generation capacity of ore material, 56% of the ore samples tested were classified as PAF. Lag times for significant acid generation (based on two samples) varied from 'weeks' to 'years'.

Based upon the analyses undertaken, the samples were classified by EGi (2014) into the following classes:

- Non-acid forming (NAF), the sample is not expected to generate acid in excess of the available acid neutralising capacity (ANC). (< 0.3% Total sulfur)
- Potentially acid forming (PAF), the sample may form sulphuric acid when in prolonged contact with water and oxygen. (> 0.3% Total sulfur)
- Uncertain (UC), the sample may or may not form acid.

Based upon the acid forming properties of the material, water which remains in contact for medium to long-term durations, may exhibit AMD.

NAPP and NAG characterisation demonstrates most waste rock samples are NAF, while ore samples are distributed between NAF and PAF. An AMD classification plot displaying the concurrence of NAPP and NAG test results is provided in Table 6-6 and Figure 6-29.

Table 6-6 Waste rock classification

WASTE/ORE	CLASSIFICATION	NUMBER OF ANALYTE RESULTS	PROPORTION
Waste Rock (Cu ≤ 0.5% Grade)	PAF	7	7%
	NAF	83	89%
	UC	4	4%
Ore (Cu > 0.5% Grade)	PAF	15	56%
	NAF	12	44%

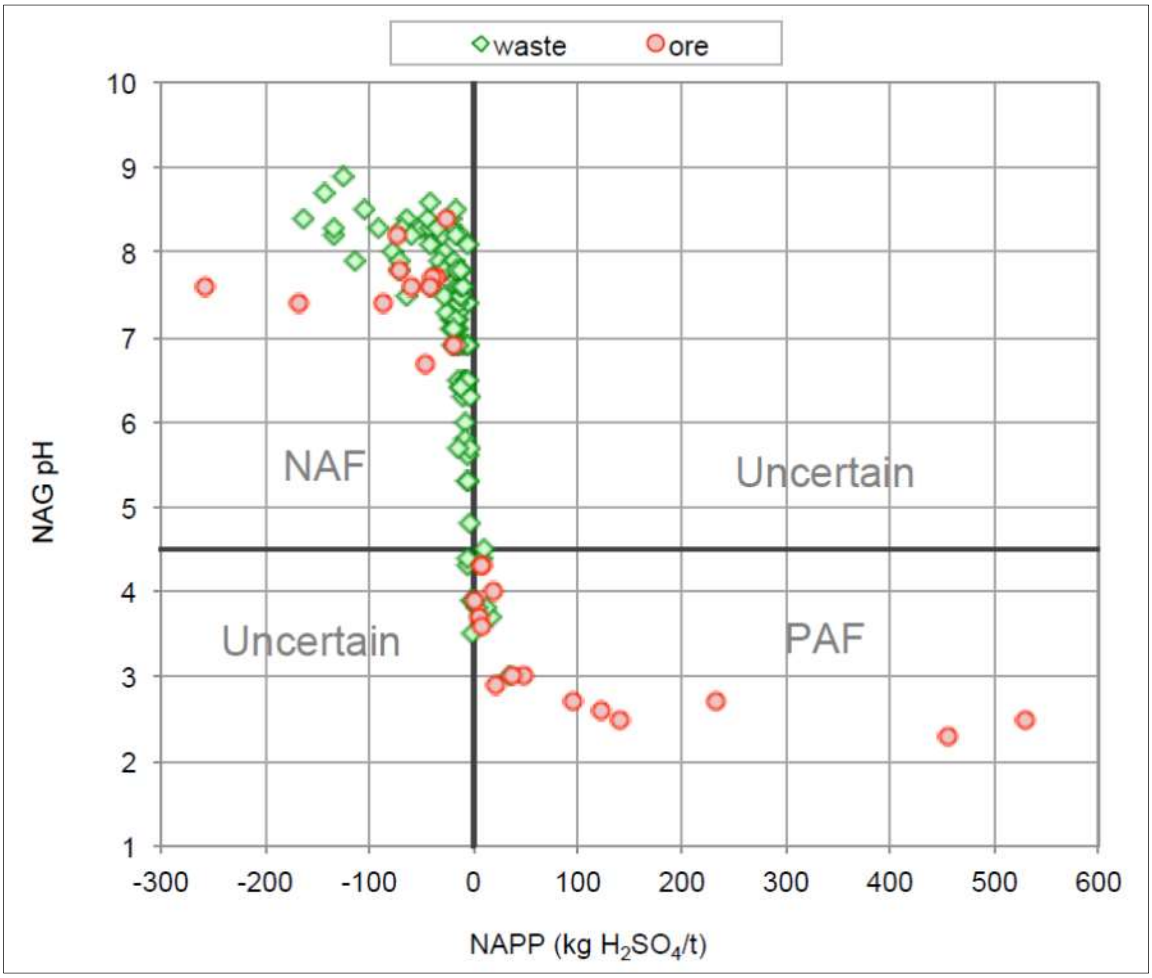


Figure 6-29 Acid rock drainage characterization of Project samples (EGi, 2014)

Additional kinetic NAG analyses were conducted for five samples (three waste, two ore) of PAF rock, to provide an indication of the lag time before significant acid generation occurs. Accordingly, the five samples analysed were PAF samples. The outcomes are presented Table 6-7.

Table 6-7 Acid rock drainage samples - acid generation lag time (EGi, 2014)

SAMPLE	FINAL PH	LAG TIME
Ore #8050	3.1	Weeks to months
Ore #8112	2.7	At least a year to several years
Waste #8066	4.7	At least a year to several years
Waste #8092	3.0	Several years
Waste #8072	6.3	At least a year to several years

Overall, lag times for samples classified as PAF were significant, and likely to exceed a year.

Of the two analysed PAF ore samples, one was highly reactive (Ore #8050), with generation of acid expected to occur within weeks of being exposed to atmospheric conditions (water and oxygen).

NAF waste rock materials exhibited limited ANC, consequently blending of NAF and PAF samples may not result in significant changes to acid generation characteristics of the blended material, compared to the PAF material alone.

Additionally, sulphur speciation was conducted on the five samples used in the kinetic NAG analyses to determine the forms of sulphur present in rock. This revealed very minimal sulfate-sulphur present in rock with most sulphur present as sulphide-sulphur.

6.4.2 Kinetic leach column tests – Waste rock and ROM oxide

A column leach test program involving samples representing waste rock and ROM oxide from the Project commenced on 30 August 2019, with leaching extending over 12 months during which a total of 13 leachate collections were made.

The six samples (each sample comprised approximately 10 kg of rock pieces) were collected from the South Pit from various geological units according to geochemical characteristics. One sample was considered PAF, three samples represented NAF waste rock and the remaining two samples represented ROM oxide, as listed in Table 6-8.

Table 6-8 Descriptions of Barbara waste rock and ROM oxide samples

Material Class	Location	Northing	Easting	Depth in Pit	Geological Description
PAF1	South Pit	380252	7741437	330 RL	Oxidise sample quartz sericite schist, minor secondary copper.
NAF1	South Pit	380184	7741440	330 RL	Biotite schist
NAF2	South Pit	380122	7741495	325 RL	Biotite schist
NAF3 (previously PAF2)	South Pit	380193	7741549	325 RL	Oxidise sample quartz sericite schist with secondary copper, malachite and azurite.
NAF4	South Pit	na	na	na	na
ROM Oxide1	South Pit	380298	7741497	325 RL	Sample collected at the southern end of the shear zone and outside the ore zone. Very oxidised samples with minor secondary copper, malachite and azurite.
ROM Oxide2	South Pit	380224	7741519	325 RL	Sample collected from the hanging wall of the shear zone. Mainly oxidised schist, with secondary copper, malachite and azurite.

Chemical characterisation of three of the NAF samples and the two ROM oxide samples indicate NAF characteristics. One NAF sample recorded significant sulphide concentration, although this sample also presented moderate to high ANC which resulted in a negative NAPP test and was subsequently confirmed to be NAF. The PAF sample recorded a positive NAPP result and acidified during the NAG test. The acid forming characteristics of samples are summarised in Figure 6-30 and Figure 6-31**.**

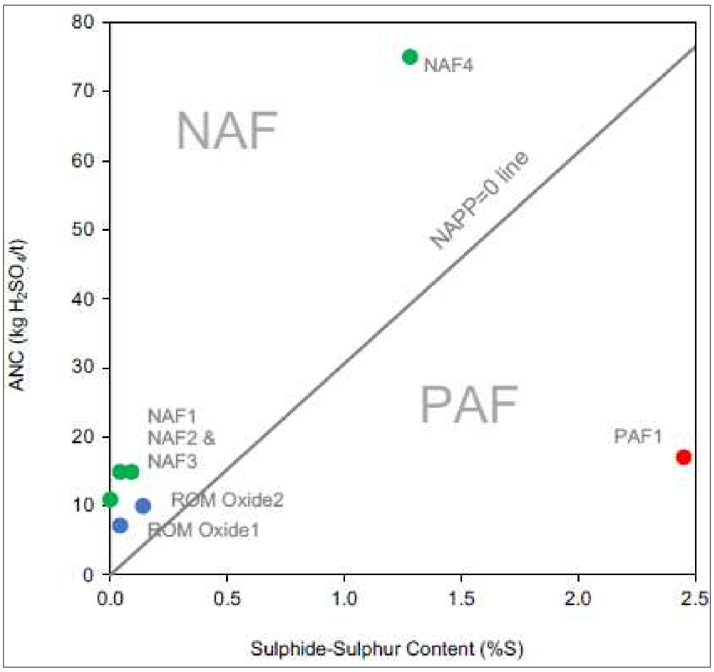


Figure 6-30 AMD plot for waste rock and ROM oxide

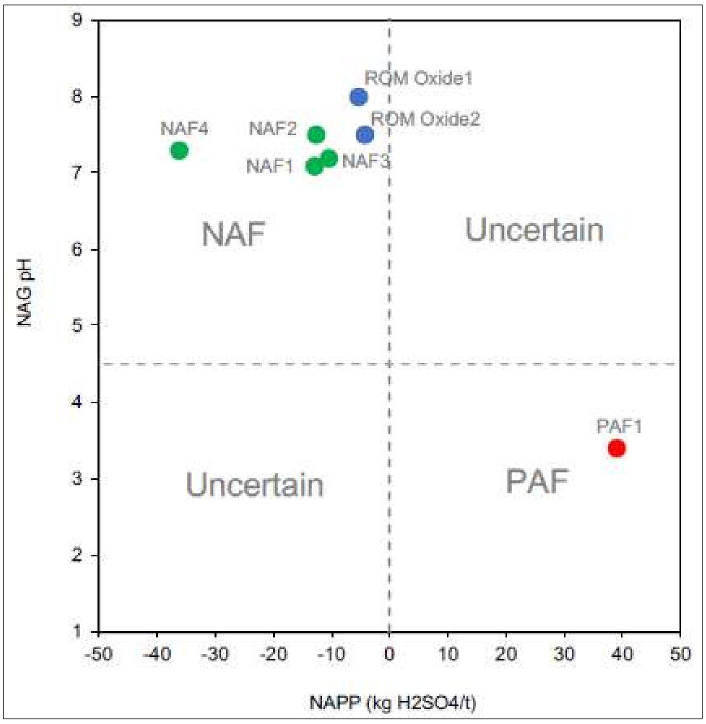


Figure 6-31 AMD classification

Sulphur speciation was undertaken on samples to differentiate between sulphide and sulfate, that is, species of sulphur that are acid forming and non-acid forming.

Two samples, one NAF and one PAF presented significant sulphide content. Although, both samples had elevated copper which indicates the process of copper sulphide mineralisation.

The PAF sample recorded a sulphide content of 2.45%. Based on the copper content of 0.79% Cu, it is estimated that approximately two-thirds of sulphur (S) exists as pyrite, with the remaining third existing as chalcopyrite. The NAF sample recorded a sulphide content of 1.32% and a copper content of 1.05% Cu. Based on this sulphide and copper concentration, it was determined that 1.06%S of sulphide exists as chalcopyrite, with 0.22% S is present as pyrite. Sample composition is presented in Figure 6-32.

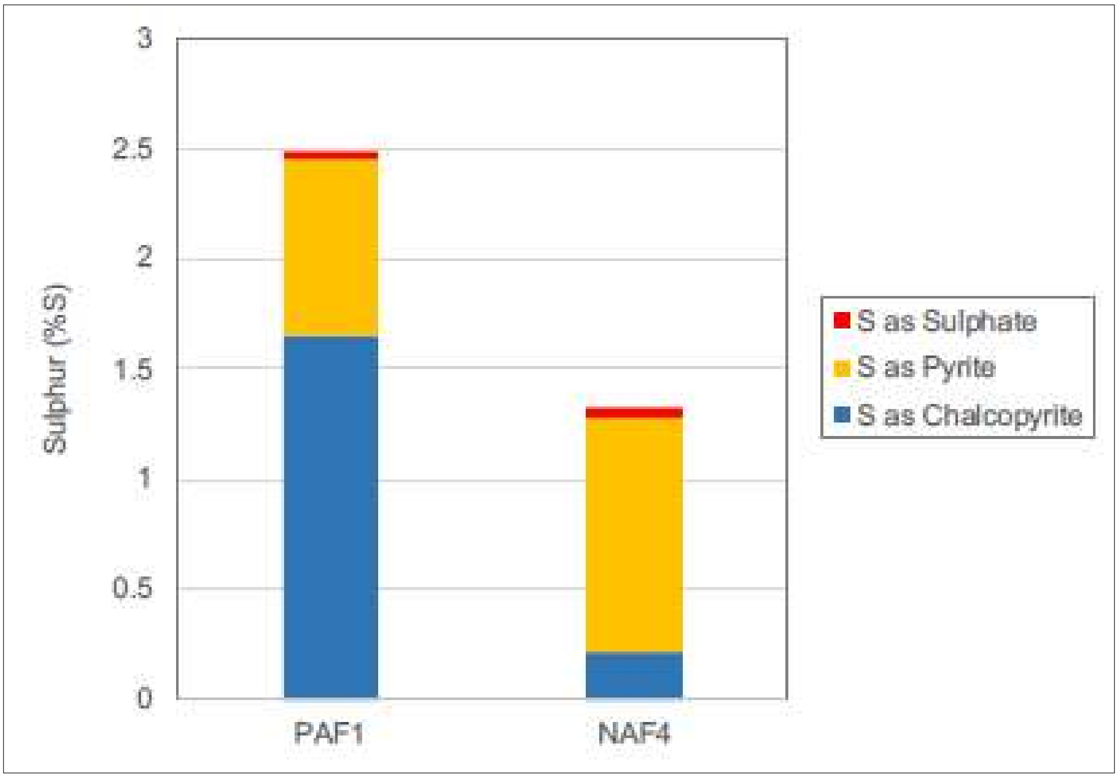


Figure 6-32 Sulphur speciation in column leach test samples

The reactivity of sulphides in the PAF sample was assessed during a monitored NAG test (EGI, 2020). The monitored NAG test revealed an initial lag in acidification, attributed to the acid neutralising capacity of the rock material. After the lag period, pH began to decline while temperature increase as sulphidic material was oxidised. The results of the monitored NAG test are presented in Figure 6-33 and indicate the sulphidic mineralisation is reactive, however, the lag period suggests acidification will only occur after many months or years under field conditions.

Two assessments for acid neutralising potential were conducted on samples, namely ANC and carbonate neutralising value (CNV). Results are presented in Figure 6-34. For all samples, CNVs were below ANC values. This suggests most acid neutralising capacity in rock is a result of carbonate mineralisation. This is particularly true for sample NAF4 which has the highest ANC. It is anticipated that for samples with very low ANCs, some acid neutralising may be derived from gangue minerals such as silicates.

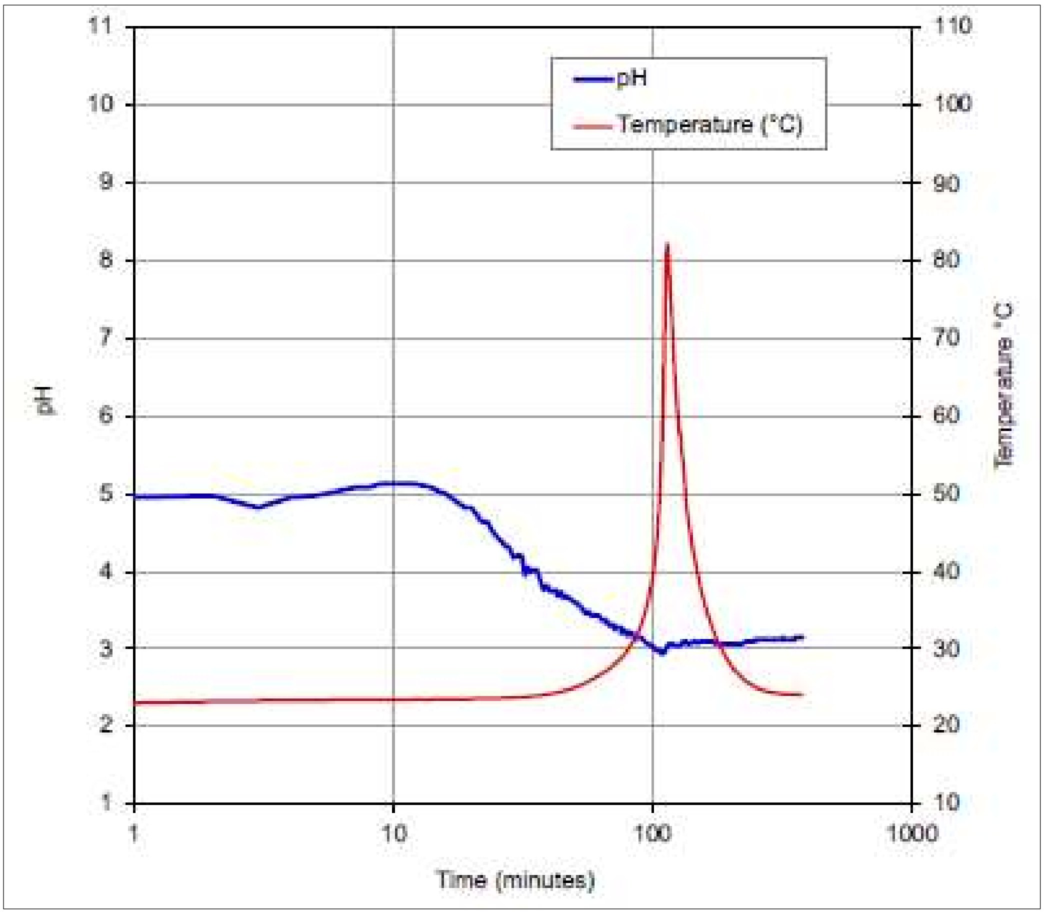


Figure 6-33 Monitored NAG pH profiles for PAF waste rock and low-grade ore samples

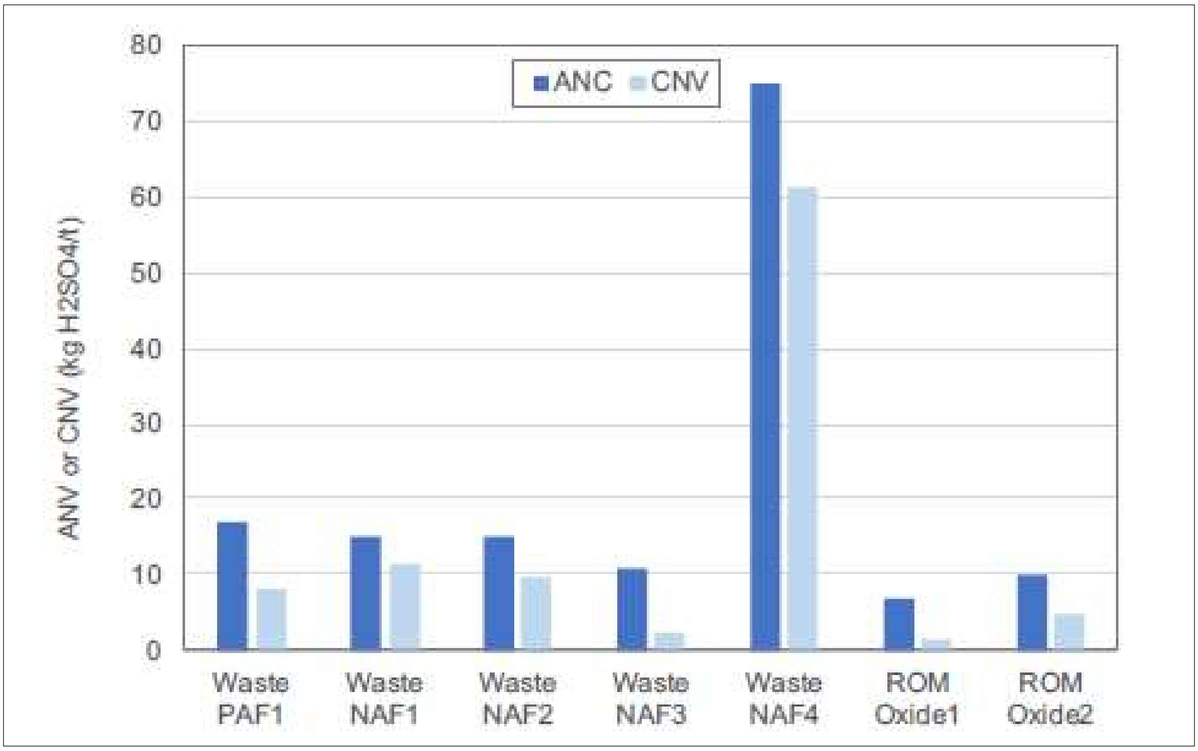


Figure 6-34 Comparison of carbonate neutralising value and acid neutralising capacity

The column leach test occurred for one year under conditions amenable to sulphide oxidation. The column was flushed every three weeks with the leachate collected for elemental analysis.

The first-flush leachate collected from all samples was found to be alkaline, low in soluble salts, contained only trace concentrations of aluminium, iron and manganese. Dissolved metal concentrations were generally below the limits of analytical detection.

A summary of chemical characteristics for the leachate produced from each sample for weeks 4-52 is provided in Table 6-9.

Table 6-9 Summary of leachate analysis from week 4 to 52

SAMPLE ID	LEACHATE CHARACTERISTICS
PAF1	pH remained circum-neutral signifying the sample was in lag phase. Release of sulfate remained relatively low – ranging between 155 to 334 mg/L which indicates slow rate of sulphide oxidation. No leaching of iron or copper as a result of slow rates of pyrite and chalcopyrite oxidation. Despite significant enrichment of cobalt and selenium and minor enrichment of arsenic and nickel in the sample, arsenic concentration was below detection limits while only trace concentrations of cobalt, nickel and selenium were present in leachate. Only minor leaching of manganese and aluminium were recorded.
NAF 1 and NAF2	pH of leachate remained alkaline. Sulfate concentrations remain very low for the duration of the column leach (NAF1 average of 20 mg/L and NAF2 average of 47 mg/L. Results indicate sulphide oxidation is near non-existent. Calcium was recorded as a major cation in leachate with the average calcium concentration of 11 mg/L and 21 mg/L in NAF1 and NAF2 respectively. Concentration of copper, cobalt and chromium indicates no significant leaching of these metals. NAF2 presented minor leach of arsenic with concentrations in leachate increasing in the first six months before stabilising at 0.03 mg/L.
NAF4	pH of leachate remained slightly alkaline for the duration of the column test. Although leachate remained alkaline, there was a significant release of sulfate during the test with and average sulfate concentration of 452 mg/L at a release rate of 32 mg/kg/week. This corresponds to an IOR of $4.8x10^{-8}$ $kg/O_2/m^3/sec$. which is in the moderate range for sulphidic rock. Significant leaching of calcium was detected which reflects the carbonate minerals within sample reacting with the acidity generated by sulphide oxidation. Release of magnesium was also reported, suggesting carbonate mineralisation may have been partially dolomitic. Although the sample had a high copper content, the concentration of copper in leachate was minor at around 0.01 to 0.04 mg/L. It is thought that copper released during oxidation likely reprecipitated as copper oxyhydroxide. No significant leaching of iron, manganese, or any other element of environmental significance was detected.
Oxide ROM1 and ROM2	Both ROM oxide samples remains circum-neutral during the column leach test. Release of sulfate occurred during the first few months of the test, however this decreased thereafter. The copper concentration of leachate indicates some evidence of copper leaching, although results indicate a pH-dependent solubility control for copper release. As

SAMPLE ID	LEACHATE CHARACTERISTICS
	such, copper leaching is expected to remain constant as a result of circum-neutral pH. No significant leaching of cobalt or other metals of environmental significance was detected.

The overall goal of waste rock management for open cut mining at the Barbara site has been to place all PAF waste rock within the final dump landform so that long-term generation of AMD from the PAF rock does not occur or is restricted to a rate that can be readily assimilated *in situ* by the surrounding NAF material so the resultant dump seepage is of a quality that will not adversely impact the downstream environment. The Waste Rock Management Plan for operations is provided in 0 and the landform and cover design for closure is provided in Section 6.5.

6.4.3 Underground waste rock geochemistry

A study on the sulphur distribution of the Barbara deposit was carried out which showed sulphur percentages for different lithologies in the footwall of the deposit. As the development for the underground operation would be situated in the footwall of the orebody, this would be the source of most of the waste rock during underground mining. The most common lithologies were Rhyodacite/Dacite and Dolerite/Amphibolite. The decline is expected to be NAF between approximately 180mRL and 260mRL.

A waste balance, using Total Sulfur cut-off grade, consistent with the open cut classifications, showed the generation of PAF could be accommodated underground as backfill, refer to Figure 6-37. The threshold for defining PAF is >0.3% Total Sulfur. Fill for underground stopes during Stage 1 of mining (the waste generated by underground mine development) will be sufficient for stope fill. The deficit of backfill material will not occur until Stage 2. . NAF generated during Stage underground mining will be temporarily stored on the before being returned underground as backfill.

