



Koolan Iron Ore Mine and Port Facility Mine Closure Plan

Revision 7 Version 0

31 January 2025

Mining Tenements

Tenement Number	Tenement Holder
M04/416-I	Koolan Iron Ore Pty Ltd
M04/417-I	Koolan Iron Ore Pty Ltd
L04/29	Koolan Iron Ore Pty Ltd
L04/68	Koolan Iron Ore Pty Ltd
L04/101	Koolan Iron Ore Pty Ltd

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1 PROJECT SUMMARY

1.1 Tenement Holder Authorisation

All tenements associated with the Koolan Iron Ore Project are held by Koolan Iron Ore Pty Ltd, as shown in **Table 1**. Koolan Iron Ore Pty Ltd (KIO) is a 100% owned subsidiary of Mount Gibson Iron Limited (MGX). All rights of KIO are shared with MGX including, but not limited to, the submission of environmental approval documents and engagement with relevant government departments.

1.2 Environmental Group Site

The Environmental Group Site (EGS) for the Koolan Island Iron Ore and Port Facility is presented in **Table 1** and Key Contact Details in **Table 2**.

Table 1 Environmental Group Site details

Element	Description	
EGS Name	Koolan Environmental Group	
EGS Code	S0235721	
Description	An iron ore mining and shipping operation on Koolan Island, about 130 kilometres north of Derby within the Buccaneer Archipelago, Western Australia.	
Phase of mining	Operating	
Commodity mined	Iron ore	
Est. commencement date	2006	
Est. completion date	2027	
Tenement details	Tenement	Tenement Holder
	L 04/29	Koolan Iron Ore Pty Ltd
	L 04/68	Koolan Iron Ore Pty Ltd
	L 04/101	Koolan Iron Ore Pty Ltd
	M 04/416-I	Koolan Iron Ore Pty Ltd
	M 04/417-I	Koolan Iron Ore Pty Ltd
Proponent Details		
Company	Koolan Iron Ore Pty Ltd	
ACN/ABN	099 455 277	
Address	Level 1/2 Kings Park Rd West Perth, WA 6005	
Postal address	PO Box 55, West Perth 6872	

Table 2 Key Contact Details

Key contact representative	Name	Jacob King
	Position	Senior Closure Specialist
	Phone number	0419193682
	Email	Jacob.king@mgx.com.au

1.3 Project Location

The Project is located on Koolan Island, approximately 130 km north of Derby at the northern end of the Yampi Peninsula. It lies in the northern Kimberley bioregion with a dry, hot, tropical climate and summer rainfall. The regional location of the Project is shown in **Figure 1**.

1.4 Project Overview

Koolan Island had a history of small-scale mining from the turn of the 20th century until BHP established and maintained substantial mining operations from 1965 to 1993. BHP extracted approximately 68 million tonnes of high-grade iron ore from five pits on Koolan Island – Main, Mullet, Eastern, Barramundi and Acacia. As part of the mining operations, BHP reclaimed the area east of Arbitration Cove (Lower Mangrove Inlet) with waste rock. Waste rock dumps were also placed adjacent to each of the pits.

BHP operated three domestic and four industrial landfills on the Island. There are no known records of the materials that were placed in the tips, management techniques, or the longevity of each waste disposal area. In 1993, BHP decommissioned the mine which included removal and some in situ burial of operations infrastructure, rehabilitation of cleared areas by moon-scaping and construction of a channel to allow seawater flooding of the Main Pit. Aside from the known domestic and industrial tip sites, the exact locations of other burial pits and the materials buried as part of the decommissioning operations is unknown.

The primary approval to clear land and commence mining was granted on 22 February 2006 via Ministerial Statement 715 under the *Environmental Protection Act 1986* (WA). At the time, 45% of the development footprint was situated in areas previously disturbed by BHP and others. The Project involved the re-opening and expansion of previously mined ore bodies and the construction of associated infrastructure and a port facility.

Significant structural features of the Project included construction of:

- a seawall across Arbitration Cove to allow deepening of Main Pit and prevent ingress of sea water, along with a revetment structure to stabilise the outer margins of the seawall; and
- a port facility at Mangrove Inlet, with a rock causeway, barge lay-down area, wharf and shiploader.