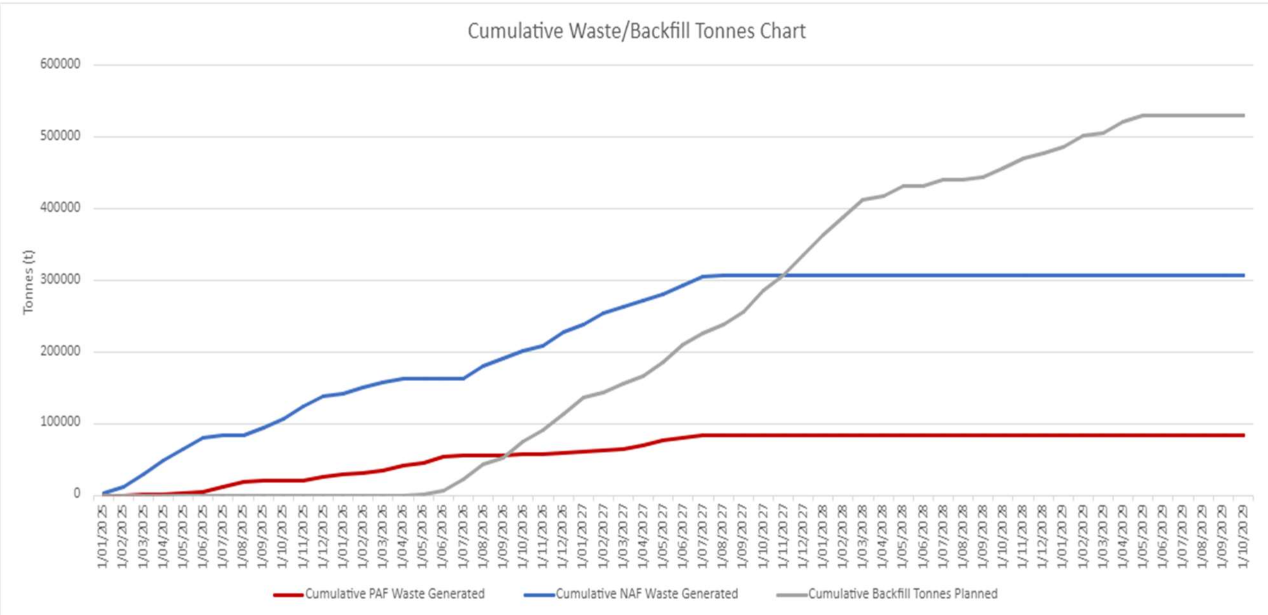


Figure 6-35 Cumulative Waste / Backfill Tonnes

6.4.4 Potential NMD & SMD

Information on void water quality and potential AMD is provided in Sections 6.1.4, 6.1.5, 6.4.2 0, and 6.4.3.

Saline mine drainage (SMD) potential

Analyses of EC were performed to provide an indirect measure of the soluble salt content of mined rock and to assess the potential for saline drainage if material is exposed to atmospheric conditions. Figure 6-36 provides a summary of EC values per rock unit.

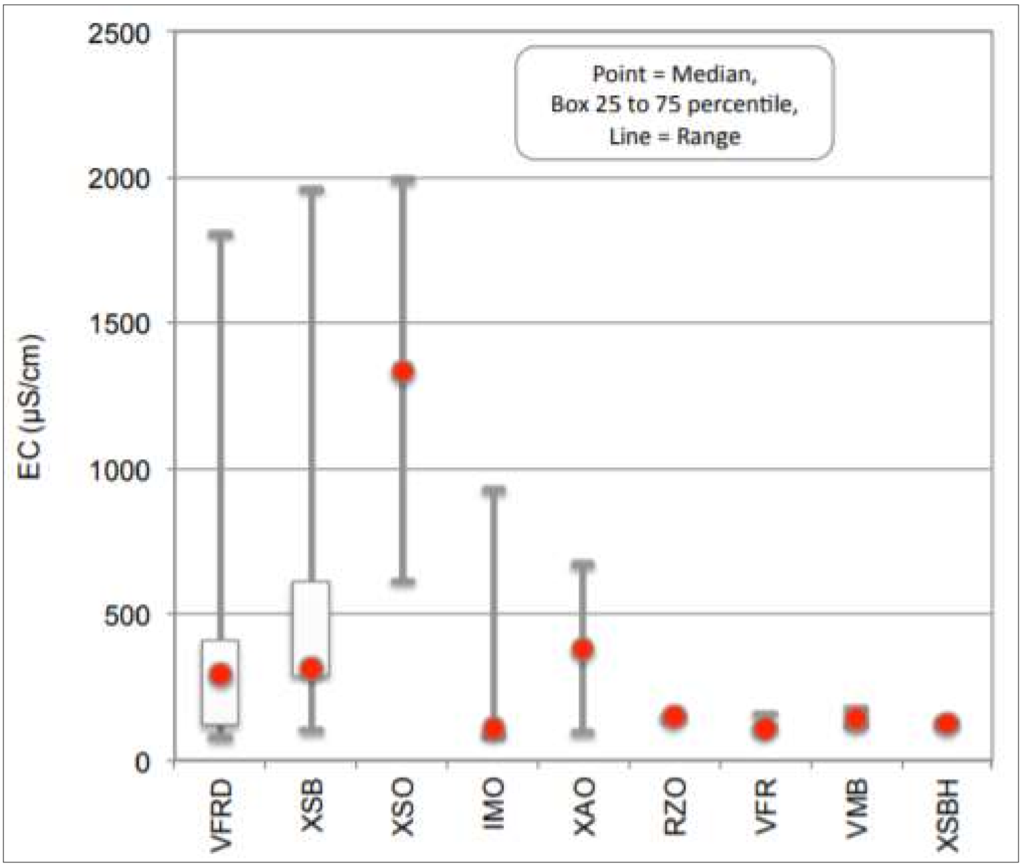


Figure 6-36 Summary of EC values for all rock units within Barbara drill core samples

From the results presented in Figure 6-36, the following outcomes can be determined:

- 72% of the 87 VRFD (the dominant waste unit) analyses - generally comprising of the predominant waste rock unit (Porphyritic Rhyolite), resulted in an EC of less than 400 µS/cm, representative of 'non-saline water'.
- 21% of the 87 VRFD analyses resulted in an EC between 400 and 800 µS/cm, representative of 'slightly saline water'.
- 13 of the 121 drill core analyses conducted were classified indirectly as 'saline' (≥800 µS/cm). It is noted that 12 of the 13 analyses resulting in a 'saline' classification comprised high sulphur ore materials.

Based upon the EGi (2014) results, it was concluded that saline drainage was not considered a significant water quality issue, with respect to waste rock materials.

Water Extractable Elements

Characterisation of the elements within each sample was undertaken using a geochemical abundance index (GAI) approach. Under this approach, the abundance of minerals within a sample is compared to reference materials which do not feature abundance or enrichment of specific elements.

The elements analysed included: Al, As, Ba, Be, Bi, Cu, Cd, Co, Cr, Cu, Fe, Hg, K, Li, Mg, Mn, Mo, Na, Ni, P, Pb, S, Sb, Se, Sn, Sr, Th, U and Zn.

All elements detected in the waste rock and ore samples that are considered to be of minor (GAI = 1-2) to significant enrichment (GAI ≥ 3) are listed in Table 6-10 and Table 6-11.

Table 6-10 Elemental ore characteristics

MATERIAL	ELEMENT	ABUNDANCE (RATION OF SAMPLE: REFERENCE MATERIAL)	GAI	DESCRIPTION
Ore	Copper	≥24	≥3	Abundant
	Sulphur	≥24	≥3	Abundant
	Selenium	12 - 24	3	Significant Enriched
	Bismuth	12 - 24	3	Significant Enriched
	Cobalt	12 - 24	3	Significant Enriched
	Arsenic	12 - 24	3*	Significant Enriched
	Nickel	6 - 12	2**	Minor Enriched

**1 of 7 ore samples was classified as having a GAI of 3 for Arsenic, with 6/7 samples classified as having a GAI of 0 (Little to no enrichment)*

***2 of 7 ore samples were classified as having a GAI of 2 for Nickel, with 5/7 samples classified as having a GAI of 0 (Little to no enrichment)*

Table 6-11 Elemental waste characteristics

MATERIAL	ELEMENT	ABUNDANCE (RATION OF SAMPLE: REFERENCE MATERIAL)	GAI	DESCRIPTION
Waste	Copper	12 - 24	3	Significant Enriched
	Sulphur	12 - 24	3	Significant Enriched
	Selenium	12 - 24	3	Significant Enriched
	Bismuth	6 - 12	2	Minor Enrichment
	Cobalt	6 -12	2	Minor Enrichment

As would be expected, all of the ore samples assayed were significantly enriched (GAI≥3) with copper and sulphur, and most were significantly enriched with selenium, bismuth and cobalt. One of the seven ore samples (8112) was also significantly enriched with arsenic (114 mg/kg), and some samples exhibited minor enrichment (GAI of 1 or 2) with nickel. Some waste rock samples were also significantly enriched with copper, sulphur and selenium relative to concentrations typically reported for background soil. In the case of copper the concentrations in the waste samples were generally markedly less than in ore, but high in comparison to soil in non-mineralised areas. There was also evidence of minor enrichment (GAI of 1 or 2) of some waste samples with bismuth and cobalt, but otherwise the results suggest that other environmentally important elements typically occurred at concentrations approximating background soil. They included antimony, arsenic, cadmium, chromium, lead, manganese, mercury, nickel, tin, and zinc.

The elemental characterisation provides an indication of elements enriched in the solid rock material, however, may not be indicative of the potential for metal leaching to water. The leaching potential of ore and waste rock was, therefore, determined using an extraction with deionised water. The composition of water extract is representative of the state of chemical equilibration between the liquid and solid phase at the natural pH of the material. Results from the water extraction test suggest drainage from freshly mined waste rock is typically slightly alkaline (median pH = 9.0) and has low concentrations of soluble salts (median EC = 200 µS/cm) (EGI 2014). Furthermore, concentrations of metals of environmental importance are considered low and are as follows:

- ≤ 0.0001 mg/L Hg, Cd
- ≤ 0.001 mg/L Cr, Co, Mn, Ni, Pb, Sb, Sn
- ≤ 0.002 mg/L As, Cu
- ≤ 0.005 mg/L Mo, Zn
- ≤ 0.01 mg/L Se

6.5 LANDFORM AND COVER DESIGN

This section provides the landform and cover design for the Project and proposed erosion control.

6.5.1 General landform areas

Prior to the spreading of rocky mulch, as required, disturbed areas will undergo surface contouring and ripping. Surface contouring will be undertaken to minimise erosion and maximise water retention. The spacing between rip lines is determined by the slope of the land, which acts to reduce soil erosion and increase plant establishment rates (refer to Table 6-12). Where soils are particularly compacted, a ripping depth of 300 mm will be employed.

Table 6-12 Design of ripping operations for post-disturbance surface preparation

SLOPE	RIPPING DEPTH	TYNE SPACING
>10%	200 mm	<1.5 m
5 – 10%	200 mm	<2.5 m
<5%	200 mm	<5 m

Constructed landforms such as the ROM pad will be contoured to resemble the original local topography as far as practicable.

6.5.2 Waste Rock Dump

Post-closure the waste rock dump is designed to be a permanent storage for waste rock mined from the Project. The waste dump design is based on selective mining and placement of waste rock to form a permanent dump that encapsulates the PAF material with NAF waste.

At the end of open cut mining and prior to placement of the proposed final cover system, the WRD has been shaped to be a water shedding to prevent infiltration into the encapsulated PAF cell. A compacted NAF material barrier layer of 2.5 to plus 7 m thick has been placed over the bounded PAF cell, followed by a compacted and rolled crushed non-mineralised rock layer of 50 mm (nominal) thickness. Figure 6-39 shows a remotely sensed image demonstrating the thick NAF cover is encapsulating the PAF material with no surface exposure. The image is over the surface of the encapsulated PAF cell.

The capping contains a low permeability layer above and below the PAF waste rock, comprised of compacted NAF waste rock to prevent infiltration into the PAF cell and isolate it from the permeable NAF waste rock located beneath it (SGM 2021). The average gradient on the upper surfaces is 3% to facilitate rapid runoff and avoid pooling.

The remainder of the WRD, including the batters has been constructed with NAF material.

A slope stability assessment has been completed and meets the FOS (ATCW), The SGME erosion assessment provides an analysis of future stability for the WRD and shows that it poses a very-low erosion risk. Each layer on the WRD has been haul truck trafficked during construction (compacted during operations). We will be placing cover material on berms but not batters (expect natural movement of fines onto batter slopes over time). The cover system aims to limit infiltration and ultimately seepage into the PAF Cell which is centrally located away from batters. The installation of monitoring infrastructure (such as VWC and Matric suction sensors) will be used to monitor potential seepage and water infiltration (SGM, 2023).

The angle of repose of the side batters will be 37 degrees. The natural rill of the batters will create rock armouring / outcropping consistent with the surrounding landscape. The outcropping could become potential habitat for fauna known to populate the surrounding rock outcrops.

The total disturbance footprint of the WRD is approximately 23 ha with 12.5 ha of this area associated with the cover system (excluding batters).

The final landform is mostly NAF waste rock (the cover material) with low sulphur content Geochemical static characterisation of the waste rock was completed by EGi in 2014. In 2019 a kinetic leach column testing program was also completed. The Kinetic column testing found that apart from limited leaching of copper, there was no evidence of leaching of environmentally important elements such as arsenic, cadmium, mercury, lead and zinc from either the cover material or the PAF samples (EGi 2020). A cover design for the Project waste rock dump was developed in 2023 (SGM, 2023).

At closure rainfall runoff from the rehabilitated WRD will be conveyed to the Sediment Dam that will be handed to the landholder for water storage. The WRD sediment Dam will spill to the North Pit diversion and ultimately the receiving environment. The current landform design for the WRD is shown in Figure 6-40.

A risk assessment has been conducted by SGM (2021c), to identify potential impacts to the receiving environment associated with long-term storage of PAF waste rock in the WRD. This information assisted in identifying the most suitable cover design for the WRD. Based on the risk assessment findings SGM have provided a series of cover options. The cover design will aim to minimise environmental harm post closure. Recommended cover options progressed towards column trials in order to determine the most effective cover type that will reduce infiltration into the PAF waste rock.

A numerical model was built in SVFlux (the model) software package to replicate the cover designs used in the trials (SGM 2023). The model simulates water flow and solute transport in variably saturated media and can be used to predict infiltration, evaporation, transpiration, soil water storage, capillary rise and deep drainage (percolation and / or seepage).

The following covers have been trialled and modelled for this Project (SGM 2022):

- Trial 1:
  - a 1.6 m ISL of coarse waste rock; and
  - a 0.3 m layer of waste rock above the ISL.

- Trial 2:
  - a 1.6 m ISL of coarse waste rock; and
  - a 0.3 m layer of soil above the ISL.

- Trial 3:
  - a 0.5 m RPL of fine compacted waste rock;
  - a 1 m ISL of coarse waste rock above the RPL; and
  - a 0.3 m layer of fine waste rock.

The instrumentation used for development of the column trials included buried pairs of sensors in the different layers of the preferred cover (SGM 2023). These pair of sensors include both a matric suction sensor and a volumetric water content (VWC) sensor. VWC sensors were not calibrated because EC was expected to remain below 10,000 µS/cm. Matric suction sensor are recommended for use for ranges between 10-1,000 kilopascals (kPa). The depth at which each sensor pair was installed is provided in Table 6-13. The function for the calibration of the matric suction sensors for the preferred cover is provided in Figure 6-37 and Figure 6-38 (SGM 2023).

Table 6-13 Sensor burial depth in the preferred cover (Table adapted from SGM 2023)

SENSOR NUMBER	SENSOR DEPTH (M BGL)	COVER LAYER
11 / B	0.1	Fine NAF waste rock
12 / C	0.2	
13 / D	1.1	Coarse NAF waste rock (ISL)
14 / E	1.3	Compacted fine NAF waste rock (RPL)
15 / F	1.6	

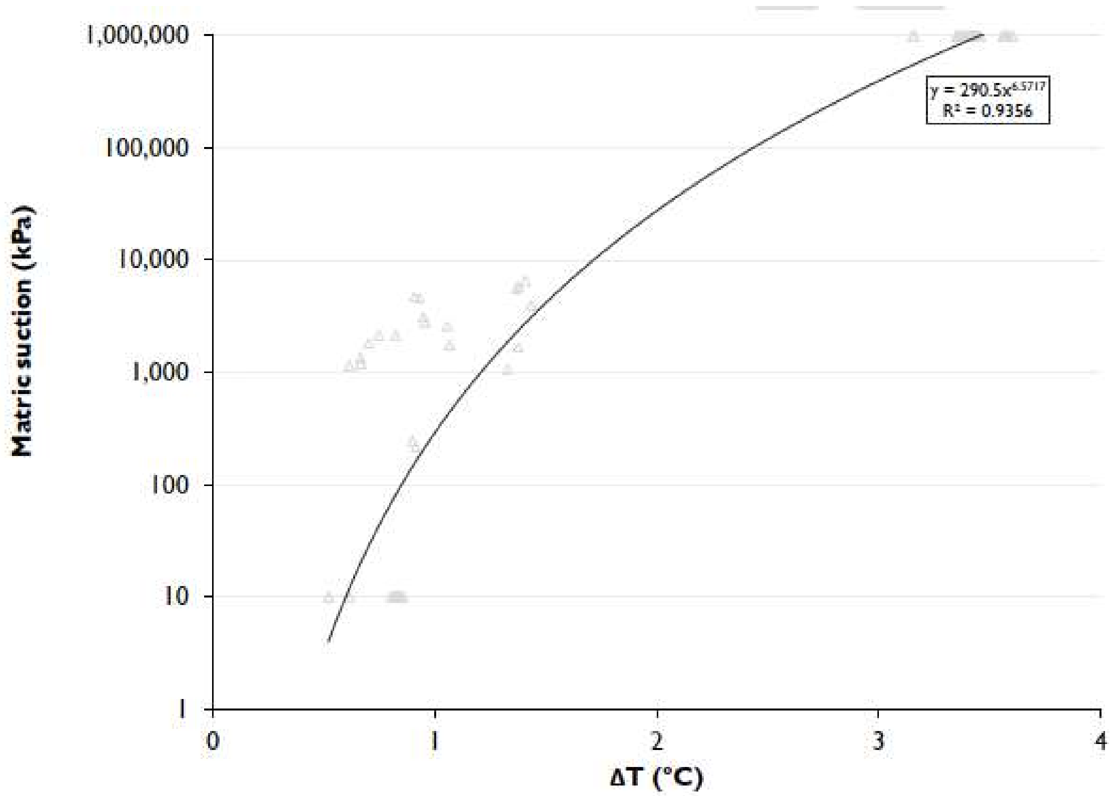


Figure 6-37 Fine NAF waste rock matric suction calibration function (SGM 2023)

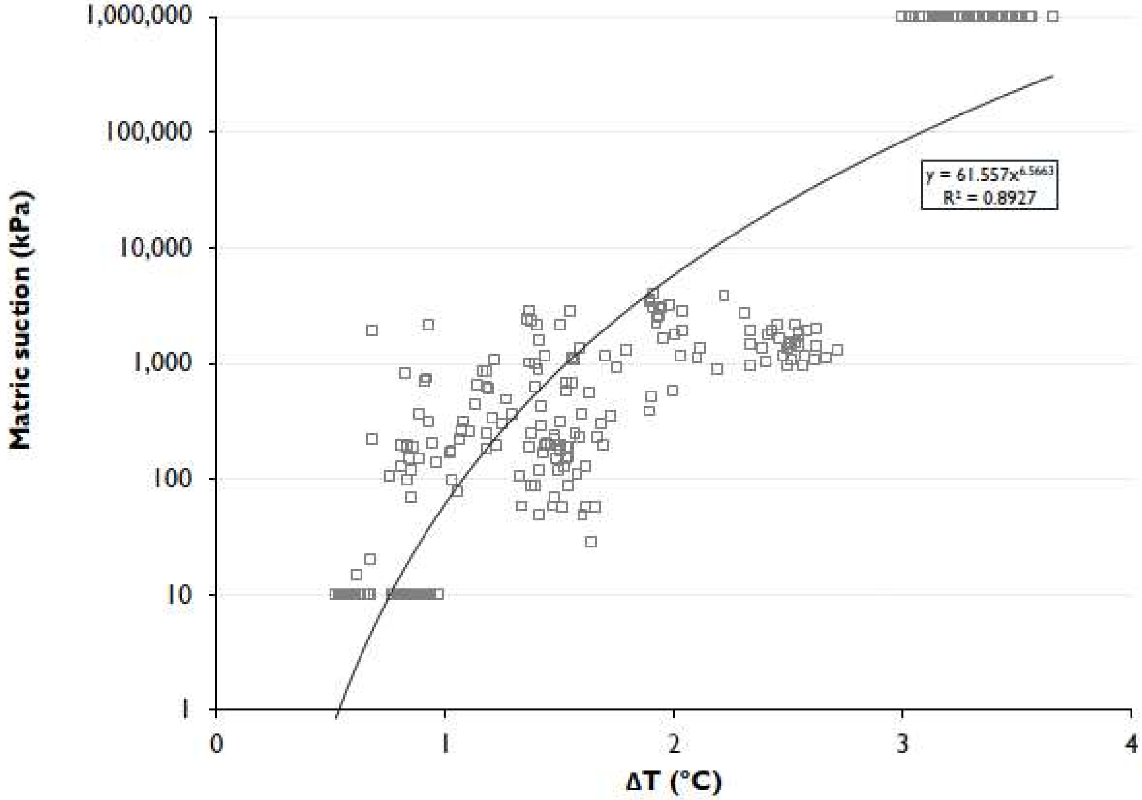


Figure 6-38 NAF waste rock matric suction calibration function (SGM 2023)

The matric suction sensors for clay/soils were individually calibrated by comparing the measured change in temperature (ΔT) of the matric suction sensors to the matric suction of each material. The matric suction was determined by measuring total suction with a dew-point water potential meter and calculating osmotic suction from electrical conductivity (EC). Matric suction was then calculated by subtracting osmotic suction from total suction. The following method was used to calibrate the matric suction sensors:

1. Place oven dried matric suction sensors into oven dried cover material and allow them to come to equilibrium for 24 hours. The measured change in temperature (ΔT) is equivalent to a matric suction of 1,000,000 kilopascals (kPa).
2. Submerge the matric suction sensors in de-aired water for 48 hours to completely saturate the sensor head. Measured ΔT is equivalent to a matric suction of 10 kPa.
3. Weigh 1 kilogram (kg) of each cover material into a zip-lock bag and add 100 millilitres (ml) of deionised (DI) water, mix well and allow the prepared mixture to come to equilibrium over 24 hours.
4. Bury each matric suction sensor in separate Falcon tubes with the selected cover material and allow them to reach equilibrium over 24 hours. Measured ΔT is equivalent to a matric suction between field capacity and permanent wilting point.
5. Repeat step 3 and step 4 with 50 ml of DI water.
6. At the end of step 4 measure total suction directly using a water potential dew-point meter.
7. At the end of step 4 measure the EC directly on a one-part cover material to five-parts DI water.

The matric suction can then be calculated from EQ A1 and EQ A2:

- EQ A1 [Total suction (kPa) = matric suction (kPa) + osmotic suction (kPa)]
- EQ A2 [Osmotic suction (kPa) = 0.36 * EC (dS/m)]

Modelling outcomes indicated that during periods of normal rainfall or during periods of no rainfall, rainfall will initially infiltrate and then be removed by evapotranspiration with negligible seepage. However, Trial 1 and Trial 3 may have an unacceptable rate of seepage when subject to periods of short duration, heavy rainfall (the wet year or the worst case). Trial 2 has been excluded from the selection of the preferred cover because there were not enough soil resources (stockpiled or undisturbed) for rehabilitation and soil has an increased potential for erosion (by mechanical movement) compared to waste rock.

Trial 1 had an increased capacity to store infiltration in the ISL, but produced more seepage, when compared to Trial 3.

Trial 3 (0.3 m of NAF waste rock overlaying a 1.0 m ISL overlaying a 0.5 m RPL) is selected as the preferred cover since:

- The coarse nature of waste rock slows runoff water velocity and reduces the potential for erosion; and
- The RPL limits the potential for seepage.

Modelling has been completed without vegetation (to give a conservative assessment) and demonstrates that vegetation is not required to limit seepage.

A field scale cover trial (field trial) has been recommended in order to validate the performance of the preferred cover (Trial 3) to limit seepage into the underlying PAF waste rock. The field scale column trials should run for several years so that seasonal variation influences on cover performance can be assessed.

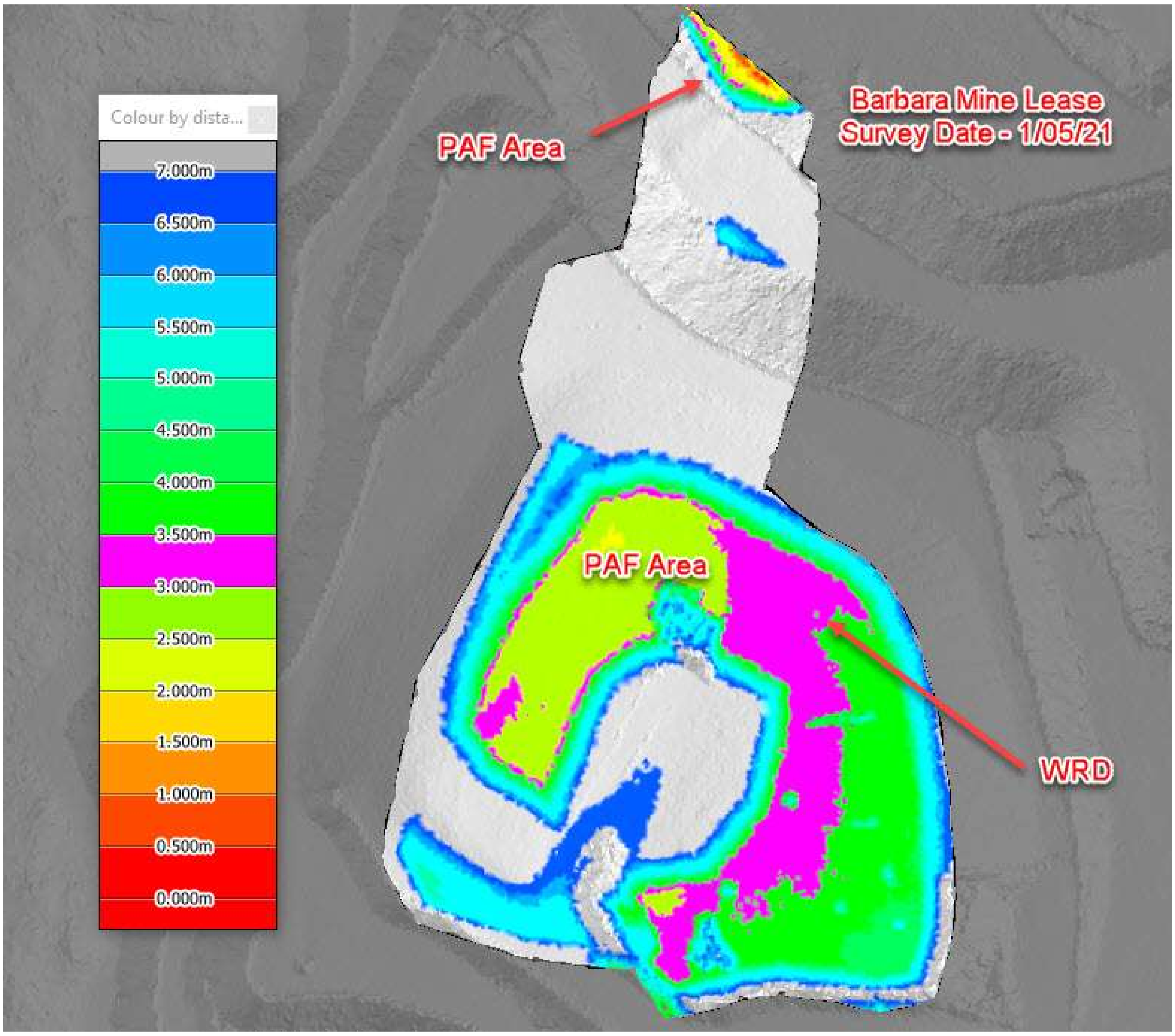


Figure 6-39 Remote sensing image displaying 5m NAF cover on Barbara WRD

Figure 6-40 Current landform design of WRD

6.5.2.1 Geotechnical stability of the WRD

The geotechnical stability of the WRD design was assessed by ATC Williams in 2020 and slope stability was assessed using GeoStudio, SLOPE.W software. The proposed geometric configuration of the WRD is as follows:

- Batter slopes: 37 degrees (angle of repose)
- Batter height: 10 m
- Bench width: 12 m
- Average batter slope: 1V:2.5H

Model parameters for WRD material properties and foundation have been sourced from the Sediment Dam Detailed Design Report (ATCW, 2020) and are detailed in Table 6-14.

Table 6-14 Adopted material characteristics

LAYER DESCRIPTION	BULK DENSITY (Y) (KN/M^3)	EFFECTIVE STRENGTH PARAMETERS	
		COHESION (C^L) (KPA)	FRICTION ANGLE ($Ø^L$) (DEGREES)
Fractured Rock	20	0	45*
Fresh Rock	20	0	45*
Gravelly Clayey Sand	18	0	28*
WRD Material	20	0	37**

**ATCW, 2019*
***PSM, 2019*

Modelling shows the waste rock landform meets the required factors of safety for long-term geotechnical stability. An output from the stability analysis, for a direct shear case along the base of the WRD (worst case) is displayed in Figure 6-41. A sensitivity analysis of friction angles for the waste rock given the use of angle of repose batters was undertaken. This shows the global stability of the landform is acceptable, with a factor of safety of 1.83 (Figure 6-41). The target minimum factor of safety is 1.5. Therefore, an outer batter slope of 1V:2.5H is proposed as part of the final landform. Results indicate for a global, long-term, condition required factors of safety are achieved with the proposed landform. It is therefore assessed that the proposed WRD would be geotechnically competent, subject to construction techniques and waste rock properties.

It is noted that this assessment considers global failure assuming competent foundation sequences. Localised slip failures could still occur on the batters of WRD placed at the angle of repose. As discussed above, as the characteristics of rock material are unknown. If weak, loose, or compressible soils are present under the waste rock, a potential slip face between underlying sequences could develop.

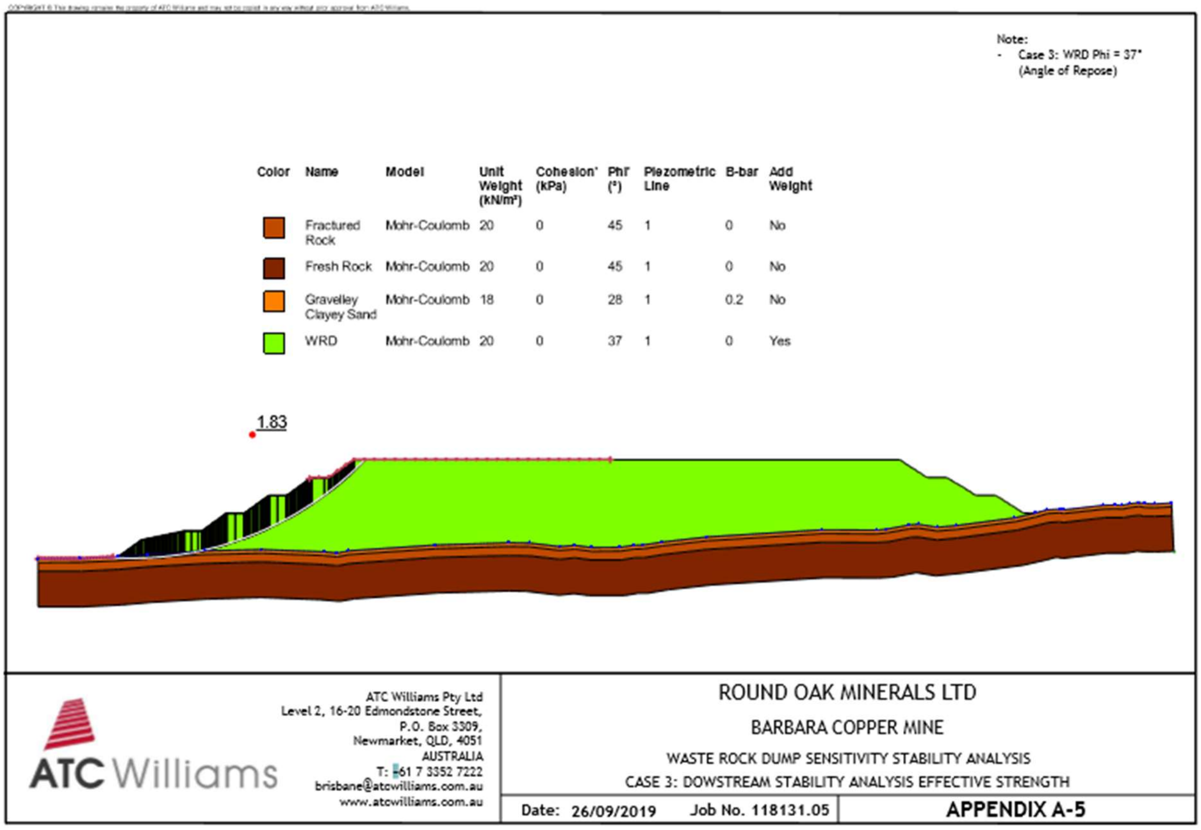


Figure 6-41 Waste rock dump sensitivity stability analysis (ATC Williams, 2019)

6.5.2.2 Cover design

In 2021, a conceptual cover design for the closure of the WRD was completed (SGM, 2023). The purpose of the conceptual cover design was a cover options analysis that recommended the most suitable covers to progress to column RPL.

The options analysis showed that cover options 3, 4 and 5 were the most suited:

Trial 1 had an increased capacity to store infiltration in the ISL, but produced more seepage, when compared to Trial 3. Trial 2 has been excluded because there is not enough soil available (Trial 1 and Trial 3 do not require soil). Notwithstanding, Trial 3 is selected as the preferred cover since:

- The coarse nature of waste rock slows runoff water velocity and reduces the potential for erosion; and
- The RPL limits the potential for seepage.

Trial 3 cover design consists of the following:

- A 0.5 m RPL (reduced permeability layer) of fine compacted waste rock;
- A 1 m ISL (infiltration storage layer) of coarse waste rock above the RPL; and
- A 0.3 m layer of fine waste rock.

A cross-section of Trial 3 is given in Figure 6-42 (SGM, 2023).

Cross section	Thickness	Material properties	Material density
	0.3 m	Crushed waste rock	1.6 t/m^3
	1.0 m	Waste rock	1.8 t/m^3
	0.5 m	Fine compacted waste rock (<10 mm)	2.1 t/m^3

Figure 6-42 Preferred cover design cross section

Further field scale cover trials will be undertaken to validate the performance of the preferred cover (Trial 3) to limit seepage into the underlying waste rock.

A conceptual cross-section was developed by ATC Williams (2022c) to illustrate the concept cover system design and the interaction of the cover system with the current WRD landform. The WRD is generally circular in shape and the cross-sections are nominally aligned northwest-southeast and southwest-northeast.

The cross-sections are shown in Figure 6-43 and Figure 6-44.

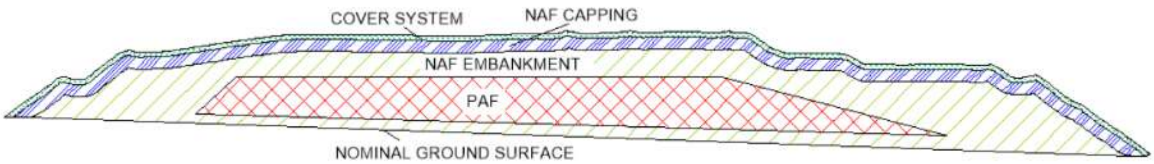


Figure 6-43 North-west and south-east cross-section

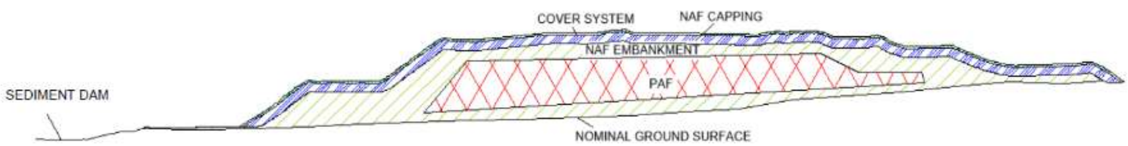


Figure 6-44 North-east and south-west cross-section

The conceptual cross-sections show the following key features:

- The cap and cover system sufficiently encapsulates the PAF cell at a thickness of up to 7 m of NAF cap and 2.1 thickness for the cover system. The surface profile is slightly convex to allow water drainage and slopes toward the north toward the 11.2 dam.
- The batter slopes are comprised wholly of NAF material with a nominal cover of fine crushed waste rock as per the cover system design.

The WRD was designed to encapsulate PAF waste rock in a cell surrounded by a NAF waste rock landform and shed water to minimise the potential for infiltration of precipitation and oxygen and resulting seepage.

This design mitigates the potential impacts from contaminants of concern through minimising oxygen ingress, precipitation infiltration and seepage through the low permeability foundation, which reduces the risk of acid generation and mobilisation of metals in groundwater.

The full details of the Cover System Design are provided in 0.

6.5.2.3 Landform Evolution Modelling

The Water Erosion Prediction Project (The WEPP) model for the Barbara site was developed by SGM environmental Pty Limited (SGME 2021b and 0) and used to simulate final landform stability predictions for a 100-year period including data for rainfall, runoff, and sediment loss for the final landform. The WEPP model was also used to determine reductions in erosion rates from increasing groundcover (SGME 2021b). The calibrated parameters have been used for long-term erosion modelling of the final landform that meets the landform evolution modelling (LEM) requirements of the PRCP (0).

Three cross-sections that are considered representative of the WRD final landform were modelled (Figure 6-45). Table 6-15 below summarise the slope parameters used in the WEPP model. The slope gradient varies slightly around the final landform and includes a bench with a gentler gradient approximately halfway down, breaking the slope into sections.

Table 6-15 Slope parameters used in the WEPP model

SLOPE ID	HEIGHT	SECTION 1		SECTION 2		SECTION 3	
	m	Length (m)	Slope (%)	Length (m)	Slope (%)	Length (m)	Slope (%)
XS-1	19.0	14.7	74.8	12.5	8.0	11.0	67.2
XS-2	42.0	33	72.8	27.7	3.6	29.5	61.1
XS-3	32.0	343.9	9.6	-	-	-	-

Results from the WEPP model predict the final landform for the WRD will experience negligible erosion rates (0.6 t/ha/y) with the modelled cover and can be considered stable (unlikely to develop significant rilling). Similarly, the maximum erosion rates modelled (less than 0.37 t/ha/y) indicate that the final landform will be stable in the event of extreme rainfall. The long-term stability of the WRD is not reliant on the topsoil or vegetative growth. The complete WEPP model report by SGME can be found in 0.

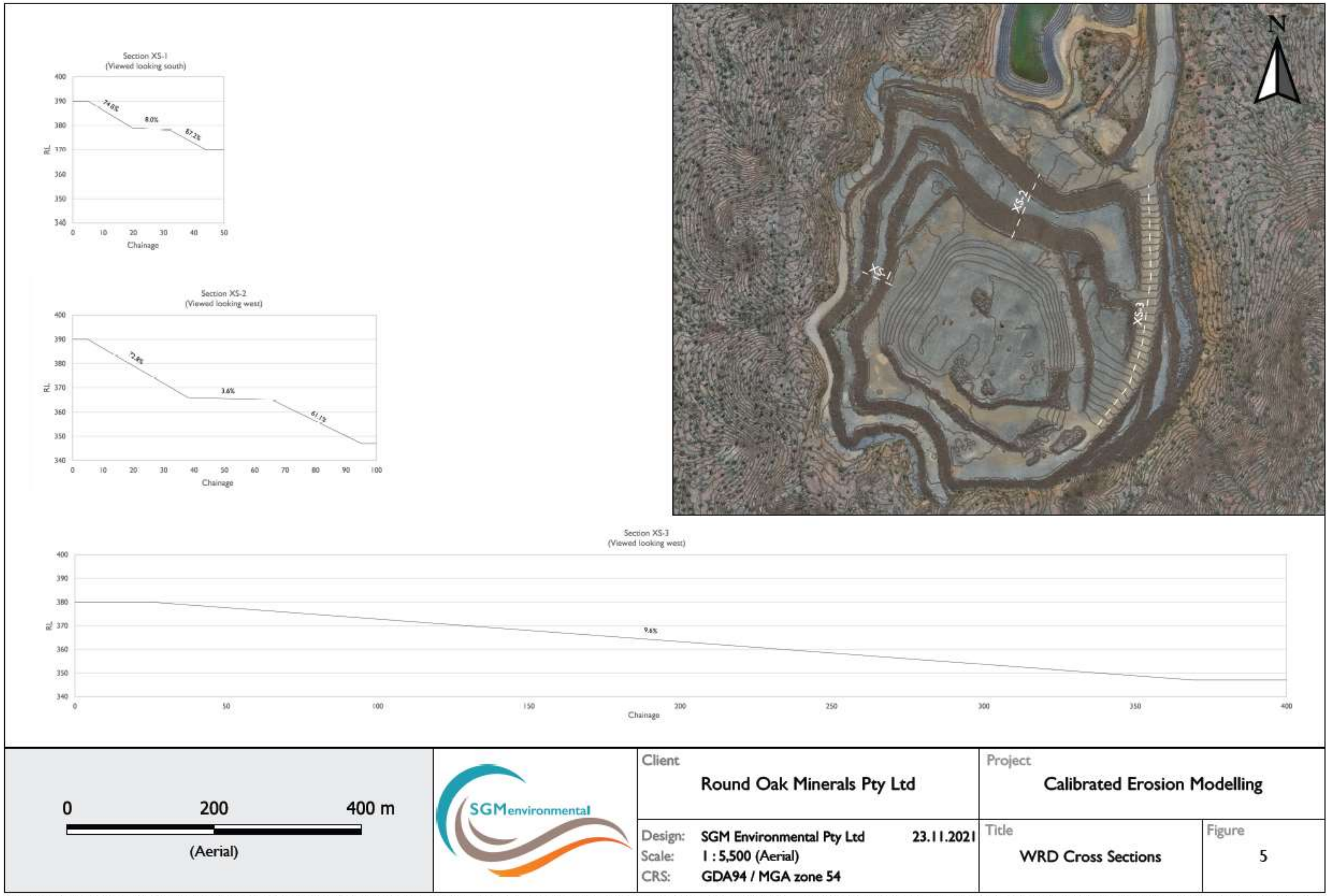


Figure 6-45 WRD cross-sections

6.5.3 Erosion control

Rainfall and overland flow simulations were done on cover material (waste rock) collected from the final landform in order to derive calibrated erodibility parameters (SGM, 2021). A rainfall simulator was used to study the interrill erosion process and calibrate the interrill erodibility factor and the effective hydraulic conductivity. An overland flow simulator was used to study the rill erosion process and calibrate the rill erodibility factor and critical shear stress.

A hillslope scale erosion model of the WRD was built in the Water Erosion Prediction Project (the WEPP model) and run using desktop data, calibrated erodibility parameters and current landform designs to estimate the potential annual erosion rate for a 100-year period.

The WEPP model showed that the final landform will experience negligible erosion and can be considered stable (SGM, 2023). Results from the WEPP modelling are presented in section 6.5.2.

6.5.4 Management

As outlined in Section 4, the North Pit Creek Diversion and Levee (west of North Pit), the Diversion Drain to the north of the North Pit, as well as the Sediment Dam Eastern Diversion will remain post-closure.

The North Pit East Creek diversion (southeast of the North Pit), Diversion east of the South Pit as well as the Sediment Dam Western Drain will be removed, to facilitate inflows to South and North pits, with the final land use being water storage for the property owner.

Due to the long-term assessed instability of the northern wall of the North Pit, it was concluded that the most suitable solution was to remove the northern wall of the North Pit to allow fresh water to enter the North Pit. In lieu of a circumferential bund, in area of steep terrain a fence is to be installed, as the topography will not allow for the access of construction machinery.

The bund at the south-west corner of the North Pit will incorporate the existing levee. This will require a raise of an additional 2.5 m to at least 322.5 m AHD. The location of the abandonment bunds for the North and South pits can be observed in Figure 6-46 (see yellow and green lines).

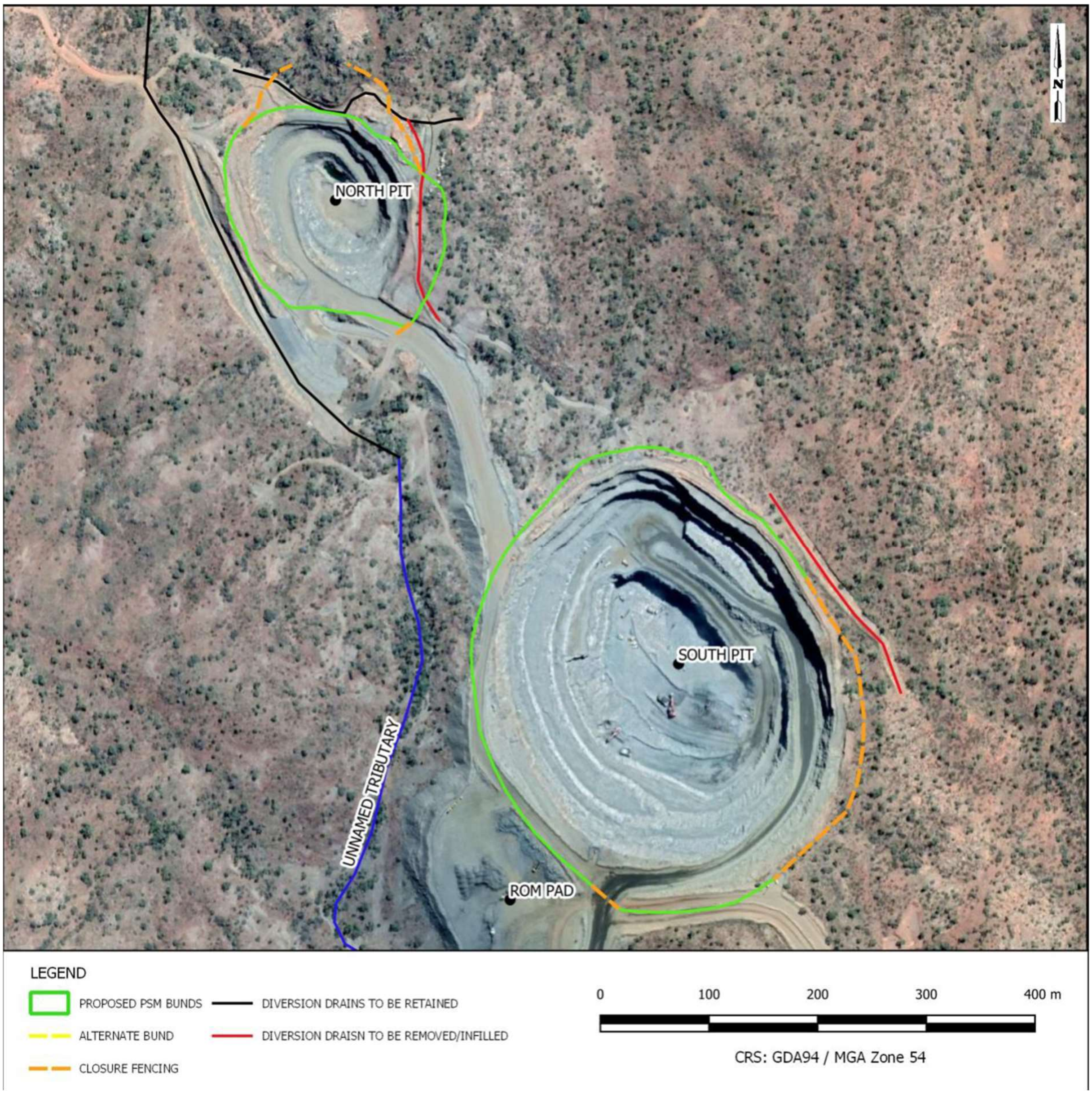


Figure 6-46 Abandonment bund locations for North and South pits (ATC Williams, 2023a)

6.5.5 Description of contaminants

6.5.5.1 Pit walls

The potential for exposure of some PAF rock around the pit shell has implications for pit water quality, especially late in mine life and closure (see Section 6.4 for the waste characterisation information). Results from the groundwater exposure pathway assessment undertaken by WMV Environmental 2022 identified that current concentrations of contaminants of potential concern (COPCs) in the pits are generally similar to background, pre-mining concentrations in groundwater.

Further geochemical modelling and validation is being completed for the pit lake water quality. Water quality in the pits is expected to be suitable for stock watering (See section 6.1.4).

6.5.5.2 Waste rock

Potential sources of contamination in the WRD are AMD from waste rock material and saline drainage. Associated COPCs include leachable metals / metalloids, salinity and sulphides. Geochemical characterisation identified that some copper leaching and release of sulfate from NAF material was observed. However, there was no significant leaching of other metals of environmental concern detected. Saline drainage potential is low and not considered a significant issue (WMV Environmental, 2022).

The decommissioning and closure design of the WRD includes a cover system in a layered sequence to limit infiltration and a surface water management system to convey runoff. These design elements are intended to create a final landform that is safe, stable, and non-polluting.

6.5.5.3 Ancillary infrastructure and ROM pad area

The ancillary infrastructure and ROM pad area may contain the following contaminants, however rehabilitation and decommissioning activities will aim to ensure any contaminants are managed appropriately at closure and will not remain:

- Hydrocarbons as total petroleum hydrocarbons, total recoverable hydrocarbons and benzene, toluene, ethylbenzene, p-xylene and naphthalene (TPH, TRH and BTEXN)
- TDS and sediment.

The geochemical characterisation of ROM oxides is provided in Section 6.4.2.

6.5.5.4 Source, pathway, and fate of contaminants

The Exposure Pathway Assessment was updated to consider underground mining, refer to Appendix U(a). The pit wall rock, PAF placement underground, WRD and ancillary infrastructure area may provide a potential source of contaminants, however operational management and rehabilitation activities will reduce the potential for this to migrate to the receiving environment.