The main activities of the Project included:

- placement of overburden (waste rock) in out-of-pit waste dumps;
- dewatering of Main Pit and discharge to the ocean;
- processing, stockpiling and ship-loading of ore;
- construction of associated infrastructure such as:
 - dry crushing and screening plant;
 - haul and access roads;
 - diesel-fuelled power station;
 - fuel storage facility;
 - conveyor system to transfer ore from the stockpiles to the shiploader;
 - accommodation village, administration offices and workshops; and

Functionally, these activities also require management of environmental impacts associated with the above operational elements including decommissioning and rehabilitation of all disturbed areas and the relinquishment of mining tenements after successful closure.

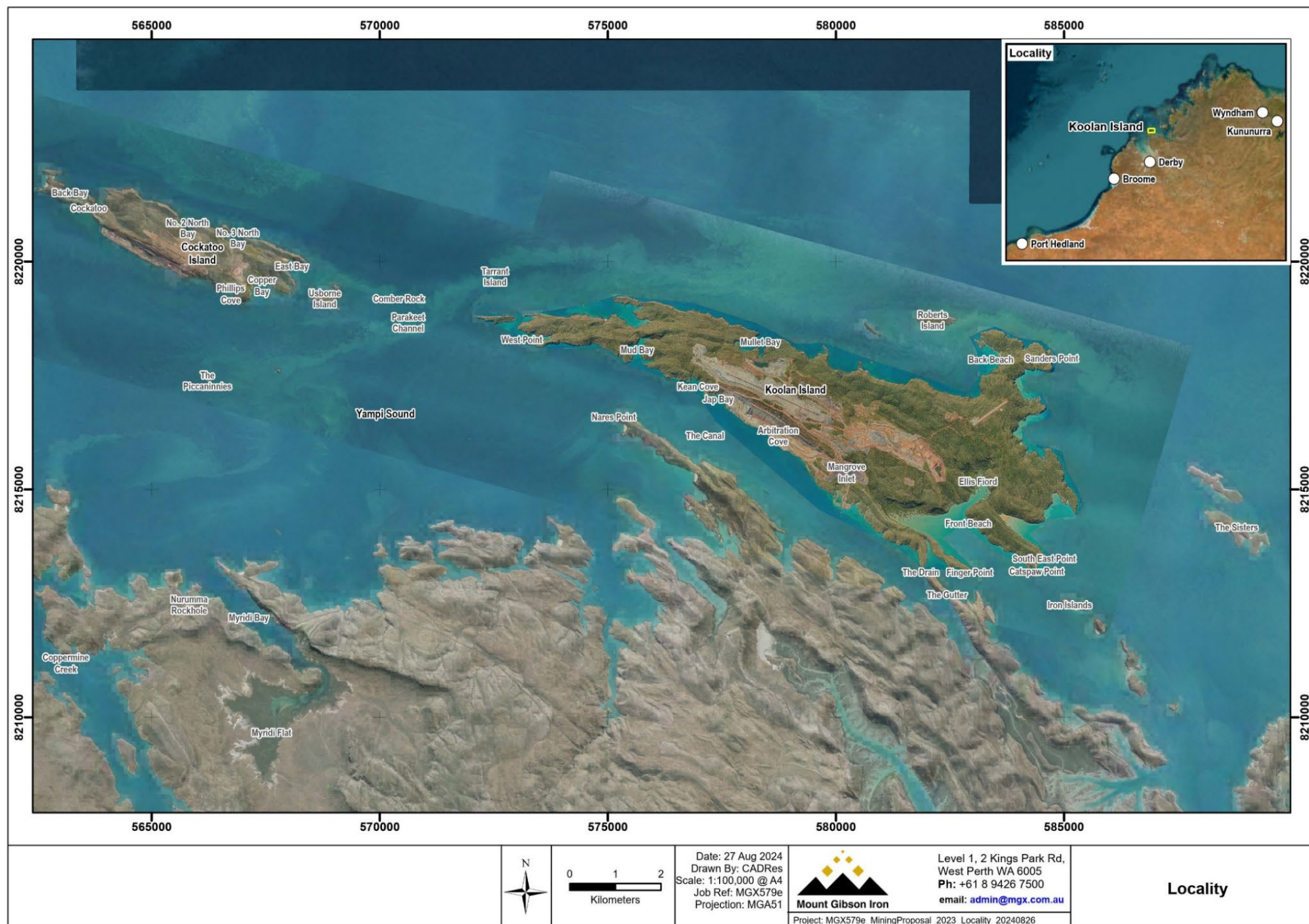


Figure 1 Regional Location of Koolan Island Iron Ore Mine and Port Facility

KIO (as MGX) commenced production in mid-2007 at a mining rate of up to 4 million tonnes of ore per annum and a typical strip ratio of 6:1. In November 2014, the Main Pit Seawall partially collapsed, resulting in the inundation of the Main Pit by seawater. During 2015, the mining rate (from pits other than Main Pit) was reduced and, in early 2016, operations at Koolan Island entered a period of care and maintenance (C&M).