Section 6.4 (waste characterisation) and water modelling studies conducted by ATC Williams (2020 and 2022a) (See Section 0), indicates that the risk of contaminant migration to groundwater and surface water is considered low on the following basis:

- Groundwater /surface water interactions:
  - On a semi-local to regional scale, groundwater levels are generally at a depth below ground level that would limit any groundwater/surface water interaction. This is evidenced by the ephemeral nature of the creeks at and near the mine site.
  - On a local scale, two semi-permanent water bodies are present within the creek, named BCP Spring (S) and BCP Spring (N). The water bodies are most likely the results of significant rainfall events leading to significant flow within the creeks, with water stagnating in lower-lying parts of the creek. Monitoring of shallow groundwater levels and levels at the water bodies indicates that there is limited hydraulic connectivity between the shallow groundwater and the creek.
  - Although the current open pits act as a groundwater sink, these pits/voids do not adversely impact the surface water environment due to the limited (to almost non-existent) connectivity between the deeper groundwater and the creek.
  - In a similar vein, the proposed underground operations will not impact the groundwater/surface water interaction.
  - There are no aquatic or subterranean GDEs within a 5km radius of the Project site. Only low-potential terrestrial GDEs are present within ML90241.
- Final Void water quality assessment
  - Regarding potential AMD impact on open pit water quality:
    - Long-term kinetic column leach results (at week 52 of the test program) are below the adopted livestock drinking WQG values.
    - Long-term kinetic column leach results (at week 52 of the test program) are below the modelled long-term solute concentrations (average of

modelled concentrations/levels after 50 years) in the open pits, except for aluminium, arsenic, calcium, chromium and copper in one or more column samples. However, the leach results of these solutes are below the livestock drinking WQG (where specified).
        - As the AMD impact groundwater inflow constitutes only a minor component of the total inflow into the open pits, the mass load of the AMD solutes will be diluted by rainfall runoff and the pit water volume already in storage.
        - Therefore, it is considered that the seepage of AMD groundwater will not adversely impact the long-term water quality in the open pits.
    - Regarding the potential impact on underground voids water quality:
        - Mixing water quality models indicate that the long-term water quality in the underground voids remains below the relevant water quality guidelines values (livestock watering and PRCP criteria for voids) and that the underground workings are suitable for a livestock watering PLMU.
        - Geochemical modelling using PHREEQC indicates that the placement of PAF and NAF material in the underground voids does not adversely impact the water quality, with long-term water quality remaining below the relevant water quality guidelines values (livestock watering and PRCP criteria for voids) and that the underground workings are suitable for a livestock watering PLMU.
    - Preliminary pit lake stratification modelling indicates that in the north Pit and South Pit:
        - Thermal, density and salinity stratifications may develop over time on a seasonal basis within the North Pit, with three stratification zones developing during the dry, hot seasons. However, the stratifications dissipate during the wet season.
        - As the pits generally act as a terminal groundwater sink, with minimal outflow/seepage and as the stratification in the pits is seasonal, the PMLU of the pit as "water storage for livestock watering" is not adversely affected by the seasonal stratification.
    - Based on the investigation and modelling results, the North Pit, South Pit, WRD Sediment Dam and underground workings are considered suitable as PMLUs for livestock watering
- The PAF material within the WRD will be encapsulated with material from the rehabilitated ROM pad, LIA area, and excess access road material. Seepage through WRD will only occur as a result of infiltration and therefore is unlikely to be significant because landform and cover design will store minimal rainfall within the uppermost mulch material and release it as evapotranspiration.
- TDS and sediment are not expected to be a significant issue from the final landforms of WRD or ROM pad at time of rehabilitation certification. The final rehabilitated areas will have established groundcover that will keep the ground surface stable and significant erosion is not expected. The WRD Sediment overtops via the spillway in events exceeding the 95th percentile. The WRD Sediment is HDPE lined and therefore groundwater inflows or outflows are eliminated (or greatly minimised).

Post rehabilitation and closure, these source of contaminants within the pit wall, WRD and ancillary mining areas will be contained by encapsulation and revegetation and in the case of the pit water quality the pit wall rock and placement of PAF underground is not expected to cause adverse effects to the pit water quality.

Potential receptors that may be exposed to contaminated groundwater were identified in an exposure pathway assessment conducted by WMV Environmental (2024) and include the following:

- Aquatic ecosystems in or livestock accessing water courses that may be contaminated through seepage of contaminated groundwater. The likelihood is considered minimal as there is limited groundwater-surface water interaction at the Project site.

- Terrestrial GDEs that may be exposed to contaminated groundwater in drainage lines and creeks. The likelihood is considered minimal as there is limited groundwater-surface water interaction at the Project site.
- Livestock that may be exposed to contaminated groundwater. The likelihood is considered minimal as there are no homesteads in the immediate vicinity of the Project site and as groundwater flow velocity is low to very low.
- Pastoralists that may come in direct contact with groundwater. The likelihood is considered minimal.
- Livestock that may be drinking the water within the voids. The PMLU of the final voids and sediment dam is as water storage, with accessibility to the pastoralist/livestock.

6.6 REVEGETATION PROCESS

After appropriate surface preparation, growth media will be spread to support the growth of vegetation (where applicable), reducing , and helping to sustain the desired PMLU.

The rehabilitation strategy for various disturbance areas such as the WRD and ROM pad will be tailored to address specific risks associated with those disturbance types. That is, specialised management strategies will be implemented as deemed necessary to prevent environmental harm.

Following surface amendments, selected domains will be revegetated as follows:

- Where available/practicable, growth media will be spread over the area to be rehabilitated.
- The area will be deep ripped where required to alleviate compaction.
- Selected native tree, shrub and pasture grass species will be sown in designated areas.

Revegetation completion criteria have been developed to measure revegetation progress. Once rehabilitated sites have achieved the revegetation completion criteria (typically three years), it is reasonable to assume that these sites are capable of natural vegetation or habitat.

Proposed revegetation milestone criteria are presented in the PRCP Schedule and are used to compare the success of rehabilitation sites against analogue monitoring sites.

The proposed rehabilitation of the WRD and ROM pad have been estimated to take up to 10-years. There are several factors that contribute to why revegetation with local plant species would take this period of time before being determined as fully rehabilitated:

- One major factor is the harsh weather and climate conditions in the region, which can impact plant growth and survival.
- The area is characterised by hot, dry summers, and unpredictable rainfall patterns, which can create drought conditions that can impede plant growth.
- Additionally, the suitability of growth media and soil conditions need time to be improved by hardier species of plants before larger varieties can thrive in the area.
- Extreme weather events such as storms, floods or bushfires can also cause significant damage to plant communities, delaying the revegetation process.
- Pest infestations can also pose a challenge to revegetation efforts, as they can damage or destroy young plants.

Overall, the complex interplay between weather, climate, soil conditions, and other environmental factors may make it difficult for the WRD and ROM pad to become revegetated with local plant species with less than 10-year timeframe.

6.6.1 Growth media availability

For rehabilitation, 38,400 m^3 of rocky substrate will be required to rehabilitate the WRD and ROM pad across the Project site (Table 6-16).

There is limited growth media availability on the Project site. Suitable growth media would have to imported from offsite, likely from sections of the Greenback Access Road.

Because of this, the preferred cover design (trial 3) for the WRD only uses crushed waste rock as the growth medium and the ISL, as well as fine waste rock (less than 10 mm) for the RPL. It is anticipated that benign rocky substrate will be sourced from the Project site for rehabilitation of the WRD and ROM pad, as there is an excess of NAF material at the site. This will create naturally draining rocky outcrops on the rehabilitated landforms, which is characteristic of natural landforms within the region.

Table 6-16 Rocky substrate volumetric requirements for rehabilitation of the Project

DISTURBANCE			ROCKY SUBSTRATE REQUIREMENT	
MINE FEATURE NAME	AREA (HA)	AREA (M^2)	THICKNESS (M)	VOLUME (M^3)
North Pit	1.5	15,000	N/A	N/A
South Pit	6	60,000	N/A	N/A
Waste Rock Dump	12.5	125,000	0.30	37,500
ROM Pad & ore stockpiles	0.6	6,000	0.15	900
Total Volume Required (m^3)				**38,400**

6.6.2 Surface preparation

Disturbed areas will undergo surface contouring and ripping. Surface contouring will be undertaken to minimise erosion and maximise water retention. The spacing between rip lines is determined by the slope of the land, which acts to increase plant establishment rates (refer to Table 6-17). Where soils are particularly compacted, a ripping depth of 300 mm will aim to be employed.

Table 6-17 Design of ripping operations for post-disturbance surface preparation

SLOPE	RIPPING DEPTH	TYNE SPACING
>10%	200 mm	<1.5 m
5 – 10%	200 mm	<2.5 m
<5%	200 mm	<5 m

An assessment of surface soils was conducted by collecting samples from the Sediment Dam crest, light infrastructure area and reference sites. Results have been compared to the baseline data (AustralAsian Resource Consultants, 2014a), to understand whether the surface conditions on the infrastructure areas have similar characteristics as baseline conditions. Pre-mining and current topsoil conditions are comparable for ESP, cation exchange capacity, calcium, magnesium, potassium, sodium, chloride, and total organic carbon. The comparison of results demonstrates additional topsoiling and ameliorant application is not required to achieve PMLUs, as pre-mine (2014) and post mine (2022) conditions are similar.

6.6.3 Growth media placement

Placement of rocky mulch at a thickness of approximately 0.15 m across the ROM pad and ore stockpiles has been recommended to create a growth medium of sufficient depth to hold water and support revegetation.

Typically, the process of rocky mulch placement would include:

- Surface roughening by dozer or other tracked machines.
- Application of rocky mulch by placement from the embankment crest on batters, or from the edge of the area to adjacent areas. Care will be taken not to compact the surface roughened areas.
- Spreading of the placed rocky mulch (and mulched vegetation, as applicable) to the desired thickness using low ground pressure plant.
- Deep ripping of rocky mulch prior to seeding.

6.6.4 Constructed landforms

Following placement of growth media, constructed landforms such as the ROM pad will be contoured to resemble the original local topography as far as practicable, in accordance with the landform design described in Section 6.5.

Landforms will be deep ripped where required to alleviate compaction prior to seeding.

6.6.5 Species selection

Revegetation of disturbed areas will occur by direct seed application using either manual or mechanical techniques. Species have been chosen based on the most dominant vegetation communities (Section 2.2.9) mapped across the Project area pre-mining and readily available at the time of rehabilitation, or through the selected post-mine land use for each domain (Section 4). The species selection, aligned with the EA conditions, is aligned with rehabilitation objectives and has been agreed with the landholder.

The low intensity grazing PMLU will include native seeds that have been agreed with landholder. These include pasture grasses and are included in Table 6-20.

An indicative grass and pasture species seed list is outlined in Table 6-18. These species are suitable for use in low intensity grazing areas, such as the ROM Pad and ancillary infrastructure. This species list is not suitable for rocky outcrop areas, such as the WRD. The WRD will be provide native ecosystem habitat similar to the barren rocky outcrops in the surrounding area (comparable to the analogue site). Where appropriate, planting of native tree and shrub seeds may be incorporated into low intensity grazing areas to improve water holding capacity of land and provide shade for cattle. Suggested tree and shrub species are provided in Table 6-18.

Where appropriate, fencing, stability controls, and erosion controls will be implemented to protect revegetation areas following soil preparation/seeding to ensure that plant establishment is not compromised.

Table 6-18 Recommended seeding mix for the rehabilitation of the Project site

SCIENTIFIC NAME	COMMON NAME	NOTE
Triodia pungens (D)	Soft Spinifex	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3), Community 3 (RE 1.3.6x1b)
Cymbopogon bombycinus (A)	Citronella Grass	Community 5 (RE 1.11.2x4) – rocky outcrops
Triodia bitextura (D)	Feathertop Spinifex	Community 6 (RE 1.11.2x1b)
Eriachne mucronata	N/A	Native species
Themeda triandra	Kangaroo Grass	Native pasture species
Dicanthium sericium	Queensland Bluegrass	Native pasture species
Sorghum spp.	Annual Sorghum	Single-generation quick establishing groundcover
Rhynchosia minima	Least snout-bean	Legume suited to north-west Queensland
Vigna savi	Cowpea	Legume suited to north-west Queensland

Key: D = Dominant, A = Associated

Table 6-19 Recommended tree and shrub species

SCIENTIFIC NAME	COMMON NAME	NOTE
Tree Layer		
Eucalyptus leucophloia (D)	Snappy Gum	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3),
Corymbia terminalis (A)	Western Bloodwood	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3), Community 3 (RE 1.3.6x1b)
Terminalia aridicola (A)	Arid Peach	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3),
Eucalyptus leucophylla (O)	Cloncurry box	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3), Community 3 (RE 1.3.6x1b)
Corymbia aparrerinja (O)	Ghost Gum	Community 1 (RE 1.11.2d),
Atalaya hemiglauca	Whitewood	Suited to north-west Queensland
Shrub Layer		
Acacia holosericea (D/A)	Soapbush Wattle	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3), Community 3 (RE 1.3.6x1b)
Acacia phlebocarpa (D)	Tabletop Wattle	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3),
Acacia chisholmii (SD)	Turpentine	Community 1 (RE 1.11.2d), Community 2 (RE 1.11.3), Community 3 (RE 1.3.6x1b)
Senna artmeisiodes subsp. *helmsii*	Crinkled Cassia	Suited to north-west Queensland
Senna artemisioides subsp. *oligophylla*	Limestone Cassia	Suited to north-west Queensland
Senna notabilis	Cockroach Bush	Suited to north-west Queensland

Key: D = Dominant, SD = Sub-dominant, A = Associated

6.6.6 Propagation

To successfully rehabilitate the Project, selected plant species will be directly seeded into rehabilitated areas. The method of planting, germination, and propagation varies based on company requirements, rehabilitation design, and the needs of individual species. Seeds of selected species must be treated in a specific manner to allow for successful revegetation. Table 6-20 shows the propagation method associated with each plant seed to ensure successful germination and plant survival.

Closer to the initiation of revegetation, Aeris will nominate a contractor to complete the revegetation tasks associated with the Project, or alternatively, employ a specialised workforce. It should be noted that the listed species represent a guide only.

Rehabilitation success is based on the completion criteria of 60% comparable species to the analogue site. Therefore, not all species identified will be added to the final species list. Species chosen for rehabilitation purposes will be based on suitability and availability, at the discretion of Aeris Resources and the chosen rehabilitation contractor. It is also expected that some *in situ* revegetation will occur over time from neighbouring vegetated areas, as the rehabilitation develops.

Table 6-20 Recommended propagation methods for selected species

COMMON NAME	SCIENTIFIC NAME	PROPAGATION METHOD
Tree Species		
Snappy Gum	*Eucalyptus leucophloia*[1]	This species can be directly seeded. Seed is separated into seed and chaff, with no listed pre-treatment. Generally, 25-30% of seed produced is viable, with this species having 375 viable seeds per gram. Seeds will be directly planted with 3-4 seeds per pot or can be field planted at 10-100 g/km^2. Seeds can be stored for 4-5 years, or longer at low temperatures.
Western Bloodwood	*Corymbia terminalis*[1]	This species can be directly seeded. Seed is separated into seed and chaff, with no listed pre-treatment. Generally, 25-30% of seed produced is viable, with this species having 37 viable seeds per gram. Seeds will be directly planted with 3-4 seeds per pot or can be field planted at 10-100 g/km^2. Seeds can be stored for 4-5 years, or longer at low temperatures.

COMMON NAME	SCIENTIFIC NAME	PROPAGATION METHOD
Cloncurry box	*Eucalyptus leucophylla*[1]	This species can be directly seeded. Seed is separated into seed and chaff, with no listed pre-treatment. Generally, 25-30% of seed produced is viable. Seeds will be directly planted with 3-4 seeds per pot or can be field planted at 10-100 g/km^2. Seeds can be stored for 4-5 years, or longer at low temperatures.
Ghost Gum	*Corymbia aparrerinja*[1]	Seed is separated into seed and chaff, with no listed pre-treatment. Generally, 25-30% of seed produced is viable. Seeds will be directly planted with 3-4 seeds per pot or can be field planted at 10-100 g/km^2. Seeds can be stored for 4-5 years, or longer at low temperatures.
Arid Peach	*Terminalia aridicola*	Variable results from seed between species. Seeds may benefit from treatment by soaking seed in water for 16 hours or gentle cracking of the seed case. Germination usually occurs in 40-60 days but can take 3-6 months. Sow seeds fresh. Warmer temperatures give best results.
Whitewood	*Atalaya hemiglauca*[1]	Grown from seed and will be sown fresh. *A. hemiglauca* has moderate results from seed and is quick to germinate. Remove the wings from the seed and sow at 25 – 30 °C. Hot water treatment can be used to improve germination.
Shrub Species		
Turpentine	*Acacia chisholmii*[1]	Hard seed coat and may benefit from treatment with dry heat (80-100 °C). Seeds will be mixed with sand or seed raising media spread to 1-2cm thickness on metal trays. Timing trials will need to be conducted to determine the most effective dry heat application. Seeds will be germinated in trays, then transferred to pots after germination. Alternatively, this species can be directly seeded in the field. 79 to 200 g of seed will be used per km^2.
Soapbush	*Acacia holosericea*[1]	Hard seed coat and may benefit from treatment with dry heat (80-100 degrees). Seeds will be mixed with sand or seed raising media spread to 1-2cm thickness on metal trays. Timing trials will need to be conducted to determine the most effective dry heat application. Seeds will be germinated in trays, then transferred to pots after germination. Alternatively, this species can be directly seeded in the field. 79 to 200 g of seed will be used per km^2, with approximately 56-86 viable seeds calculated per gram.
Tabletop Wattle	*Acacia phlebocarpa*	Hard seed coat and may benefit from treatment. Several treatments can be used to break dormancy. Pouring boiling water over seed and allowing to soak for 12-15 hours is the most widely used method. Although trials will be undertaken to determine if temperature needs to be varied. Seeds sown in trays are easiest to handle as seedlings. Seed usually germinates in 3-10 weeks with seedlings usually growing quickly. Seeding rates of 70 – 200g per km^2 are required to achieve a natural bush effect.
Crinkled Cassia	*Senna artmeisiodes* subsp. *helmsii*[1]	Seed known to have hard coats. Hot water treatment is recommended (95°C for two minutes). Seedlings usually begin germination within 2-7 weeks. Most species are suited to direct seeding in pots or in the field. *S. helmsii* may not require hot water treatment.
Limestone Cassia	*Senna artemisioides* subsp. *oligophylla*[1]	
Cockroach Bush	*Senna notabilis*[1]	
Grass Species		
Feathertop Spinifex	*Triodia bitextura*[1]	This species likely has after-ripening period, though the timing of this period is unknown. Smoke treatment can improve germination results. Division may also be a successful method of propagation, though will result in low species diversity. Non-dormant seeds should germinate within 1-4 weeks.
Soft Spinifex	*Triodia pungens*[1]	This species likely has after-ripening period, though the timing of this period is unknown. Smoke treatment can improve germination results.
Citronella Grass	*Cymbopogon bombycinus*[1]	This species can be grown from seed and is unlikely to have an after-ripening period. The removal of husk can improve germination. Smoke germination also improved germination, but not significantly.

COMMON NAME	SCIENTIFIC NAME	PROPAGATION METHOD
N/A	*Eriachne mucronata*[1]	This species has an after-ripening period and requires 12 months dry storage after picking.
Kangaroo grass	*Themeda triandra*[1]	This species has an after-ripening period of up to 11 months (found in Alice springs, Canberra and Townsville samples). To reduce seed dormancy, several temperature treatments have been found to be effective. These treatments will be completed over one month, and include either 60° storage, 45°-day 20°-night storage, or constant 3-5° storage. Gibberellic acid treatment has also been found to be effective. Germination should be 2-4 weeks in non-dormant seeds.
Queensland Bluegrass	*Dicanthium sericium*	This species has an after-ripening period. Seed collected from coastal areas are less likely to be dormant. Seeds sourced from inland areas likely require 2-24 months dry storage. Smoke treatment, chilling of seed (5°C for 1 week) and dry heat (80°C for 15 minutes) all helped improve germination rates.
Annual Sorghum	*Sorghum spp.*[3]	Best sowing rate for this species within a seed mixture under dryland conditions is between 2-6 kg/ha. Ideal sowing time occurs when soil temperature reaches 16°C.
Least snout-bean	*Rhynchosia minima*[1]	Grown from seed. Seeds generally have hard coats and will benefit from treatment. Hot or boiling water is a commonly used treatment. Treatment temperatures usually range from 70 – 100 °C. The standard treatment method is to pour hot/boiling water over seeds, allow to soak for 4-8 hours. Germination usually occurs in 3-6 weeks. Seed can be prone to rotting, caution will be taken not to over water. Seeds suited to direct sowing in the field or direct seeded in pots (if limited availability).
Cowpea	*Vigna savi*[1]	Methods described for *R. minima* can be used for *V. savi*.

1 – Growing Australian Native Plants from Seed, Murry Ralph (2009)
2 – South Australian Seed Conservation Centre, Botanic Gardens of South Australia (2018)
3 – Pastures Australia, GRDC (2010)

6.6.7 Direct seeding

Direct seeding will be used in areas where consistent dispersal over a relatively large area is required. Seeds utilised for this process will be available in large quantities, suited to direct seeding and will have undergone all necessary pre-treatments prior to dispersal. If the seed is robust, agricultural machinery may be used for this purpose, dictated by the size of the area and ease of access.

6.6.8 Maintenance

6.6.8.1 Weed control

Following revegetation, rehabilitated areas will be checked for weed proliferation. Maximum allowable targets are outlined in in the PRCP Schedule and indicate that rehabilitated sites will have equal or greater than 60% of comparable species to the analogue site, with weeds not exceeding 10% of analogue site cover (see 0)(SLR, 2023).

Weed control incorporates:

- Preventing the introduction of exotic/invasive weeds (appropriate washdown procedures)
- Minimising the spread of existing weeds (removing weeds prior to seed formation, ensuring known weed infestations are avoided on foot and in vehicles)

- Controlling weed infestations using either mechanical or herbicidal treatments (targeted chain-sawing, mulching, weed pulling, or use of handheld weed sprayers).

The first few years following planting are the most important for controlling the spread of invasive species. As weeds behave as pioneer species, weeds tend to out-compete native species on exposed soils before native species can become established across the rehabilitated area. During the first three growing seasons, botanical surveys and hand removal of weeds or targeted herbicide applications will be undertaken as necessary.

Rehabilitated areas will be monitored for weed proliferation during qualitative monitoring periods (Section 8.2.9). Maximum allowable weed cover targets set in the EA will be adopted as performance indicators for revegetated areas, with areas not meeting the set criteria managed appropriately.

6.6.8.2 Reparation

If rehabilitated areas exhibit loss of vegetation, erosion, or weed infestations, reparation will be required to ensure the success of the area. Depending on the specific issue, reparation may include:

- Replanting failed/unsatisfactory areas
- Repairing eroded areas
- Pest and weed control
- Fertiliser applications
- Watering plants in drier areas, especially during the establishment phase
- Visual inspection of revegetated areas will be undertaken regularly to determine maintenance requirements.

6.7 TAILINGS STORAGE FACILITY

There are no tailings storage facilities for the Project.

6.8 VOIDS

The proposed PMLU for the pits is water storage for livestock post closure. This section outlines the assessments of the voids at closure to ensure the landform is safe and stable, and can achieve the PMLU.

6.8.1 Void hydrology and hydrogeology

Refer to Section 6.1 for the long-term hydrology water balance and the assessment of the interaction with the groundwater system for the pits at closure.

6.8.2 Geotechnical stability

To ensure the final voids achieve the nominated rehabilitation objectives, the North and South Pit areas have been subject to detailed geotechnical assessment by Pells Sullivan Meynink Consult Pty Ltd (PSM, 2020) (0).

The structural model developed for voids is based on mapping completed by PSM and Round Oak (now Aeris Resources) within the South Pit during the quarterly geotechnical inspections. The structural database consists of data from field mapping undertaken by ROM and additional field and photogrammetric mapping undertaken by PSM. Structural data from geotechnical investigations show major structures in the rock mass comprise of foliation and faults/shears:

- Foliation is identified as the predominant defect within the schist rock mass, compromising two splays of the Barbara Fault Zone (BFZ), and is also present in localised zones of weakly foliated felsic volcanics adjacent to the schist
- Other sporadic faults and shears that may also be present within the rock mass.

Structural data also demonstrates minor structures in the rock mass that are less continuous with jointing the main defect type. Five domains have been mapped across the structural model from the South Pit. Structural integrity of each domain has been summarised by PSM as follows:

- Domain 1 and Domain 2 (east wall of the South pit):
  - Most joint defects dip greater than 60° towards the west. Joints mapped in the north-east part of the East wall, Domain 2, are slightly rotated likely due to the proximity to the BFZ.
  - Faults and shears are present in Domain 1 and Domain 2. These are generally moderately to steeply dipping (greater than 55°) but some moderately to shallow dipping faults and shears are also present.
- Domain 3, Domain 4, and Domain 5 (west wall of the South pit):
  - Most defects dip greater than 75° towards the east, except for a cluster of joints exposed in Domain 4 that dip between 30° and 50° towards north-northeast (NNE).
  - The shallow defect set dipping towards the NNE is evident within Domain 4, and typically have a persistence of less than 5 m.

The North Pit presents similar structural characteristics, although PSM also note:

- Joint sets form cubic blocks, resulting in a blocky to very blocky character, and
- Poorer structural conditions are associated with the BFZ as dilation and poorer rock mass have been observed around this zone.

The stable "void" is defined as the area within the abandonment bund/fence as illustrated Figure 6-47. Long-term instability is not anticipated to impact areas outside of the recommended abandonment bund/fence location.

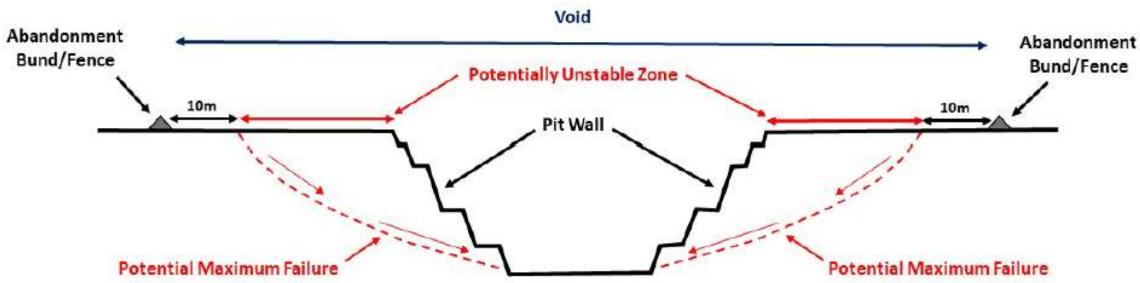


Figure 6-47 Schematic illustration highlighting long-term potential maximum failure, potentially unstable zone, abandonment bund and void

The long-term pit slope stability assessment was undertaken on representative cross sections through the North and South pits in the most geotechnically adverse location. Stability analyses were completed for Section A for the North Pit, and Section B and Section C for the South pit, with the respective locations shown in Figure 6-51 and Figure 6-52. The cross section results are shown in Figure 6-48, Figure 6-49 and Figure 6-50 and imply that there is a low risk of global instability impacting outside the final pit crests. The results indicate that the current pit crests have a FoS of greater than 1.5 when considering only rock mass failure. As the majority of the rock mass within the pits is high to very high strength rock, global pit stability is controlled by geological structure (i.e., failure will occur along adverse defects).

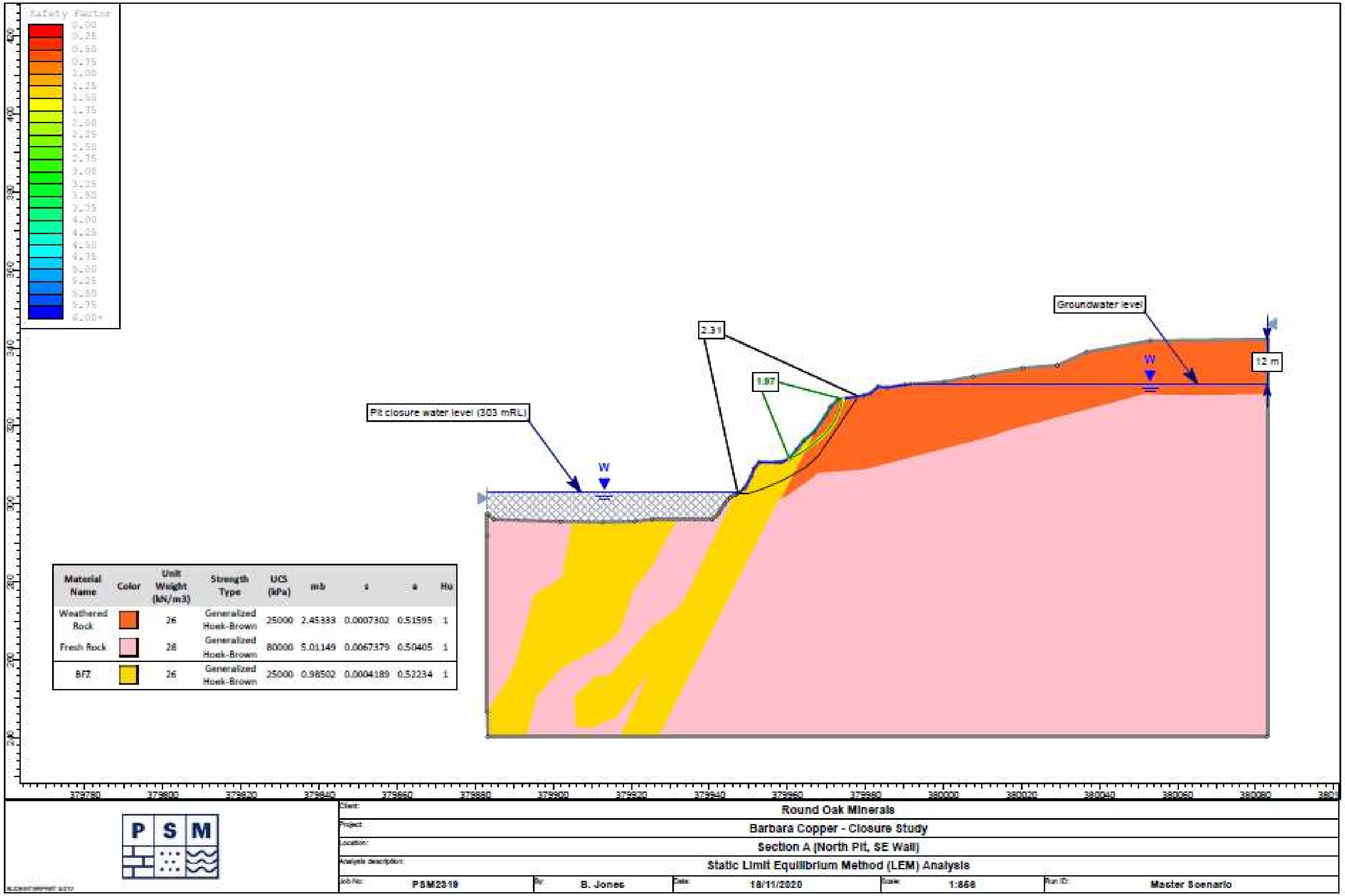
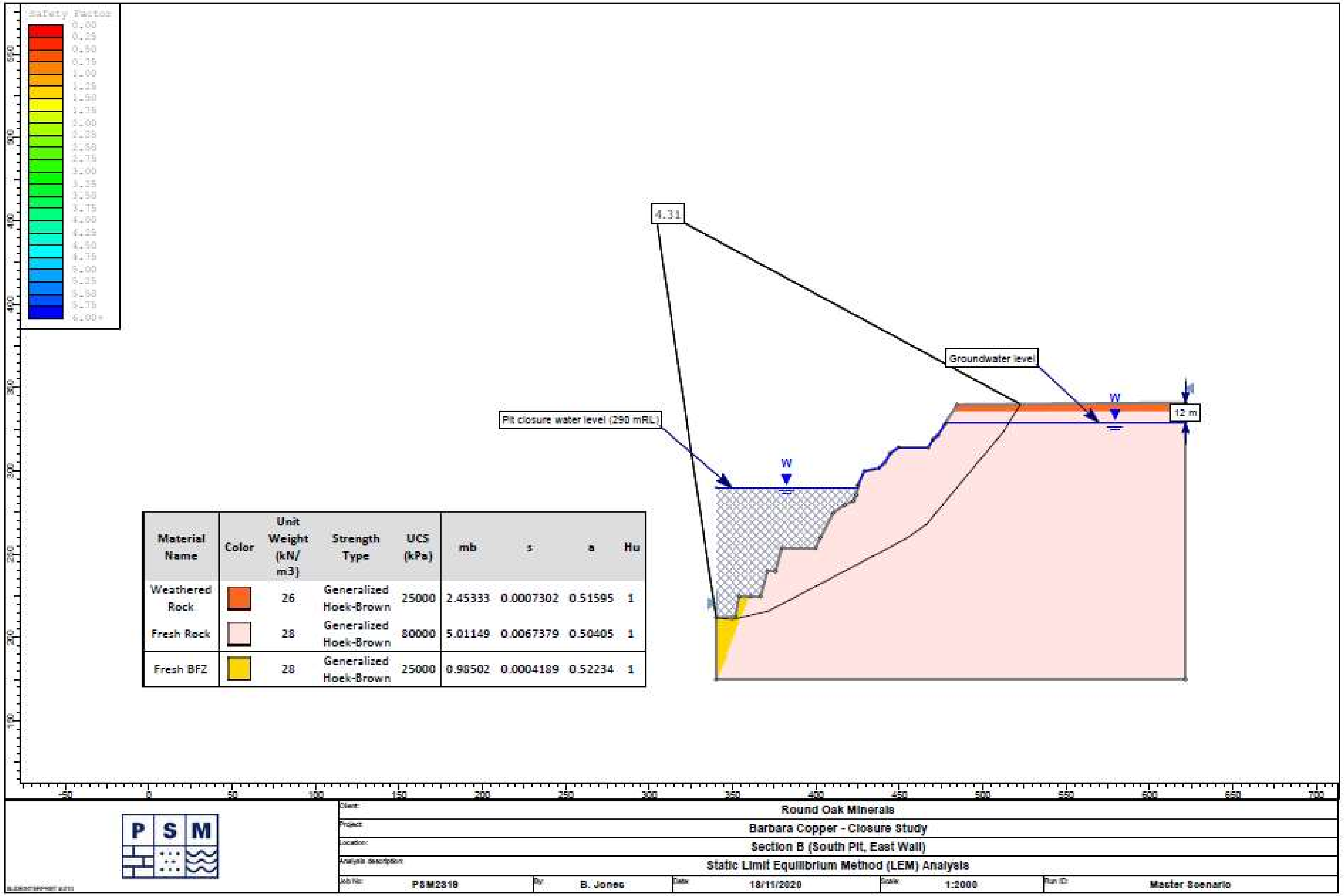


Figure 6-48 Limit equilibrium stability analysis – North pit (Section A)



Material Name	Color	Unit Weight (kN/m3)	Strength Type	UCS (kPa)	mb	s	a	Hu
Weathered Rock		26	Generalized Hoek-Brown	25000	2.45333	0.0007302	0.51595	1
Fresh Rock		28	Generalized Hoek-Brown	80000	5.01149	0.0067379	0.50405	1
Fresh BFZ		28	Generalized Hoek-Brown	25000	0.98502	0.0004189	0.52234	1

Figure 6-49 Limit equilibrium stability analysis – South pit (Section B)

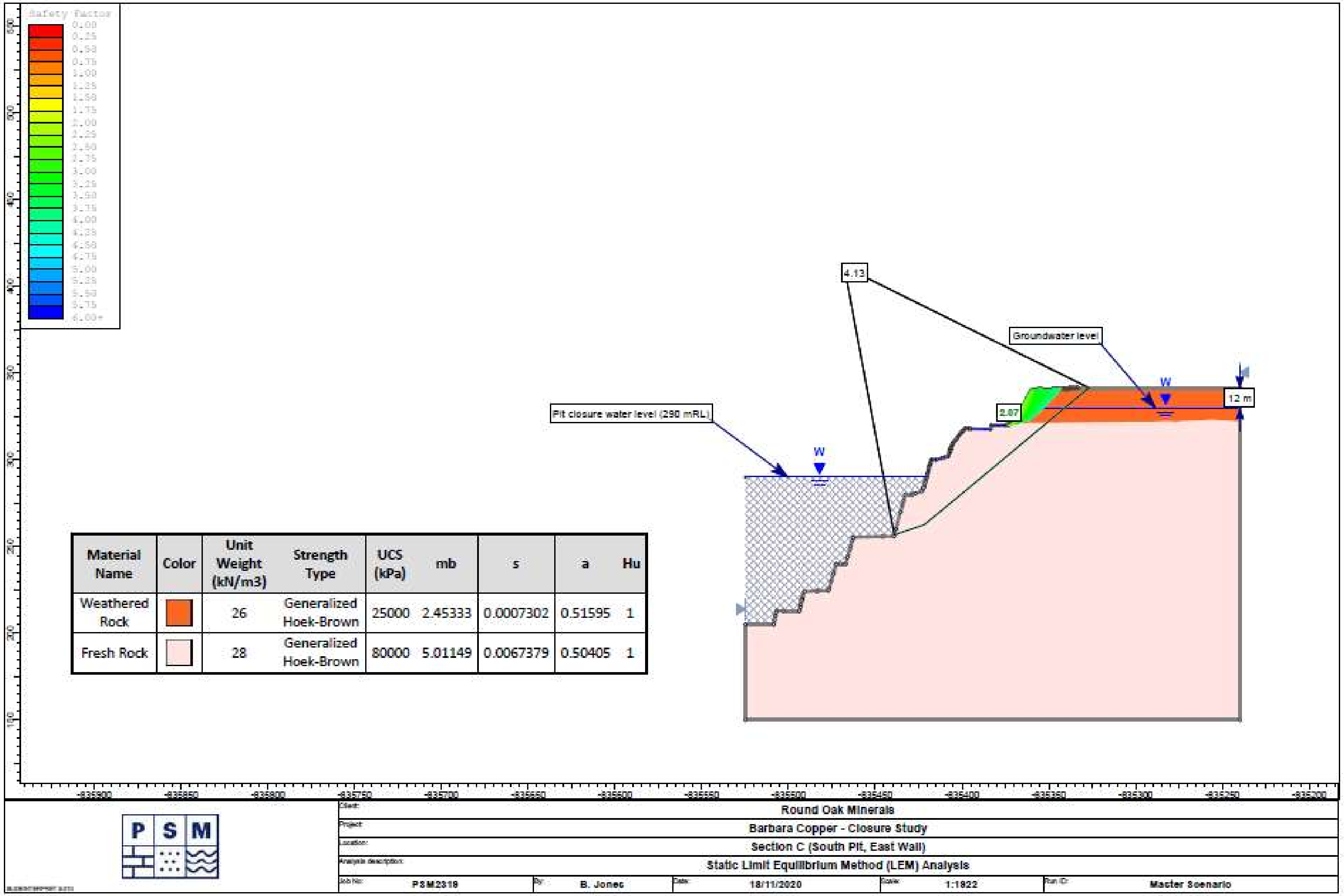


Figure 6-50 Limit equilibrium stability analysis – South pit (Section C)

The location of the abandonment bund for the North Pit is presented in Figure 6-51. Following the assessment of slope stability, the suitable location for the abandonment bund typically varies between 15 to 20 m from the pit permitter, except for in the south-east (the assessed potentially unstable pit edge zone delineated by Section A in (Figure 6-51) where it will be located 36 m behind the pit crest due to a deeper weathering profile. Abandonment bund will be a combination of soil, gates, rocks and will prevent access to general public but allow access for landowner. No buttress or diversion will be in place.

A section of the abandonment bund at the north of the North Pit will be comprised of a fence due to the limitations of the surrounding topography for access by construction machinery (steep terrain). The final alignment of the fence to the north of the North Pit will intersect the diversion to the north of the North Pit that is to be retained.

All safety controls will be located outside of the maximum potential zone of instability. The engineered north wall would be removed upon closure to increase the clean water catchment area reporting to the North Pit to improve the quality of stored water in the Pit for use as a stock water supply. As such, the current North Pit crest height will be reduced from approximately 316.0 m AHD to 313 m AHD. The proposed abandonment bund was modified at the southwest corner of the North Pit to incorporate the existing levee by raising it an additional 2.5 m to at least 322.5 m AHD. Where safety bunds are to be constructed the geometry is to be in accordance with 2m height, 5m width at base, 0.5m crest width and side slopes of 1(H):0.5(V). Three-strand wire fencing will be installed to exclude livestock and the public.

The location of the abandonment bund for the South Pit is presented in Figure 6-52. Due to the potentially unstable pit edge zones delineated by Section B and Section C in Figure 6-52 the minimum location of the bund has been determined at 14 m and 32 m behind the pit crest respectively.

A small gully (as per Appendix S) connecting to the existing diversion drain to the east of the south pit is planned. This gully is approximately 1.5m deeper than the existing diversion drain and will divert water away from the pit. The diversion drain and the planned gully are situated outside the south pit safety controls (abandonment bund). The potential subsidence /open pit disturbance zone is entirely managed inside the south pit bund and as such does not impact any void or surface subsidence risk nor does it impact the proposed PMLU of water storage, refer to Appendix Y.

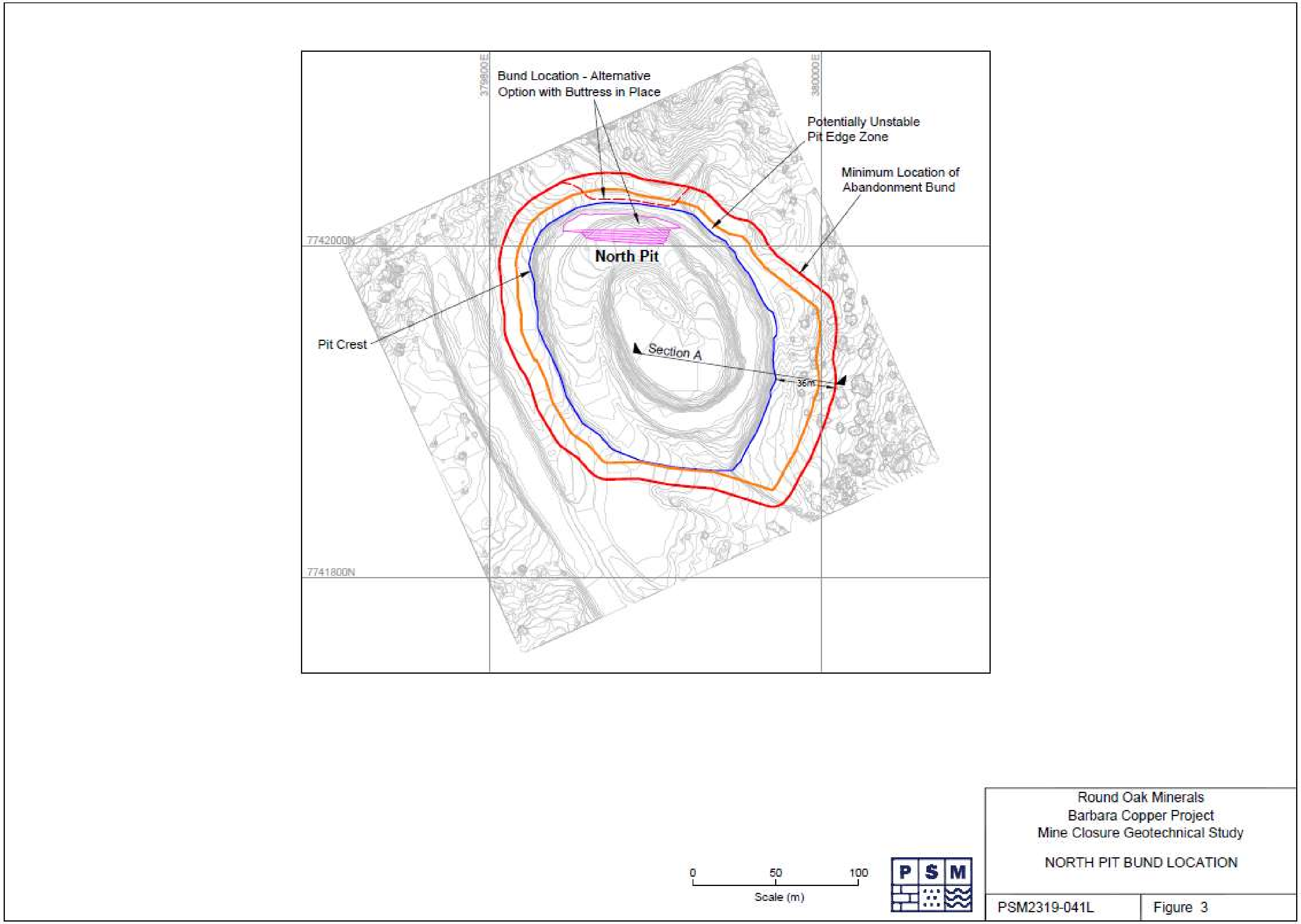


Figure 6-51 Bund location for the North Pit

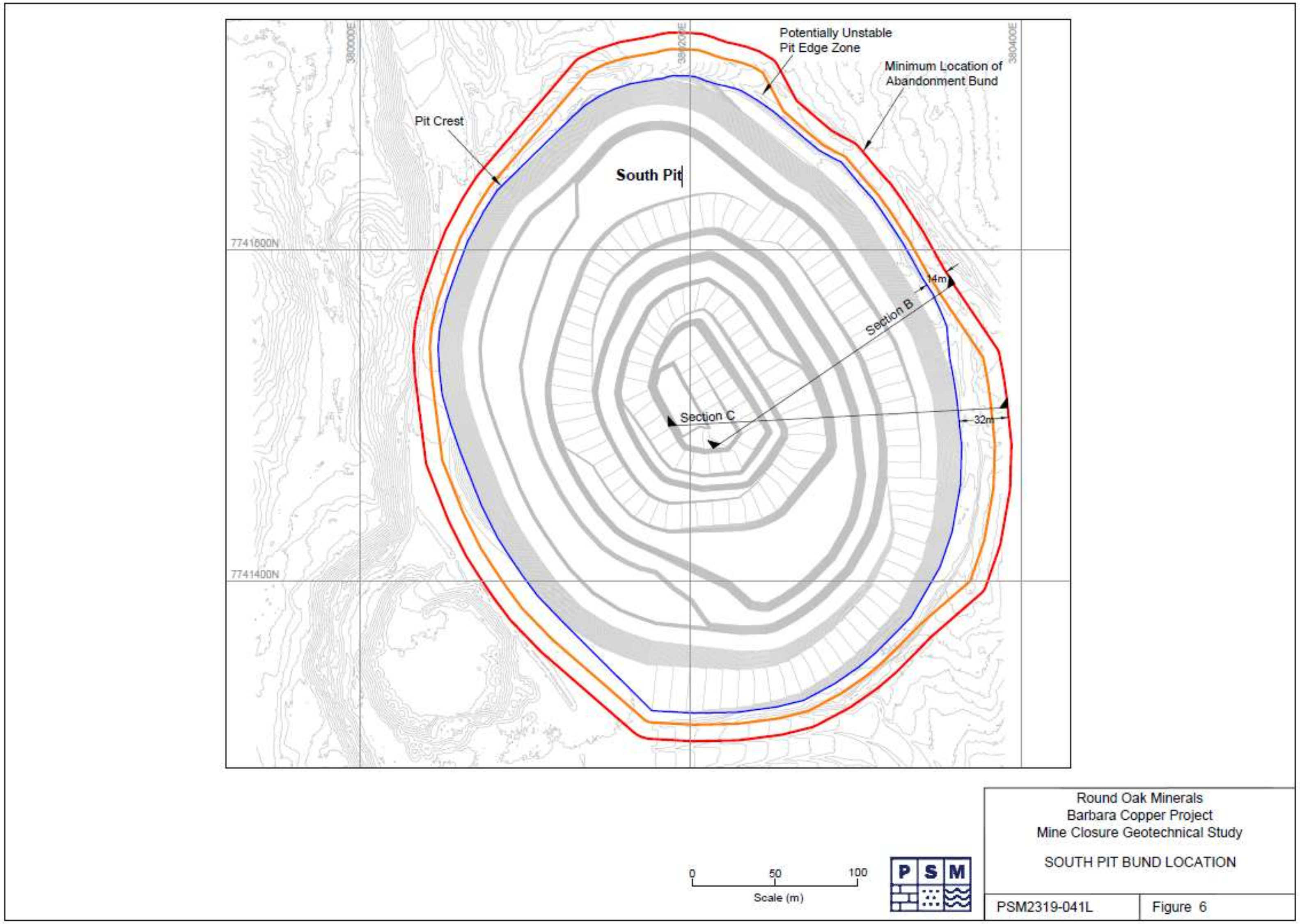


Figure 6-52 Bund location for the South Pit

6.8.3 Geochemical stability

Refer to Sections **Error! Reference source not found.** and 0 for the geochemical assessment for the pit walls.

6.9 UNDERGROUND MINING

Key elements involved in the rehabilitation planning for underground mining operations, including geotechnical assessments, hydrogeological modelling, subsidence analysis and overall management strategy for successful rehabilitation are considered within this section. Underground mining is proposed in Stages as described in Section 2.1 and Section 2.3.4The Water Balance model for Stage 1 is summarised in Section 6.1.2.1. and the water balance model incorporating the Stage 2 underground workings is summarized in section 6.1.2.2. In summary the impact of the Stage 1 underground development on the water balance of the existing voids (WRD Sediment Dam, North Pit and South Pit) is considered negligible. The South Pit, North Pit and Sediment Dam will not run dry during Stage 1. The statistical assessment of the long-term water quality criteria in the voids indicates that the long-term (200-yrs) water quality levels remain below the adopted guidelines, refer to Section 6.1.4.1.

Stage 2 assumes the South Pit has been completely dewatered and the crown pillar removed. The Underground receives all rainfall and runoff from the South Pit from the end of Stage 2 mining (~2029). After the Underground Workings fill, the South Pit then begins to fill. By ~2050, under mean rainfall conditions, the South Pit water level reaches 260 m AHD. Both the North Pit and South Pit do not overtop or spill but act as terminal sinks. Both water containment and long term water quality in the South Pit will continue to achieve its PMLU of water storage suitable for livestock watering, the modelling results to support this outcome are presented in Section 6.8.1.

Subsidence modelling presented in section 6,9.1 demonstrates there will be no surface instability as a result of underground mining and any long term void instability will be adequately contained within the proposed abandonment bunds for each void, restricting access.

6.9.1 Geotechnical Stability and Subsidence Modelling

Geotechnical assessment to address the impact the development of underground workings will have on the stability of the north and south pits for potential subsidence of the Barbara Copper Project footprint has been completed (Appendix Y). Planned underground voids beneath/surrounding the north and south pits pose a low risk of breakthrough to surface. Subsidence assessment indicates that the planned underground mining voids are highly unlikely to present any surface disturbance due to good ground conditions in and around the stope hanging wall and crown. Stopes planned to be mined at Barbara Underground Project have been assessed to be stable with waste backfill used to provide passive support and as a working platform. Some up-hole blind stopes planned to be mined and left open are expected to be stable in the short term but may exhibit some instability in the long run due to time dependant deterioration of the rock mass. In other cases where poor ground conditions may be encountered on the hanging wall and crown, unravelling of the rock mass is likely to continue to occur until a stable arch has been achieved before reaching surface and remains stable. In other cases, continued unravelling of the hanging wall and crown may continue to occur with failed material filling and choking the void before reaching surface and remain stable.

It is envisioned that instability due to mining of the underground stopes will only be restricted to the pit bottom where the stopes interact with the pit void (Stage 2). Surface disturbance influence from the underground mining activities is minimal. Any disturbance arising from underground mining will be restricted to the ore zone and thus within the current surface disturbance zone defined for the south pit void as per Section 6.8.2, within the proposed locations of the safety bunds, refer to Figure 6-57.

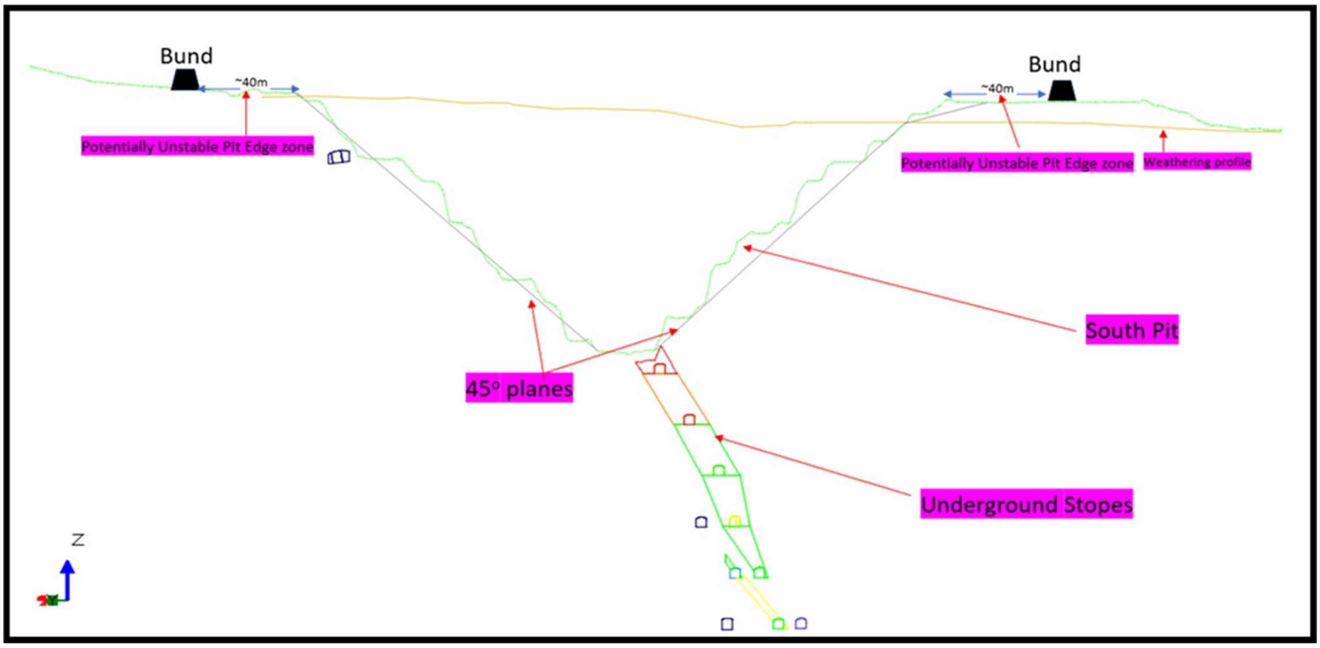


Figure 6-53 Barbara South Pit and underground stopes showing potentially unstable pit zone

6.9.1.1 Rehabilitation of Portal and Vent Fan

The Portal located within the South Pit will be backfilled with inert waste rock and a shotcrete bulkhead in front of the backfill. The waste rock backfill, and shotcrete bulkhead will be located approximately at least 50m down decline entrance in an area of good ground conditions. Shotcrete wall (Bulkhead) will be installed with drainage holes to allow for surface runoff to drain into the underground. The shotcrete plug will be installed as per standard bulkhead wall installation as per mine site bulkhead construction safe work instructions. Geotechnical assessment for shotcrete bulkhead construction will be undertaken prior to construction to decide location and size of the bulkhead. An inert bund will be installed just outside the portal entrance and a metal grate gate fitted at the portal. The vent shaft, also located within the South Pit will be decommissioned and sealed.

Being located within the South Pit access will be restricted by a physical barrier: abandonment bund and fencing with appropriate signage as per section 6.8.2.

6.10 .BUILT INFRASTRUCTURE

6.10.1 Ancillary infrastructure, ROM pad and roads

All crushing plant-associated buildings and equipment will be dismantled and removed from the site upon cessation of the Project. Infrastructure will be decommissioned as follows:

- All services disconnected to redundant infrastructure
- All road materials (bitumen, gravel) removed (ripped and revegetated) where not to be retained
- All pipelines drained and removed
- All fencing that is not part of the PMLU removed
- All buildings are demolished and removed
- Any remaining infrastructure to be transferred to landholder through signed Landholder Agreement
- All machinery and equipment removed
- All surface water drainage infrastructure not required in the PMLU has been removed (Where drains or bunding are not required for flood and/or erosion protection they will be levelled or used as fill)
- All diversions and levees not to be retained are removed

- All waste material to be removed and disposed of
- Demonstrate areas which contained ancillary infrastructure does not contaminate receiving waters or surface waters.

All contamination will be remediated or removed from site. Any contamination removed from site has been removed in accordance with relevant regulations. A contaminated land investigation document will then be prepared by a suitably qualified person (SQP) containing a site suitability statement that states that land is not contaminated and is suitable for the proposed PMLU (low intensity grazing).

All access tracks and haul roads on the Project will be ripped and revegetated Section 0except those roads over 4 m in width which will be handed to the landholder.

The ROM pad will be excavated to a depth of 0.5 m, or refusal, to ensure the removal of ore and any potentially contaminated materials and proposed post-closure topography shown in Figure 6-54. Benign material will be used either as capping material or regraded and revegetated (Section 0).

The remaining disturbed areas will be reshaped where required, deep ripped to remove compaction, and revegetated using the methods described in Section 0 of this document.

The PMLU for ancillary infrastructure, ROM pad and roads will be low intensity grazing.

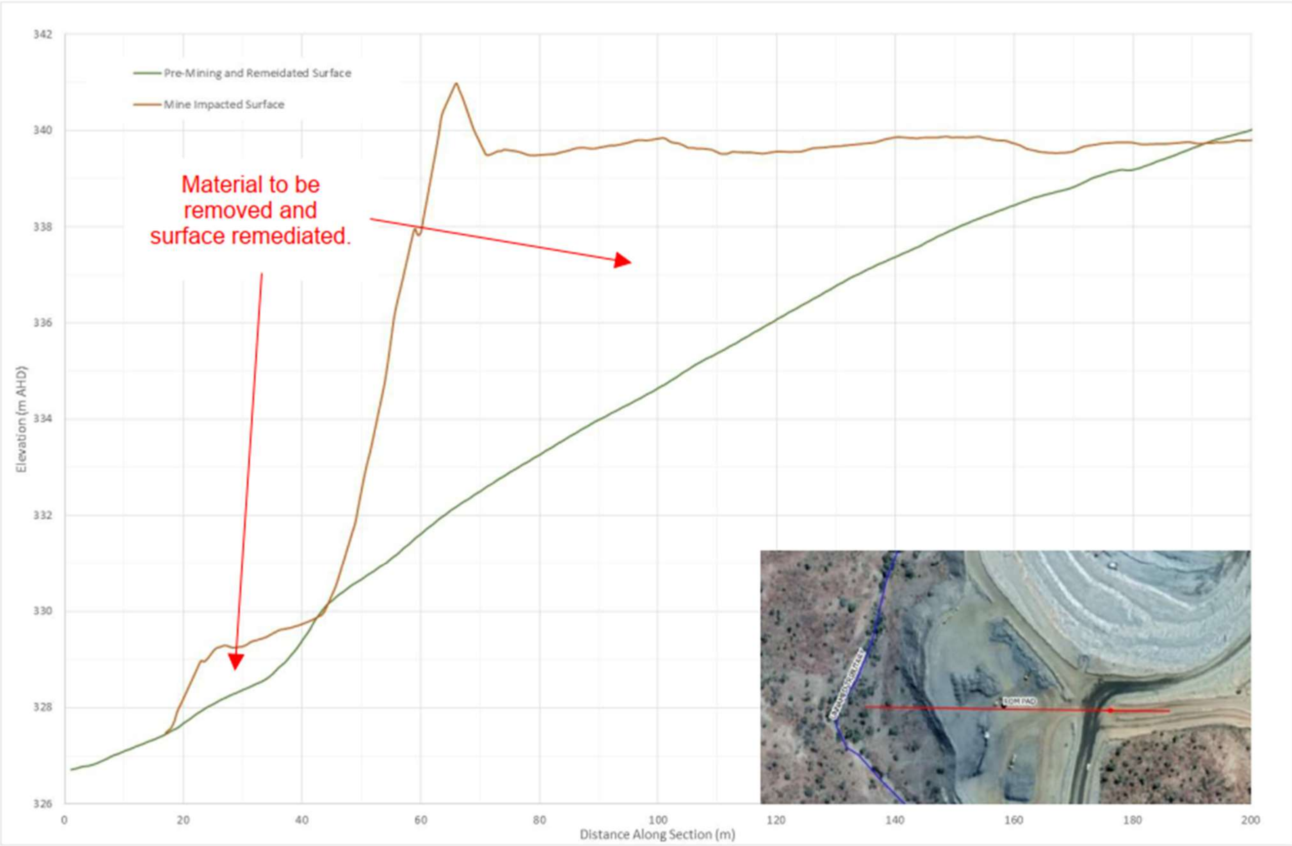


Figure 6-54 ROM Pad proposed post-closure surface topography

6.10.2 Bunds, levees, diversion drains, and dams

Several diversion drains, bunds and culverts have been constructed to manage local runoff by preventing backflow into mining operational areas and mine impacted run-off from entering the receiving environment. The location of diversion drains and culverts are provided in Figure 2-3.

The following diversion drains will be decommissioned:

- Sediment Dam western diversion drain
- Diversion drain southeast of the North Pit.

The following diversion drains will be retained:

- Diversion drain (and levee) to the west and south of the North Pit
- Diversion drain to the north of the North Pit
- Diversion drain to the east of the WRD Sediment Dam
- Diversion drain east of the South Pit and new gully

As per the EA criteria and the consequence category of the pits, the North Pit Creek Diversion and Levee has been designed to convey a peak flow for a 1:1,000-year annual exceedance probability (AEP) rainfall event. Rock armouring of the diversion drains was not required as diversions were formed from competent rock.

Initially, the Sediment Dam will be retained to evaporate stormwater runoff from the rehabilitated WRD. The Sediment Dam will subsequently be reconfigured and transferred to the landholder in agreement as water storage for livestock. Water quality monitoring will continue to determine the quality of the water in the pits and Sediment Dam prior to decommissioning.

The South Pit diversion drain was constructed to the east of the South Pit to divert clean surface runoff to the north of the South Pit, where it passes beneath the haul road and enters the creek diversion drain to the west of the North Pit. This South Pit eastern diversion drain will be decommissioned. A small gully connecting to the existing diversion drain to the east of the south pit is planned. This gully is approximately 1.5m deeper than the existing diversion drain and will divert water away from the pit.

The north wall of the North Pit is to be reduced from RL 316 m to RL 313 m (as detailed in Section 6.8.2), and the North Pit eastern diversion drain removed to allow freshwater inputs to the North Pit from the catchment to the east.

The diversion drain (and levee) to the west of the North Pit ('North Pit diversion') and diversion drain to the east of the WRD Sediment Dam to be retained.

Figure 6-55 shows in red the diversion drains that are to be removed post-closure. Further information on post-closure pit and the WRD sediment dam configurations is provided in 0.

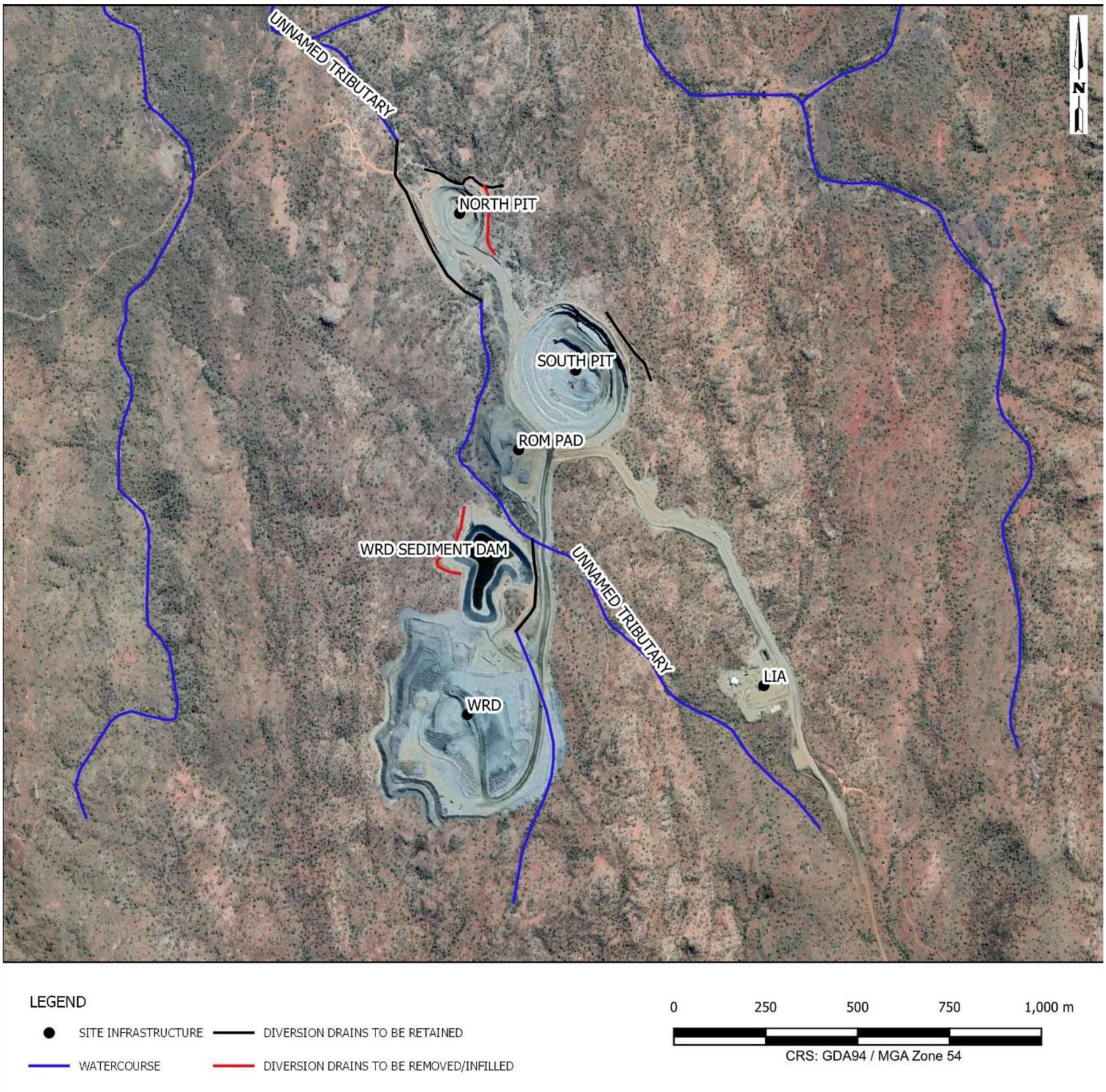


Figure 6-55 Diversions drains to be retained or removed post-closure

Refer to Section 6.8.2 for location and parameters of bunds around Voids.

7 RISK ASSESSMENT

The PRCP Guideline requires that a risk assessment is undertaken to identify the risks of a stable condition of land not being achieved and other risks that may be present at closure and to propose how the risks will be managed or minimised. A risk assessment was conducted by Round Oak for the Project to determine and manage potential post-closure risks.

As per section 126C(1)(f) of the EP Act, the focus of the risk assessment related to the risk of not achieving the proposed PMLUs (low intensity grazing, water storage and native ecosystem). It did not aim to identify internal project risks or financial risks to the company from closure activities.

The risk treatment plan may also require updates where additional risks are identified.

7.1 METHODOLOGY

The aspects of risk assessment, as described by the AS ISO 31000:2018: Risk Management – Guidelines (Standards Australia, 2018), were included in the risk assessment:

- Risk identification – sources of risk, areas of impacts, events and causes, potential for consequences
- Risk analysis – causes of risk, positive and negative consequences, and likelihood of consequences occurring
- Risk evaluation – analysis to determine what risks need to be managed and prioritised
- Risk treatment – select and implement options for addressing identified risks.

The risks associated with the ability to return the RAs to a stable PMLU were analysed using qualitative criteria to assess likelihood and consequences. Table 7-1, Table 7-2 and Table 7-3 provide the descriptors for the likelihood and consequence rankings and also the overall risk matrix provided.

Table 7-1 Qualitative criteria for likelihood

LIKELIHOOD PROBABILITY	DESCRIPTION (SINGLE EVENTS)	FREQUENCY
Almost certain	Common occurrence	Once per decade
Likely	Probably will occur	Once every 10 - 50 years
Possible	Could happen at some time or has happened in the past	Once every 50 - 100 years
Unlikely	Occurs infrequently	Once every 100 - 500 years
Rare	Not likely to occur	Once every 500+ years

Table 7-2 Qualitative criteria for consequence

CATEGORY	HEALTH AND SAFETY	ENVIRONMENT	COMMUNITY & SOCIAL
CATASTROPHIC	**Single or multiple fatalities** Health effects leading to early mortality	Long term impact to sensitive environments, requiring long-term recovery, leaving major residual damage Emergency response involving external emergency services	Community and social unrest stops operations for greater than one month Significant irreparable damage to a site or items of cultural significance
MAJOR	**Lost Time Case** Impairment resulting in days lost Progressive chronic health condition or infectious disease	Moderate impact to sensitive environments or medium-term impact to non-sensitive environments Requires long term recovery and leaving some residual damage	Community and social unrest stops operations for between one week and one month Irreparable damage to site or item of cultural significance

CATEGORY	HEALTH AND SAFETY	ENVIRONMENT	COMMUNITY & SOCIAL
MODERATE	**Restricted Work Case or Medical Treatment Case** Medically treated injury or injury requiring modified duties Reversible health effect of concern, no long-term disability	Minor impact to sensitive environments or moderate impact to non-sensitive environments Isolated community and customer complaints	Community and social unrest stops operations for up to one week Significant but repairable damage to heritage items of significance
MINOR	**First Aid Case** Minor reversible health effects of no concern	Environmental incident contained on site Incident tolerated without external complaints	Repeated community complaints requiring site management or business unit response Minor, repairable damage to cultural heritage items or sites
INSIGNIFICANT	**No Treatment Case** Short-term temporary health effects, inconvenience or symptoms	Environmental issues/impact resolved within normal business operations	Community complaint resolved via existing site procedures

Table 7-3 Qualitative risk assessment matrix

LIKELIHOOD	MOST SERIOUS CONSEQUENCE				
	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

7.2 RISK ASSESSMENT FINDINGS

This section provides the findings of the risk assessment which identified the potential risks to achieving a PMLU if rehabilitation and closure activities are undertaken as they are proposed. The risk assessment was updated following completion of studies to support underground activities.

0 below presents the complete risk assessment including existing controls and the residual risk outcomes (after additional controls are applied).

There were 24 inherent risks identified and, out of these, 18 were ranked with a severity score of 'Low', 4 ranked as 'Medium' and 2 ranked as 'High' for the inherent risk.

After the consideration of mitigation measures, and implementation of several modelling investigations, severity scores for residual risks were assigned. There were only 3 residual risks ranked as 'Medium' and none ranked as 'High'. Table 7-4 provides the summary of the medium residual risks and the proposed treatment controls. Refer to 0 for remaining residual risks identified as having a 'Low' severity score.

Table 7-4 Summary of 'medium' residual risks and treatment controls

RISK ID	RISK/IMPACT DESCRIPTION	DESCRIPTION	CONTROLS	RESPONSIBLE PERSON	TIMING AND SCHEDULING
9	Access to voids causing injury or death	Access to steep, unprotected slopes / instability of pit walls / surface subsidence causing injury or death to a member of the public or livestock.	Long term geotechnical stability assessment completed on open cut and surface subsidence from UG. Construction of abandonment (safety) bunds / gates / barriers / signage located outside maximum extent of pit wall failure to restrict access to people or animals. Rare occurrence however consequence of catastrophic cannot be reduced to below Medium Residual risk.	Site Senior Executive (SSE)	• End of mining and prior to relinquishment.
10	Infiltration to encapsulated PAF causing seepage, occurrence of poor-quality seepage/runoff from WRD impacting groundwater or surface water / riparian vegetation.	Causes considered included the placement of PAF in upper tiers of WRD and limited compatibility causing potential infiltration oxidation of PAF / leaching, the known characteristics of NAF/PAF, the known segregation and encapsulation of PAF, reasonable lag time of PAF to oxidise	Treatment controls for managing impacts to receiving environment from PAF seepage/runoff include: • Encapsulation of PAF within nominal 5 m of NAF within top and edges of dump. Surface of final landform will be shaped to direct surface run-off to eastern portion of WRD (assumes no cover system) Additional controls included a cover system to reduce percolation of incidental rainfall and seepage expression from the WRD within reasonable timeframe (5 years), to consider erosion potential, technical specification by engineer, as constructed certification of cover system, followed by a verification of cover system works. Design of cover system by appropriately qualified personnel, budget requirements to make sure enough NAF material is included in the capping system to prevent seepage in to PAF material. Additional monitoring of groundwater quality (See Section 8.2.7) and receiving environment (See Section 8.2.8). Resource requirements include budgetary requirements for groundwater quality monitoring, landowner cooperation.	SSE	• Encapsulation of PAF: During development of final cover system as per PRCP Schedule • Ongoing water quality monitoring

RISK ID	RISK/IMPACT DESCRIPTION	DESCRIPTION	CONTROLS	RESPONSIBLE PERSON	TIMING AND SCHEDULING
22	Fire damaging revegetation and sediment dam	Bushfire by lightening strike (or other cause) damaging revegetation and dam on site. Poor fire management practices may increase severity of impacts.	Tracks onsite to be considered firebreaks, with maintenance as required (landowner agreement to cover maintenance including firebreaks (roads)). Grazing by livestock to keep fuel load down. Seeds to be endemic/naturally regenerating. Ensure dam is in good condition for landowner handover	SSE	End of mining and prior to relinquishment.

8 MONITORING, MANAGEMENT AND MAINTENANCE

Post-closure monitoring aims to demonstrate that milestone criteria have been met and that key post-closure residual risks have been effectively managed. Monitoring will also enable any unforeseen issues to be identified and further management implemented.

8.1 MONITORING SCHEDULE

During mine completion environmental elements (e.g., flora, fauna, and water quality) will be monitored to demonstrate that outcomes have been achieved (against the rehabilitation milestone criteria). Table 8-1 provides the milestone monitoring schedule. The monitoring is proposed to continue for five years post closure, which is when it is expected that there will be achievement of the final milestone for the PMLUs.

For further detail on milestone criteria, refer to the PRCP Schedule. More details on the monitoring of the individual aspects are provided in Sections 8.2 to 8.2.8 below

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Table 8-1 Milestone monitoring

REF#	REHABILITATION MILESTONE	MONITORING TASK	METHODOLOGY	FREQUENCY	REPORTING	CONTINGENCY STRATEGY	REVIEW TIMING	REVIEW METHODOLOGY	CONTINGENCY STRATEGY
RM1	Infrastructure Decommissioning	Review legal agreements for retention of any infrastructure	Community consultation, document review and site inspection	Annually	Internal	Update documentation as required	At completion of landowner agreement	Visual inspection	Organise additional removal of infrastructure as required
		Confirm removal of agreed infrastructure							
		Confirm decommissioning of portal and vent fan	Document review and inspection	Following completion of works	Internal	Maintenance as required	Annually	Geotechnical assessment	Maintenance as required
RM2	Remediation of Contaminated Land	Review infrastructure mapping for inclusion of potentially contaminated sites	Document review and inspection	Annually	Internal	Update documentation as required	Following removal of any potentially contaminated material	Contaminated land investigation by SQP	Prepare remediation plan for any residual areas of contamination
		Site Suitability Statement produced							
RM3	Landform Development and Reshaping/ Reprofiling	Monitor against PRCP schedule and milestones	Ground survey and Lidar	Annually	Internal	Update schedule if required	Following completion of earthworks	Ground survey and Lidar	Update schedule or undertake additional works
RM4	Surface Preparation	Assess adequacy of growth media	Visual inspections	Biannually first three years	Internal	Identify cause of unsuccess	Annually	Growth media monitoring	Plan and execute remediation program
RM5	Rehabilitation (Native Ecosystem)	Assess adequacy of cover design	Capping materials assessment, permeability testing, review of compaction test work	Annually	Internal	Update documentation as required	Following completion of earthworks	Review of matrix suction sensor data	Remediate further areas if required
						Update design plan if required	Annually	Review of groundwater / receiving water data	
		Analysis of stability (slope, FoS) by a geotechnical engineer	Geotechnical inspection, ground survey and Lidar	Annually	Internal	Remediate areas of instability	Following completion of works	Geotechnical assessment	Remediate further areas if required
						Update design plan if required			
		Inspection of rehabilitated areas to monitor alignment with PMLU	Visual inspections	Annually	Internal and landowner as required	Identify cause of unsuccess	Annually	Erosion monitoring	Plan and execute remediation program
RM6	Revegetation (Water management infrastructure / Low intensity grazing)	Inspection of revegetated areas for germination success plus declared weed emergence	Visual inspections	Annually	Internal and landowner as required	Identify cause	Annually	Visual inspections	Plan and execute remediation program
		Inspect landform for erosion	Visual surveys and Lidar	Annually	Internal	Identify cause of erosion	Annually	Rehabilitation monitoring	Develop maintenance program for remediation
						Remediate where necessary			
RM7	Achievement of surface requirements (Water storage)	Analysis of survey data and geotechnical data for pits by a geotechnical engineer	Geotechnical inspection, ground survey and geotechnical data	Annually	Internal	Review set back distances to ensure safety	Following completion of mining	Geotechnical assessment	Review set back distance plan
									Plan and execute set back distance controls
		Compliance with EA requirements	RPEQ inspection	Annually	Internal, DES	EA amendment to deregister regulated structure	Annually	Review consequence category assessment	Update documentation where required

REF#	REHABILITATION MILESTONE	MONITORING TASK	METHODOLOGY	FREQUENCY	REPORTING	CONTINGENCY STRATEGY	REVIEW TIMING	REVIEW METHODOLOGY	CONTINGENCY STRATEGY
		Assess access restrictions are in place and operable	Visual inspections	Annually	Internal and landowner as required	Repair, remediate areas not meeting requirements	Annually	Visual inspections	Investigate cause of access issue
RM8	Achievement of surface requirements (Native ecosystem)	Water quality sampling against ANZECC Stock Drinking Water requirements	Water quality sampling and comparison to guidelines	Biannually	Internal and landowner as required	Investigate non-compliant results where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results Review landowner agreement where required
		Survey for erosion	Visual surveys and Lidar	Annually	Internal	Identify cause of erosion Remediate where necessary	Annually	Erosion monitoring	Develop maintenance program for remediation
		Cover system performance assessment	Cover system assessment by SQP	Annually	Internal	Investigate non-compliant results where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results. Remediate where necessary
RM9	Achievement of post mining land use (Low intensity grazing)	Geotechnical survey by SQP of levee & diversions to be retained	Site survey by geotechnical engineer SQP	Annually	Internal	Remediate areas of instability	Annually	Geotechnical assessment	Review design and revise if required
		Inspect landform for erosion	Visual surveys and Lidar	Annually	Internal	Identify cause of erosion Remediate where necessary	Annually	Rehabilitation monitoring	Develop maintenance program for remediation
		Inspection of revegetated areas for germination success plus declared weed emergence	Visual inspections	Annually	Internal and landowner as required	Identify cause	Annually	Visual inspections	Plan and execute remediation program
RM10	Achievement of post mining land use (Water Management Infrastructure)	Inspect storages for erosion	Visual surveys and Lidar	Annually	Internal	Identify cause of erosion Remediate where necessary	Annually	Erosion monitoring	Develop maintenance program for remediation
		Water quality sampling against ANZECC Stock Drinking Water requirements	Review of water quality data between reference sites and rehabilitation sites	Annually	Internal	Investigate spikes in potential contaminants where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results Plan and execute management program where required Review landowner agreement where required
		Groundwater level monitoring	Recording groundwater bore levels. Observe pit levels	Biannually	Internal and landowner as required	Investigate non-compliant results where required	Annually	Increased groundwater monitoring (up to quarterly)	Review landowner agreement where required

REF#	REHABILITATION MILESTONE	MONITORING TASK	METHODOLOGY	FREQUENCY	REPORTING	CONTINGENCY STRATEGY	REVIEW TIMING	REVIEW METHODOLOGY	CONTINGENCY STRATEGY
RM11	Achievement of post mining land use (Water storage)	Inspect storages for erosion / geotechnical stability (i.e. Portal & Vent)	Geotechnical inspection, ground survey and Lidar	Annually	Internal	Identify cause of erosion / instability Maintenance / Remediate where necessary	Following completion of works / Annually	Erosion monitoring & Geotechnical Assessment	Develop maintenance program for remediation
		Water quality sampling against ANZECC Stock Drinking Water requirements	Review of water quality data between reference sites and rehabilitation sites	Annually	Internal	Investigate spikes in potential contaminants where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results Plan and execute management program where required Review landowner agreement where required
		Groundwater level monitoring	Recording groundwater bore levels. Observe pit levels	Biannually	Internal and landowner as required	Investigate non-compliant results where required	Annually	Increased groundwater monitoring (up to quarterly)	Review landowner agreement where required
		Compliance with EA requirements	RPEQ inspection	Annually	Internal, DES	EA amendment to deregister regulated structure	Annually	Review consequence category assessment	Update documentation where required
RM12	Achievement of post mining land use (Native ecosystem)	Water quality sampling against ANZECC Stock Drinking Water requirements	Water quality sampling and comparison to guidelines	Biannually	Internal and landowner as required	Investigate non-compliant results where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results Review landowner agreement where required
		Survey for erosion	Visual surveys and Lidar	Annually	Internal	Identify cause of erosion Remediate where necessary	Annually	Erosion monitoring	Develop maintenance program for remediation
		Cover system performance assessment	Cover system assessment by SQP	Annually	Internal	Investigate non-compliant results where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results. Remediate where necessary
RM13	Achievement of post mining land use (Low intensity grazing)	Survey for erosion	Visual surveys and Lidar	Annually	Internal	Identify cause of erosion Remediate where necessary	Annually	Erosion monitoring	Develop maintenance program for remediation
		Inspection of rehabilitated areas to demonstrate vegetation cover and diversity meets PMLU of Low intensity grazing	Laboratory analysis of topsoil / growth media	Annually	Internal	Identify cause of unsuccess	Annually	Vegetation monitoring	Infill seeding where required
		Water quality sampling against ANZECC Stock Drinking Water requirements	Water quality sampling and comparison to guidelines	Biannually	Internal and landowner as required	Investigate non-compliant results where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results Review landowner agreement where required

REF#	REHABILITATION MILESTONE	MONITORING TASK	METHODOLOGY	FREQUENCY	REPORTING	CONTINGENCY STRATEGY	REVIEW TIMING	REVIEW METHODOLOGY	CONTINGENCY STRATEGY
RM14	Installation of cover system/cap	Analysis of stability (slope, FoS) by a geotechnical engineer	Geotechnical inspection, ground survey and Lidar	Annually	Internal	Remediate areas of instability	Following completion of works	Geotechnical assessment	Remediate further areas if required
						Update design plan if required			
		Survey for erosion	Visual surveys and Lidar	Annually	Internal	Identify cause of erosion	Annually	Erosion monitoring	Develop maintenance program for remediation
						Remediate where necessary			
		Cover system performance assessment	Cover system assessment by SQP	Annually	Internal	Investigate non-compliant results where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results. Remediate where necessary
		Assess adequacy of cover design	Capping materials assessment, permeability testing, review of compaction test work	Annually	Internal	Update documentation as required	Following completion of earthworks	Review of matrix suction sensor data	Remediate further areas if required
						Update design plan if required	Annually	Review of groundwater / receiving water data	
		Water quality sampling against ANZECC Stock Drinking Water requirements	Water quality sampling and comparison to guidelines	Biannually	Internal and landowner as required	Investigate non-compliant results where required	Annually	Sampling and laboratory analysis	Investigate cause of non-compliant results
									Review landowner agreement where required

8.2 DESCRIPTION OF MONITORING METHODOLOGIES

This section provides a description of the monitoring methodologies and standards to be implemented to assess the trends and success of rehabilitation and revegetation. Post closure monitoring to demonstrate the milestone criteria is provided in Section 8.4.

8.2.1 Vegetation monitoring

A rehabilitation monitoring program (RMP) will be conducted annually to analyse the progress of rehabilitated areas against undisturbed reference (analogue) sites (see 0). Monitoring will be undertaken as close to the end of the wet season as possible, to allow for the identification of annual species and to assist with identification of species that require the presence of flowers/fruiting material for accurate identification.

The aims of the RMP are to:

- Collect detailed information at each of the analogue and rehabilitation sites, including species composition, density, richness, and percentage ground cover to compare site performance against previous monitoring results and analogue sites.
- Assess the performance of rehabilitation activities against the rehabilitation criteria outlined in PRCP Schedule milestone criteria.

Monitoring of rehabilitation sites will commence once initial rehabilitation activities have been completed at each domain and will continue annually for five years post closure, which is when it is expected that there will be achievement of the final milestone criteria for the PMLUs; and every 10 years until surrender of the rehabilitation area from the EA. Progressive certification under Chapter 5 of the Queensland EP Act would be required to demonstrate milestone criteria have been met.

8.2.1.1 Analogue sites

Rehabilitation involves the revegetation of areas disturbed by mining that are no longer required for operational purposes. These areas need to be subsequently monitored to track their progress towards a native ecosystem or grazing on native pastures). This is done by comparing rehabilitated site data to reference data from an undisturbed area, known as a reference or analogue site.

A study undertaken by SLR (2023) identified six reference sites for Barbara, that will enable tracking of completion criteria for rehabilitated areas. The nominated reference sites apply to all rehabilitation monitoring for the Project. Six (6) Reference sites were established in locations that reflect the post-mining rehabilitation goals of the respective disturbance and Rehabilitation Areas. Factors to consider include slope/landform characteristics, pre-clearing vegetation and land use. This will allow rehabilitation sites to be paired with an appropriate reference site.

The six analogue sites representative of the proposed final rehabilitated landform were established in the landscape surrounding BCP as follows:

- Two replicate sites were established in areas field verified as RE 1.11.8, with steep slopes which are sparsely vegetated, representative of the side batters of the WRD (37 degrees).
- One replicate site, and one site with a single monitoring transect[2], were established in areas field verified as RE 1.11.2/1.11.3. Areas of flatter terrain were selected, representative of the cap of the WRD.

- Two replicate sites were established in areas field verified as RE 1.11.2/1.11.3. Areas of undulating terrain with native grass species (preferred by cattle) were selected, to represent low intensity grazing.
- Analogue monitoring sites representative of the 'water storage for livestock' and 'water management infrastructure' land uses, are not considered necessary or relevant; as water quality parameters at rehabilitated sites will be compared to published guideline values (rather than analogue site values).

Locations (transect starting point) for analogue monitoring sites are listed in Table 8-2.

Figure 8-1 provides the location of the reference monitoring sites for Barbara.

Table 8-2 Proposed analogue site locations

DOMAIN(S)	POST-MINE LAND USE	DESCRIPTION	ANALOGUE SITE ID	PROPOSED LOCATION (GDA94)	
				LATITUDE	LONGITUDE
Waste rock dump (WRD)	Native ecosystem	Areas field verified as RE 1.11.8, with steep slopes which are sparsely vegetated, representative of the side batters of the WRD (37 degrees).	A1.1	-20.401979	139.839381
			A1.2	-20.403388	139.839455
			A2.1	-20.417144	139.846550
			A2.2	-20.417395	139.845081
		Areas field verified as RE 1.11.2/1.11.3. Areas of flatter terrain will be selected, representative of the top of the WRD.	A3.1	-20.414892	139.844226
			A4.1	-20.413167	139.843531
			A4.2	-20.413241	139.842382
Ancillary infrastructure (ROM pad, roads, exploration)	Low intensity grazing	Areas field verified as RE 1.11.2/1.11.3. Areas of undulating terrain with native grass species (preferred by cattle) will be selected, to represent low intensity grazing.	A5.1	-20.420619	139.835723
			A5.2	-20.418974	139.834563
			A6.1	-20.428476	139.859263
			A6.2	-20.430010	139.859301
North pit, south pit, sediment dam	Water storage for livestock	NA – analogue site not required. Water quality parameters at rehabilitated sites will be compared to published guideline values.			
Diversion drains to be retained	Water management infrastructure	NA – analogue site not required.			

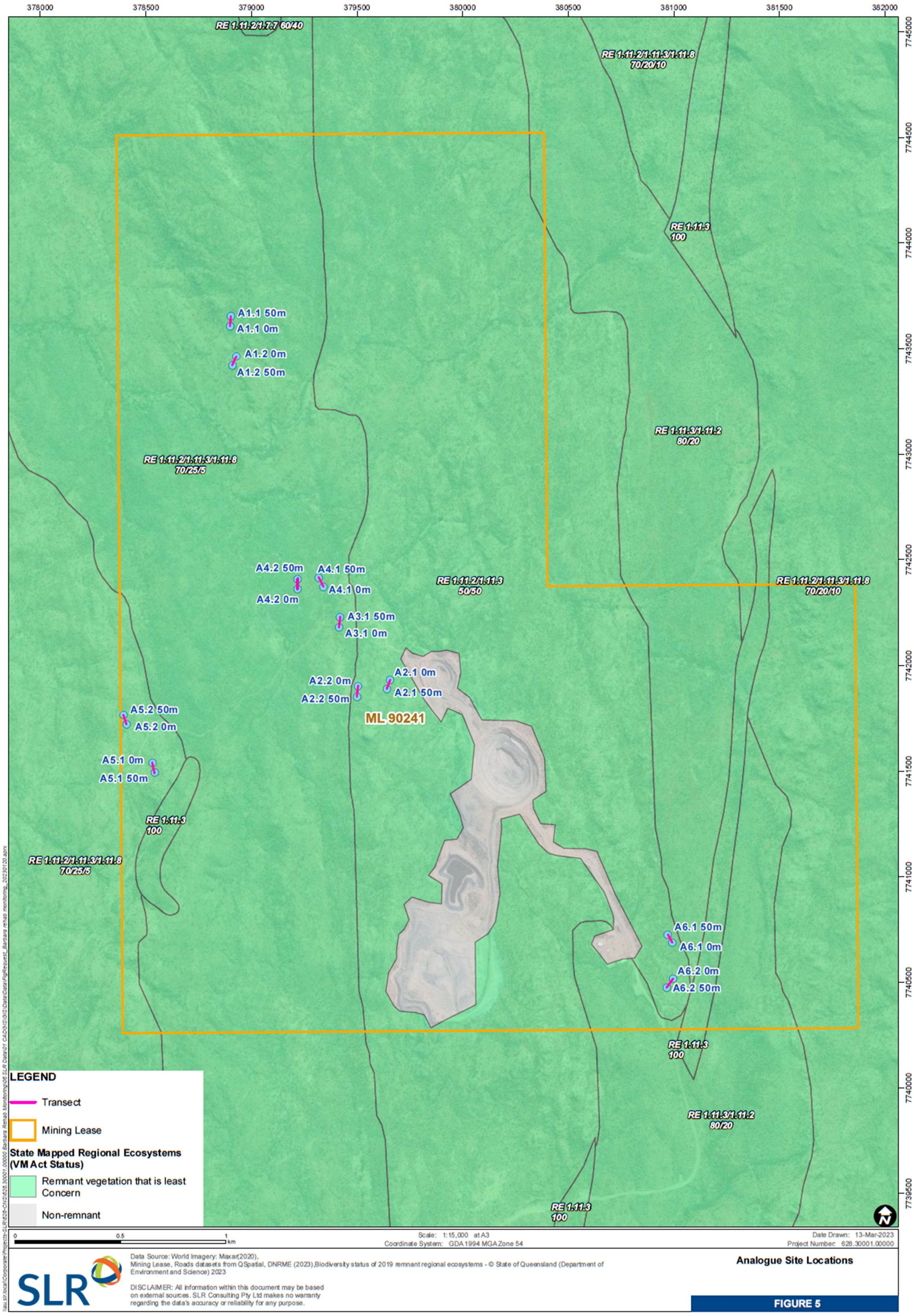

Figure 8-1 Location of analogue sites for Barbara

8.2.1.2 Rehabilitation sites

Rehabilitation monitoring sites will be established in impacted areas as progressive rehabilitation is undertaken. Once rehabilitation has been undertaken, each RA (excluding the open pit water storage) will contain a minimum of three permanent sampling sites to be compared with reference sites as a part of the RMP.

Rehabilitation site sampling density will be based on the sum of all disturbance areas within a particular RA (e.g., total area occupied by all dams belonging to the water storage domain). The sampling densities proposed are designed to enable the RMP to be statistically robust.

A minimum of two replicate rehabilitation sites per domain (i.e. WRD and Ancillary Infrastructure) are proposed, as outlined in Table 8-3 . The final number of rehabilitation sites for each area and domain required at Barbara will be determined as rehabilitation works progress.

As rehabilitation progresses, supplementary rehabilitation sites may be established as part of the RMP and assessed against analogue sites.

Table 8-3 Proposed rehabilitation site monitoring locations

DOMAIN	SITE ID	REHABILITATION SITES	
		EASTING	NORTHING
Waste Rock Dump	Rehabilitation 1	TBD	TBD
	Rehabilitation 2	TBD	TBD
Ancillary infrastructure (ROM pad, roads, exploration areas)	Rehabilitation 3	TBD	TBD
	Rehabilitation 4	TBD	TBD
North Pit, South Pit, WRD Sediment Dam	Rehabilitation site monitoring not required. Water monitoring locations are described in Section 8.2.8		
Water management infrastructure	Diversion drains to be retained. No rehabilitation site monitoring locations required for this domain.		

Note: TBD = To be determined following completion of landform

8.2.1.3 Monitoring methods

Rehabilitation monitoring will compare the progress of rehabilitated sites to reference site data by assessing the following characteristics:

- Ground cover percentage
- Canopy cover
- Species richness
- Woody stem density
- Recruitment
- Weed disturbance
- Photographic monitoring
- Landform evolution modelling
- Soil Moisture Characteristic Curves
- Soil permeability/matrix suction
- Erosion monitoring
- Soil sampling and growth media depth (every 2-3 years).

These methods are further described in the following sections.

8.2.1.4 Permanent vegetation monitoring

This method involves the collection of quantitative data on groundcover cover, canopy cover, species richness and woody stem density/recruitment. At each monitoring site a 50 m tape is extended, with the coordinates of each end recorded, to establish a permanent 50 m transect. A star picket is installed at each end of the transect to identify the exact transect location during each monitoring period. The transect area extends 5 m on either side of the 50 m tape, with 1 m quadrants placed every 5 m on alternating sides Figure 8-2. The permanent vegetation monitoring methodology will follow the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al*., 2017). Results from this survey will be used to compare plant communities between analogue and rehabilitated sites, including percentages of native species and weeds referred to in the milestone criteria of the PRCP Schedule. The permanent location of these monitoring transects will be decided during the first annual RMP.

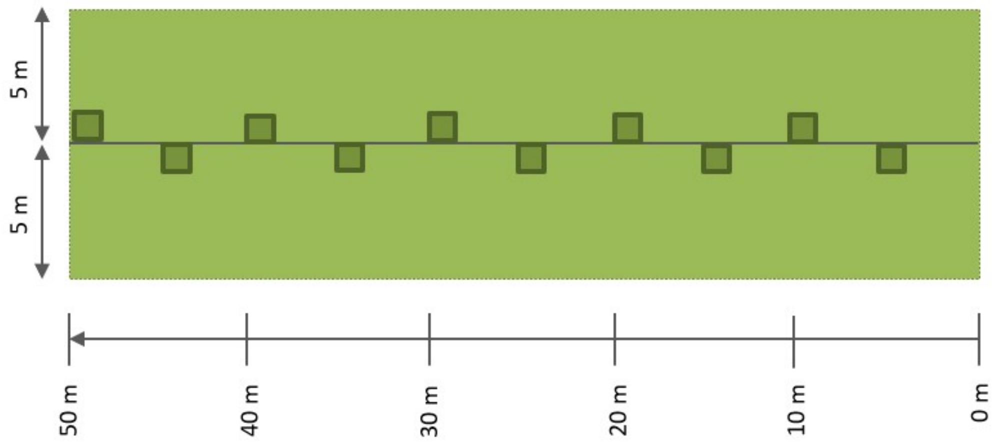

Figure 8-2 Transect area and layout

8.2.1.5 Statistical analysis

Average species richness will be calculated from the data obtained using the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland*. Data recorded for each site will be collated and averaged to obtain an indication of the species richness and type that the rehabilitation strategy is aiming to achieve.

Tree, shrub and ground cover densities will be calculated from both the stem counts and the species counts within the Ground Cover Percentage Method. These densities and percentages will then be averaged as described above for species richness and used to compare with completion criteria listed in PRCP Schedule.

8.2.2 Photographic monitoring

Photographic monitoring provides a visual record of the vegetation, ground cover, erosion and general appearance of each reference and rehabilitation site, allowing these sites to be compared over time (see 0). Site inspections of rehabilitated surfaces will occur annually following mine site closure until the full rehabilitation and relinquishment. Inspections are also recommended following significant rainfall events (greater than 50 mm depth).

A digital camera will be used to take the photos so a permanent record can be kept on file for each site. The process of taking the monitoring photos is as follows:

- The person taking the photograph stands at the star picket which marks the beginning of the 50 m transect within each of the sites
- The camera is then aimed directly towards the end of the 50 m transect and a single photograph is taken. The photo is taken directly above the star picket at chest height (approximately 110 cm above the ground)
- The photographer then stands at the star picket at the opposite end of the 50 m transect
- The camera is then aimed directly towards the start of the 50 m transect and a single photograph is taken. The photo is taken directly above the star picket at chest height (approximately 110 cm above the ground)
- The digital photographs are then downloaded and stored for future reference.

8.2.3 Opportunistic observations of fauna and key microhabitat features

Incidental observations of fauna will be recorded assessing rehabilitation of the WRD area. Key microhabitat features will also be recorded to determine habitat quality (see 0). Key features include presence of decorticating bark, stones and grassland features including tussocky habitat and seeds for foraging. This method will be undertaken in the ecosystem services PMLU only (e.g., the WRD Rehabilitation Area).

8.2.4 Erosion monitoring

Erosion of rehabilitated landforms reduces the likelihood of revegetation success, and in extreme cases can compromise the structural integrity of the landform, making it unstable and unsafe. In addition, if not managed correctly, erosion can result in the release of suspended sediments and potential contaminants into the receiving environment (see 0).

Erosion can be avoided by improving ground cover (particularly where large bare patches are present) such that vegetation occurs in a more uniform and consistent manner. Large bare patches will be shallow ripped and seeded to improve ground cover.

An erosion monitoring methodology has been developed by experienced AARC ecologists with consideration to relevant guidelines and research (Neldner et al., 2020). Erosion at the survey sites is monitored through visual assessment over time. Assessment is undertaken by traversing the 50 m transect on foot and recording the number and average depth of any erosion features or rill lines. It is noted that the placement of the permanent transects does not adequately capture the level of erosion across the entire rehabilitation landforms, and observations during the surveys have also been considered for the preparation of this report.

Erosion is measured along a 100 m transect. Erosion features or indicators that will be recorded, if identified, include wind or sheet erosion, erosion rills, gullies or tunnels, or signs of slumping.

When rills (less than 30 cm) and gullies (more than 30 cm) are observed along the 100 m transect then the area of erosion intercepting the 100 m transect will be calculated using the line intercept method, to understand the proportion of disturbance at each monitoring location.

The total number of rills will be counted at each monitoring location to determine rill severity, refer to Table 8-4. The overall classification of the erosion on each transect is determined by the higher classification attributed to either the number of rills/gullies or the average depth.

For example, a transect may present only one or two rills but if these are recorded as being 25 cm deep, the transect will be classified as presenting a Moderate erosion classification. Obvious cases of localised settlement which are not causing any subsequent erosion were not counted as instances of erosion.

Table 8-4 Erosion classification

EROSION CLASSIFICATION	MINOR	MODERATE	SEVERE	EXTREME
No. of rills#	< 15	15–30	31–50	> 50

Note: #Survey Field Handbook (Source: Australian Soil and Land RC, Isbell RF, Speight JG, Walker J and Hopkins MS 1990)

If a gully intersects the 100 m transect then the location, depth, and width at the point of crossing the transect as well as the depth at the deepest point, and width at the widest point, and the total length of the gully up and down the slope will be recorded for monitoring. Additional gullies of significance outside of the transects may be identified, demarcated with star pickets and monitored for stability.

8.2.5 Soil monitoring

An assessment of the place growth media health and suitability will be completed to confirm soil is suitable for target vegetation establishment (see Appendix W).

Soil monitoring involves the collection of growth media samples from a maximum depth of 10 cm to obtain quantitative data on the chemical and physical properties of soil. Soil sampling is conducted by collecting approximately 200 g samples with a clean plastic trowel and bucket every 10 m along the 50 m transect. These five samples are mixed in the bucket. The final 200 g soil sample is taken from the mix and placed into plastic sample bag. Samples are sent to a National Association of Testing Authorities (NATA) certified laboratory for analysis of indicators of soil nutrition and land contamination including:

- pH
- Electrical conductivity
- Soluble chloride
- Moisture content
- Emerson Aggregate Stability test
- Particle size analysis
- Exchange acidity
- Exchangeable cations (Calcium, Magnesium, Potassium, Sodium and Aluminium)
- Cation Exchange Capacity (CEC)
- Calcium / magnesium ratio (Ca:Mg)
- Exchangeable sodium percentage (ESP
- Total nitrogen, nitrite & nitrate
- Sulfate
- Extractable Potassium and Phosphorous (Colwell)
- Total organic carbon and organic matter
- Trace elements (Copper, Manganese, Zinc, Iron and Boron).

Soil moisture content will be measured for interpretive purposes only and will not be assessed in determining rehabilitation success. Ideally, rehabilitation site data will reflect that of reference sites, though variable data may be sufficient in supporting the chosen PMLU.

8.2.6 Waste Rock Dump monitoring

Instrumentation is proposed for the waste rock surface to monitor the performance of the capping system against rehabilitation objectives. Instrumentation proposed to be installed on the WRD are as follows:

- Weather station – climatic data will be useful for calibrating vadose models and for analysis of matric suction measurements. Rainfall, temperature, and wind speed will be monitored.
- Matric suction sensors – a thermal conductivity sensor measures matric suction. Measurement of matric suction in the cover system will provide an indication of the fate of moisture within the cover system. At the recommended location, nodes will be placed in the surface of the cover soil and surface of waste rock material.

- Settlement monitoring plates - settlement monitoring plates installed on the WRD will be used for monitoring settlement and geotechnical stability on annual basis.

Monitoring of the overall condition of the WRD and presence (and cause) of surface settlement /displacement/erosion/ disturbance will occur on an annual basis for a five-year timeframe.

8.2.7 Groundwater monitoring

Groundwater monitoring will be conducted on an annual basis during rehabilitation activities and post closure for a period of five-years. Samples will be collected by a suitably trained person, and the samples analysed by a National Association of Testing Authorities (NATA) accredited laboratory. The groundwater monitoring locations will be the same location as those contained in the EA (Table E5-6), plus additional monitoring within the North and South pits. There are eighteen monitoring bores included in the monitoring framework and the two pits (Table 8-5). The groundwater quality milestone criteria are provided in the PRCP Schedule.

The Groundwater report by RLAP (2014) describes the local geology where monitoring bores are located, as comprised of Proterozoic rocks of the Mount Isa Inlier. Rock types at Barbara include Felsic Volcanics (forming in the hills), dolerite/amphibolite (in the drainages/valleys) and basalt (forming plateaus).

Table 8-5 Groundwater monitoring locations

GROUNDWATER MONITORING LOCATION	EASTINGS (GDA94 ZONE 54)	NORTHING (GDA94 ZONE 54)
BAWB05	**380948**	**7740252**
Bore E	380022	7738827
BAWB01	380432	7742097
BAWB02	379480	7742395
BAWB03	379834	7741692
BAWB04	380043	7742054
BAWBR1	380292	7740939
BAWBR2	379912	7741279
BAWBR3	379991	7741485
Seepage Bore 1a	380084	7741046
Seepage Bore 1b	380084	7741048
Seepage Bore 2a	380025	7741117
Seepage Bore 2b	380023	7741116
Seepage Bore 3a	379985	7741133
Seepage Bore 3b	379986	7741135
Seepage Bore 4a	380711	7740798
Seepage Bore 4b	380711	7740800

8.2.8 Receiving water monitoring

Monitoring locations are provided in Figure 2-8 and

Table 8-6. Receiving water monitoring will be conducted at a frequency consistent with other monitoring events conducted at the site (once following a significant rainfall event (>50 mm), for a period of five years. Samples will be collected by a suitably trained person, and the samples must be analysed by a NATA accredited laboratory. Milestone criteria relevant for the receiving water is outlined in the PRCP Schedule.

Table 8-6 Receiving water and sediment monitoring site locations

MONITORING SITE	SITE DESCRIPTION	EASTING (GDA94 ZONE 54)	NORTHING (GDA94 ZONE 54)
BASW09*	Drainage feature outside and northeast of disturbance footprint catchment	377540	7738673
BASW05*	Drainage feature southwest and outside of disturbance footprint catchment	380736	7742273
BASW01	Watercourse at Mining Lease west boundary	378513	7743286
BASW04	Watercourse downstream of North Pit	379491	7742440
BASW08	Drainage feature at the top of catchment (Mining Lease entry)	380776	7740396
BASW11	Drainage feature upstream of junction with watercourse	379884	7743040

**Upstream / Reference Monitoring Points*

8.2.9 Maintenance and weed control

Following revegetation, rehabilitated areas will be checked for weed proliferation. Periodic monitoring will be undertaken to check the weed presence and weed control implemented if required. Weeds at target sites, should not exceed 10% of analogue site cover.

Weed control and maintenance involves the following:

- Preventing the introduction of exotic/invasive weeds (through the use of seed-free topsoil and appropriate washdown procedures)
- Minimising the spread of existing weeds (removing weeds prior to seed formation, ensuring known weed infestations are avoided on foot and vehicles); and
- Controlling weed infestations using either mechanical or herbicidal treatments (targeted chain-sawing, mulching, soil solarisation, weed pulling, or use of hand-held weed sprayers).

Weeds tend to out-compete native species on disturbed soils before desirable species have had time to set roots adequately over a rehabilitated area. Botanical surveys and hand removal of weeds or targeted herbicide applications will be pursued vigorously the first few years of newly established rehabilitated areas.

Rehabilitated areas will be checked for weed proliferation during monitoring periods. Weed control will also be conducted for sites that are meeting performance indicators for weed coverage, if relative cover of non-native/native species is increasing between surveys

8.2.10 Contingency Strategies

Monitoring of the rehabilitation areas will be undertaken (Section 8.1) annually to provide data that substantiates the performance of the rehabilitation from completion of rehabilitation activities to relinquishment. If during a subsequent monitoring event, a rehabilitation area fails to meet the success criteria or the area is not trending towards the success criteria, the following steps will be undertaken:

- An investigation into the reasons for failure or regression of rehabilitation. In some cases, the cause may be a naturally occurring event, such as a fire event, and not due to the failure of the rehabilitation method.
- If necessary, a risk assessment to determine whether remedial actions are required. This may occur when the ground cover is not sufficient to prevent erosion of the rehabilitation area; and

- The decision to conduct remedial actions will be undertaken through the close liaison with regulatory authorities to identify the best approach. Possible remediation activities may include the use of fire, thinning or the additional seeding of areas.

Upon identification of the cause of failure to comply with rehabilitation success criteria and the completion of remedial activities (if required), the area of rehabilitation will be monitored annually until the criteria have been met.

Contingency strategies if rehabilitation monitoring indicates milestone criteria are not trending towards being met is also provided in Table 8-1. The rehabilitation monitoring program will help identify and quantify problems, risks and opportunities for corrective actions and adaptive management.

8.3 MONITORING REPORTS

Annual rehabilitation monitoring reports for internal purposes will be prepared following the collection of monitoring data for the five-year monitoring period. These reports will present analyses of monitoring results and assess the rehabilitation progress over time as well as against success criteria. Ongoing rehabilitation monitoring and assessment will allow for the identification of challenges should they arise, and early remediation, ensuring rehabilitation success and certification in the long term.

Rehabilitation monitoring results will be analysed both over time and against success criteria and rehabilitation milestones. Results obtained from rehabilitation sites will be compared to analogue sites (where relevant). Common variables such as climatic conditions, seasonal variation and other event specific circumstances will also be considered in the analysis of rehabilitation data.

8.3.1 Statistical validity and data analysis

Statistical validity provides verification that if a conclusion is drawn from a given data set after experimentation, the conclusion is scientifically valid, if the conclusion drawn from the experiment is scientific and relies on mathematical and statistical laws. Data analysis from the rehabilitation monitoring program will include validity of construct, content, conclusion, internal and external aspects. Statistical validity will ensure the appropriate control sites/impact sites are being represented data set is being analysed and milestone criteria are being achieved as the primary aim of conclusions.

The analysis of rehabilitation monitoring results will involve comparing rehabilitation sites across the Project using statistical analyses where sufficient data is available. Statistical analysis will be undertaken where required to identify any significant differences between sample means. To determine any significant differences between the means of rehabilitation characteristics recorded across analogue and rehabilitation sites, it is recommended that rehabilitation performance be assessed using statistical test determined by the type of data available at the time. Variables measured at analogue and rehabilitation sites are considered statistically comparable where no significant difference between the means is detected. Temporal variation will be presented graphically for vegetation quality variables as required to identify any outliers or ongoing trends.

8.3.2 Intent of monitoring reports

The purpose of the monitoring program is to measure the performance of rehabilitation against the milestone criteria. The rehabilitation monitoring report provides a summary of rehabilitation performance, as well as a comparison of observed trends against previous monitoring events for rehabilitation areas.

The program will also help identify and quantify problems, risks and opportunities for corrective actions and adaptive management. The program describes the processes and activities that will be used to determine the biophysical state of rehabilitation and closure. A standardised and repeatable approach to the measurement of certain biophysical attributes and processes must be identified that can be compared against the milestones in the PRCP schedule.

Presentation of a long time series of monitoring data is one way to demonstrate that the risk of rehabilitation or management failure is low and/or quantifiable. The monitoring will also assist in improving the validity of the PRCP schedule. Any risks that remain upon surrender and post-surrender will be accounted for under the residual framework.

8.3.3 Quality Assurance and Quality Control

Monitoring, data assessment and reporting will be done by a suitability qualified person. This will be staff (e.g., environment officer) or an external consultant. All monitoring data files will be stored on-site. Aeris Resources staff will be responsible for reviewing monitoring data, analysis, reports and managing consultants.

Aspects to consider when reviewing the data, analysis and reports include QA/QC of data, methodologies used, fluctuating trends in data from previous years, accuracy of figures and graphs and general conclusions made about rehabilitation progress.

8.3.4 Standards and guidelines for monitoring

The abovementioned rehabilitation monitoring methodology will be followed in accordance with the following guidelines and standards:

- *Monitoring and Sampling Manual: Environmental Protection (Water) Policy*, version 2, 2018. Department of Environment and Science Government
- *Groundwater Sampling and Analysis* – A Field Guide, 2009. Geoscience Australia
- *Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland*, Version 5.1, 2020. Queensland Herbarium, Queensland Department of Environment and Science, Brisbane
- *Australian & New Zealand Guidelines for Fresh and Marine Water Quality*, 2018. Commonwealth of Australia
- *AS/NZS 5667.12:1999 Water quality*—Sampling Part 12: Guidance on sampling of bottom sediments
- SQP person guidance for soil moisture, erosion and settlement station monitoring.

8.4 POST-CLOSURE MONITORING

Post-closure monitoring aims to demonstrate that the final rehabilitation milestone criteria have been met and that the key post closure residual risks have been effectively managed. Monitoring enables any unforeseen issues to be identified and further management implemented.

Monitoring of the site has focused on demonstrating the achievement of PMLUs (low intensity grazing, water storage and native ecosystem) using the monitoring methods provided in Section 8.2 and assessed against the milestone criteria in the PRCP Schedule.

Once rehabilitation milestone criteria have been met, for the specified amount of time, application for certification of rehabilitated land can be made before relinquishment.

8.5 MANAGEMENT STRATEGIES

As a general principle, the Project's mining department will be charged with supervising and ensuring compliance with the milestone schedule. Assessment against completion criteria will be incorporated into the ongoing environmental management of the Project and assessment of the Rehabilitation Areas for revegetation, water quality and achievement against PMLUs will be completed as part of the annual rehabilitation monitoring program as detailed in previous Sections 8.1, 8.2 and 8.3. The management strategies for engineering works consist of appropriate supervision, verification and audit in the form of inspections, reviews and /or assessment.

Table 8-7 provides a summary of the measures discussed in Section 8 to be undertaken in determining the achievement of each rehabilitation milestone, proposed management strategies and justification for assigned timeframes. Timeframes have been developed with consideration for the size of the RA, the activities applicable to the milestone and interim rehabilitation activities that are scheduled to occur or anticipated to be required prior to the area becoming available for rehabilitation.

Table 8-7 Summary of Management strategies to achieve RMs within proposed timeframes

Rehabilitation milestone	Rehabilitation Areas (RA)	Description / criteria	Proposed management/ monitoring measure(s)	Proposed Timeframe	Justification for assigned timeframe
RM1: Infrastructure decommissioning	RA1, RA2, RA3, RA4	Applicable to all infrastructure identified to be decommissioned/ removed from site. Considered to be met when identified infrastructure removed, can occur concurrent with RM2 but prior to RM3 and RM4).	Infrastructure decommissioned/ removed at closure will be subject to environment and safety planning requirements including completion inspections. A visual inspection(s) will be conducted to determine that no infrastructure remains that does not form part of a Landholder Agreement. Geotechnical assessment (inspection and review) that portal and vent fan have been decommissioned.	2 years	Decommissioning is a low risk activity. With appropriate forward planning, the required activities can be completed within the 2 year period. In the event Stage 2 is not approved/commenced Stage 1 underground portal and vent fan will be available for rehabilitation at the end of 2026.
RM2: Remediation of contaminated land	RA3	This milestone is applicable to the Ancillary Infrastructure Area (i.e. where notifiable activities have been carried out) and, ROM Pad. Involves the completion of a contaminated land investigation undertaken by an AQP Considered to be met when contaminated material has been removed from site, or remediated in situ, An AQP certified site suitability statement prepared. ROM Pad surface excavated to 1m (or refusal).	A completed Phase 1 contaminated land investigation report, as well as any consequent reports where required. Visual inspection of potential sites or sources of contaminated material will be conducted, and samples collected as required. The contaminated land investigation will determine the presence of any contaminants. Remediation activities will be undertaken if required following consultation on appropriate remediation activities. A validation report will detail the remediation of contaminated land and, if required, a site suitability statement prepared by an AQP that states that the land is suitable for the nominated PMLU.	2 years	Given the small Ancillary infrastructure Area and limited Notifiable activities on site the timeframe allows for contaminated land assessment to be undertaken and contaminated material to be either remediated or removed. If contaminated land is identified, remediation works will be undertaken immediately. With appropriate forward planning, the required activities can be completed within the 2 year period nominated
RM14 Installation of cover system / capping	RA2	Only applicable to the WRD. Earthworks to complete final landform design on slope angles and installing storage and	Ongoing water monitoring and assessment in accordance with operational plans and rehabilitation monitoring plans. Land based and/or remote sensing survey techniques will be employed to confirm that graded slopes meet design specifications.	2 years	The WRD (RA2) will become available at the completion of Stage 1. There is no infrastructure associated with the WRD. With appropriate forward planning, the required activities

Rehabilitation milestone	Rehabilitation Areas (RA)	Description / criteria	Proposed management/ monitoring measure(s)	Proposed Timeframe	Justification for assigned timeframe
		release cover to meet design. QA/QC during construction and AQP to certify as built.	Records of capping design and cover placement/depth in accordance with design criteria. AQP assessments for slope stability and capping materials (records of physical properties and geochemistry).		can be completed within the 2 year period.
RM3: Landform development (reshaping, reprofiling)	RA1, RA2, RA3, RA4	Applicable to all areas where bulk earthworks and other grading are required to achieve target landform shape and drainage characteristics. Considered to be met when landforms are reprofiled to design characteristics, erosion and sediment controls, bunds and check dams installed where required, and natural drainage is established where applicable. Final survey and report on geotechnical stability by AQP meets landform design	Land based and/or remote sensing survey techniques will be employed to confirm that graded slopes meet design specifications. Regular visual inspections will be completed to determine if any future maintenance/repair action is required.	2 years	As land becomes available and at the completion of RM1, and where relevant RM2, all bulk earthworks and surface installation of drainage features will be completed to design specifications. With appropriate forward planning, the required activities can be completed within the 2 year period.
RM4: Surface Preparation	RA1, RA2, RA3	Applicable to all areas requiring revegetation. Includes final profiling and application of growth media materials, suitability testing, and amelioration if necessary. Considered to be met when surface preparation activities have been completed and soil condition is conducive to plant germination and growth.	Visual inspections and documentation of contour ripping, including depth, spacing and machinery used. Records of growth media placement indicating achievement of a target depth of the $\geq$ 0.15 m (RA1, RA3) or 0.3m on the WRD (RA2) Records to include any fertilisers/ ameliorants applied, including types, rates and timing of applications.	2 years	With appropriate forward planning, the required activities can be completed within the 2 year period.

Rehabilitation milestone	Rehabilitation Areas (RA)	Description / criteria	Proposed management/ monitoring measure(s)	Proposed Timeframe	Justification for assigned timeframe
RM5: Revegetation (Native Ecosystem)	RA2	Can commence after completion of RM4. Considered met when seeding completed.	Visual inspections and documentation for test work (i.e. capping material and geotechnical stability). Survey of completed areas, and record of revegetation method. Records of seeded and/or planted species consistent with the species listed in Tables 1 and 2 in PRCP schedule	2 years	With appropriate forward planning, the required activities can be completed within the 2 year period.
RM6: Revegetation (water management infrastructure / low intensity grazing)	RA3, RA4	Can commence after completion of RM4. Considered met when seeding completed.	Survey of completed areas, and record of revegetation method. Records of seeded and/or planted species consistent with the species listed in Tables 1 and 2 in PRCP schedule	2 years	With appropriate forward planning, the required activities can be completed within the 2 year period.
RM7: Achievement of surface requirements (water storage for stock water)	RA1	Can occur at the end of RM4 and considered to be met when AQP certified as geotechnical stable and safety bunds, fences and signage in place (RA1 only). Land can be transitioned to progressive certification.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring. Involves monitoring, RPEQ inspection and assessment, remediation works if monitoring identifies risks to the final rehabilitation criteria being achieved.	2 years	With appropriate forward planning, the required activities can be completed within the 2 year period.
RM8: Achievement of surface requirements (Native Ecosystem)	RA2	Involves monitoring and remediation works if monitoring identifies risks to the final rehabilitation criteria being achieved. Considered to be met when all completion criteria have been achieved and land is safe, stable (applicable to RA2 only), does not cause environmental harm and can sustain the nominated PMLU. Rehabilitated areas to be assessed against all	Recommendations for remedial works will be made where required (through monitoring and assessment), and remedial activities undertaken as soon as practicable. Completion of weed control surveys to ensure vegetation communities remain consistent with the species listed in Tables 1 and 2 in PRCP schedule. Additional seeding programs as required as required by results of rehabilitation monitoring program. Maintenance of any temporary sediment control measures (i.e. coir logs) used to retard surface runoff velocity and facilitate vegetation establishment.	5 years	Moderate risk activity allowing 5 years for completion.

Rehabilitation milestone	Rehabilitation Areas (RA)	Description / criteria	Proposed management/ monitoring measure(s)	Proposed Timeframe	Justification for assigned timeframe
		completion criteria developed with reference to analogue sites of similar characteristics and land use (Table 8 in PRCP).			
RM9: Achievement of post mining land use (Lost Intensity Grazing)	RA3	Considered to be met when all completion criteria have been achieved and land is safe, stable (applicable to RA3 only), does not cause environmental harm and can sustain the nominated PMLU. Rehabilitated areas to be assessed against all completion criteria developed with reference to analogue sites of similar characteristics and land use (Table 8 in PRCP). Considered to be met when land can be transitioned to progressive certification.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring (includes erosion and stability). Completion of weed control surveys to ensure vegetation communities remain consistent with the species listed in Tables 1 and 2 in PRCP schedule. Additional seeding programs as required as required by results of rehabilitation monitoring program. Maintenance of any temporary sediment control measures (i.e. coir logs) used to retard surface runoff velocity and facilitate vegetation establishment.	5 years	Moderate risk activity allowing 5 years for completion.
RM10: Achievement of post mining landuse (Water Management Infrastructure)	RA4	Involves monitoring and remediation works if monitoring identifies risks to the final rehabilitation criteria being achieved. Considered to be met when all completion criteria have been achieved and land is safe, stable, does not cause environmental harm and can sustain the nominated PMLU.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring (includes erosion and stability). A Hazard and Safety Assessment will be undertaken by an appropriately qualified person, and a final landform survey will be undertaken to confirm that retained infrastructure forms part of a landholder agreement. Recommendations for remedial works will be made where required, and remedial activities undertaken as soon as practicable.	5 years	Low risk activity.. Can commence on completion of RM6.

Rehabilitation milestone	Rehabilitation Areas (RA)	Description / criteria	Proposed management/ monitoring measure(s)	Proposed Timeframe	Justification for assigned timeframe
RM11: Achievement of post mining land use (water storage)	RA1	Rehabilitated areas to be assessed against all completion criteria developed with reference to PRCP schedule Table 5. Considered to be met when land can be transitioned to progressive certification.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring (includes erosion and stability). Ongoing quarterly water monitoring as per operational Groundwater Management Plan and as per Rehabilitation Monitoring Plan, results consistently assessed against PRCP Schedules Table 7. Rehabilitation Report by AQP/RPEQ (Progressive Certification Report)	5 years	Allowed 5 years for continuous quarterly data collection.
RM12: Achievement of post mining land use (native ecosystem)	RA2	Rehabilitated areas to be assessed against all completion criteria developed with reference to analogue sites of similar characteristics and land use (Table 8 in PRCP schedule). Monitoring demonstrates performance of cover system, safe and stable landform with negligible erosion Considered to be met when land can be transitioned to progressive certification.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring (includes erosion and stability). Rehabilitation Report by AQP (Progressive Certification Report)	5 years	RM8 to demonstrate trajectory of achieving RM12. Cover performance monitoring to occur for duration of RM8 and RM12 provides for 10 years continuous monitoring data.
RM13 Achievement of post mining land use (Low Intensity Grazing)	RA3	Rehabilitated areas to be assessed against all completion criteria developed with reference to analogue sites of similar characteristics and land use (Table 8 in PRCP schedule). Considered to be met when land can be transitioned to progressive certification.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring (includes erosion and stability). Ongoing quarterly water monitoring as per operational Groundwater Management Plan and as per Rehabilitation Monitoring Plan, results consistently assessed against PRCP Schedule Table 7. Groundwater quality currently meets ANZECC livestock watering criteria. Rehabilitation Report by AQP (Progressive Certification Report)	5 years	RM9 to demonstrate trajectory of achieving RM13 (10 years for both RM8 and RM13)). Relatively small area and low risk of any repair and maintenance activities will be minor that may be required as a result

9 CONCLUSION

This transitional PRCP has been developed to meet the requirements under the EP Act and the PRCP Guideline for the Project (comprised of ML90241, under EPML02840015).

Section 2.2 provides the baseline information for the site, which has been assembled from specialist reports, pre-mining surveys, government databases, or data collected during operations. As well as the project description and how the areas have been mined.

The site meets the criteria for a transitional PRCP. Therefore, information from existing land outcome documents has been used throughout the report.

The PMLUs for the site is low intensity grazing, water storage and native ecosystem. Section 6 provides the rehabilitation and closure methodology based on the knowledge of the baseline environment, assessments and modelling for post closure and rehabilitation landforms and consultation with landowners.

Monitoring and maintenance of rehabilitation, described in Section 8, will occur to demonstrate milestone criteria are being met and that the final milestone for achieving the PMLU is complete.

The PRCP Schedule is provided to DESI separately and has been informed by the information provided within this PRCP.

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Appendix A Environmental Authority Permit

Appendix B PRCP Checklist

PRCP Requirement	Requirement met? (Yes / NA)	PRCP Section No.	Justification
Project description	**Yes**	**1**	
Describe the following: Each resource tenure, including the area of each tenure, to which the application relates	Yes	1 and Section 2.3.1	
The relevant activities to which the application relates	Yes	2.3.2	
The likely duration of the relevant activities	Yes	1	Transitional PRCP. Mining operations have already ceased, currently in care and maintenance. Proposed Stage 1 underground mining to occur 2025 to 2027 (2 years).
Include a detailed description, including maps, of how and where the relevant activities are to be carried out.	Yes	2.3.3 & 2.3.4	Updated summary of Stage 1 mining operation inclusions/ exclusions and timings (Jan 2025-Dec 2026).
Consultation	**Yes**	**3**	
Include details of the consultation undertaken by the applicant in developing the proposed PRCP.	Yes	3.2	
Include details of how the applicant will undertake ongoing consultation in relation to the rehabilitation to be carried out under the plan.	Yes	3.3	
Post-mining land use	**Yes**	**4**	
State the extent to which each proposed post-mining land use identified in the proposed PRCP Schedule for the plan is consistent with the outcome of consultation with the community in developing the PRCP.	Yes	4	
State the extent to which each proposed post-mining land use identified in the proposed PRCP Schedule for the plan is consistent with any strategies	Yes	4	

PRCP Requirement	Requirement met? (Yes / NA)	PRCP Section No.	Justification
or plans for the land of a local government, the State or the Commonwealth.			
Non-use management area	**Yes**	**5**	
State the extent to which each proposed non-use management area identified in the PRCP Schedule for the plan is consistent with the outcome of consultation with the community in developing the PRCP.	Not applicable		No NUMAs have been proposed as part of the PRCP
State the extent to which each non-use management area identified in the PRCP schedule for the plan is consistent with any strategies or plans for the land of a local government, the State or the Commonwealth.	Not applicable		
For each proposed non-use management area, state the reasons the applicant considers the area cannot be rehabilitated to a stable condition because of a matter mentioned in section 126D (2).	Not applicable		
For each matter mentioned in the requirement above, include copies of reports or other evidence relied on by the proponent for each proposed non-use management area.	Not applicable		
Rehabilitation and management methodology		**6**	
For each post-mining land use, state the applicant's proposed methods or techniques for rehabilitating the land to a stable condition in a way that supports the RM under the proposed PRCP Schedule.	Yes	6 and 8.5	Inclusion and update of Table 8-7 Management Strategies and PRCP timeframe (Stage 1) and justification of achievement of milestones.
For each non-use management area, state the applicant's proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRCP Schedule for the area.	Not applicable		No NUMAs have been proposed as part of the PRCP
Risk assessment	**Yes**	**7**	

PRCP Requirement	Requirement met? (Yes / NA)	PRCP Section No.	Justification
Identify the risks of a stable condition for land described as a post-mining land use not being achieved, and how the applicant intends to manage or minimise the risks.	Yes	0 and Section 7.2	Summary of Risk findings in 0.
PRCP Guideline	**Yes**		
Include any other information prescribed by the administering authority in the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964)	Yes	Various sections	Baseline data included, monitoring and maintenance as well as post closure monitoring, Waste characterisation and geochemical studies. Underground Mining added to Section 6.9
Include the spatial information required in the Guideline – Progressive Rehabilitation and Closure Plans (ESR/2019/4964).	Yes	Provided as shapefile	Rehabilitation areas, disturbance footprint, sensitive receptors
Other information	**Yes**		
Include the other information the administering authority reasonably considers necessary to decide whether to approve the PRCP Schedule.	Yes		Provided throughout PRCP document, as appropriate
PRCP Schedule	**Yes**	**0**	
Include a PRCP schedule prepared using the PRCP schedule template (ESR/2019/5103)	Yes		Provided to DES separately
Include maps showing all of the land mentioned in the PRCP schedule, as it relates to being progressively rehabilitated.	Yes		Spatial data provided to DES separately

Appendix C Post Mine Land Use Plan

Appendix D REMP Annual Report 2020

Appendix E Terrestrial Flora and Fauna Assessment

Appendix F Aquatic Ecology Report

Appendix G Assessment of Waste Rock Geochemistry

Appendix H Waste Rock Management Plan

Appendix I Kinetic Column Leach Testing of Waste Rock and ROM Oxide

Appendix J Air Quality Monitoring Program

Appendix K Groundwater Management Plan

Appendix L Water Management Plan

Appendix M Erosion and Sediment Control Plan

Appendix N Calibrated Erosion Modelling Report (WEPP)

Appendix O Geotechnical Study (Pits)

Appendix P Water Management Plan and Water Balance Model

Appendix Q Community Consultation Plan

Appendix R Risk Assessment

Appendix S Hydraulic Assessment

Appendix T Water Quality Assessment of North Pit, South Pit and WRD Dam

Appendix U(a) Groundwater Technical Report

Appendix U(b) Groundwater Technical Memo – Long term void water quality

Appendix U(c) Stage 1 and 2 Water Balance and Water Quality Modelling

Appendix V Cover Design Supplementary Report

Appendix W Rehabilitation Monitoring Program

Appendix X Water Management Plan & Water Balance -UG

Appendix Y Geotechnical Assessment Underground Subsidence