In 2017, the MGX Board approved reconstruction of the seawall, incorporating a vertical grout curtain longitudinally along its axis. In July 2018, the seawall had been rebuilt and dewatering of the Main Pit commenced. Excavation of waste rock from Main Pit commenced in January 2019, and mining recommenced in March 2019. KIO plans to mine the Main Pit ore body and handle waste rock to waste rock landforms (WRL) and pit voids, as it did up until the 2014 seawall breach, until closure, currently forecast from H1 FY26-27.

The mine site layout identifying disturbed areas as defined in the *Mining Rehabilitation Fund Regulations 2013*, tenement boundaries, and proposed or existing disturbance types within each tenement, are shown in **Figure 2** and **Figure 3**.

1.5 Approvals History

The activities approved via previous mining proposal registrations are outlined in **Table 3**, noting this list may not be exhaustive.

Additionally, Koolan Island operations are supported by a mine closure plan (MCP). The current MCP is Revision 7 which is submitted with this Mining Proposal. The last approved MCP was Revision 4 (Reg ID 56401) with Revision 5 and 6 remaining under assessment by DEMIRS (Reg ID 82735).

Table 3 Koolan Island Approved Mining Proposals

Reg ID	Mining Proposal Title	Approval Date
18563	Koolan Island Iron Ore Mine and Port Ari M04/417 416 L04/29	19 June 2006
18629	Koolan Island Iron Ore Ship Loading Facility	20 June 2006
18646	Koolan Island Iron Ore Land Prep and Accom Camp M04/416 417	22 June 2006
18680	Koolan Island Iron Ore Mine Project Infrastructure	11 August 2006
18931	Koolan Island - Temporary Barge Landing M04/417	15 December 2006
18965	Koolan Island Iron Ore Seawall Construction/Main Pit Dewatering	05 November 2007
19080	Koolan: Gravel Pit L04/29	28 August 2007
19402	Koolan Island: Increase Of Accommodation Quarters L04/29	23 April 2008
20559	Letter Of Intent for The Construction of a Central Storage Facility on Koolan Island	17 October 2008
23857	Scree Stripping Letter of Intent, Koolan Island	21 April 2010
31828	Mining Proposal for Dewatering Mullet Pit, Dewatering Below -40mrl At Main Pit, Mining of Main and Mullet Pits Below Water Table, Construction of Saline Waste Dumps, on Koolan Island, Western Australia on Tenements M04/416, M04/417 and L04/29	11 October 2011
31899	Mining Proposal Additional Infrastructure and Clearing Koolan Island, Western Australia Tenements M04/416, M04/417 And L04/29	19 September 2011
43236	Koolan Island - Clearing of Firebreaks - Letter of Intent	19 September 2013

Reg ID	Mining Proposal Title	Approval Date
47516	Referral And Supporting Document Application for Construction of a Bypass Road Between Koolan Island Village And Airstrip Koolan Island Iron Ore Pty Ltd, Tenements L04/29 April 2014	17 April 2014
53093	Optimisation Of Waste Rock Placement - Koolan Iron Ore Mine and Port Facility	29 January 2015
60751	Addendum To Koolan Island Iron Ore Mining Proposal Reg ID 5601 - Seawall Construction and Mine Pit Dewatering on M04/416, M04/417 & L04/2	20 April 2017
79171	Koolan Island Iron Ore Mine and Port Facility (Project Code: J00728) - Airfield Construction and Operation - Koolan Iron Ore Pty Ltd	15 August 2019
83724	Optimisation Of Mullet Pit and East Pit Backfills & Barramundi Pit Backfill	15 May 2020
99160	Mining Proposal for Small Mining Operations - Koolan Island - Concrete Batch Plant & Infrastructure	08 October 2021
103366	Mining Proposal for Small Mining Operations - Koolan Island Operations - M04/417	12 May 2022
115983	Mining Proposal with Mine Closure Plan Small Mining Operation - Koolan Island Facilities - M04/417	22 February 2023

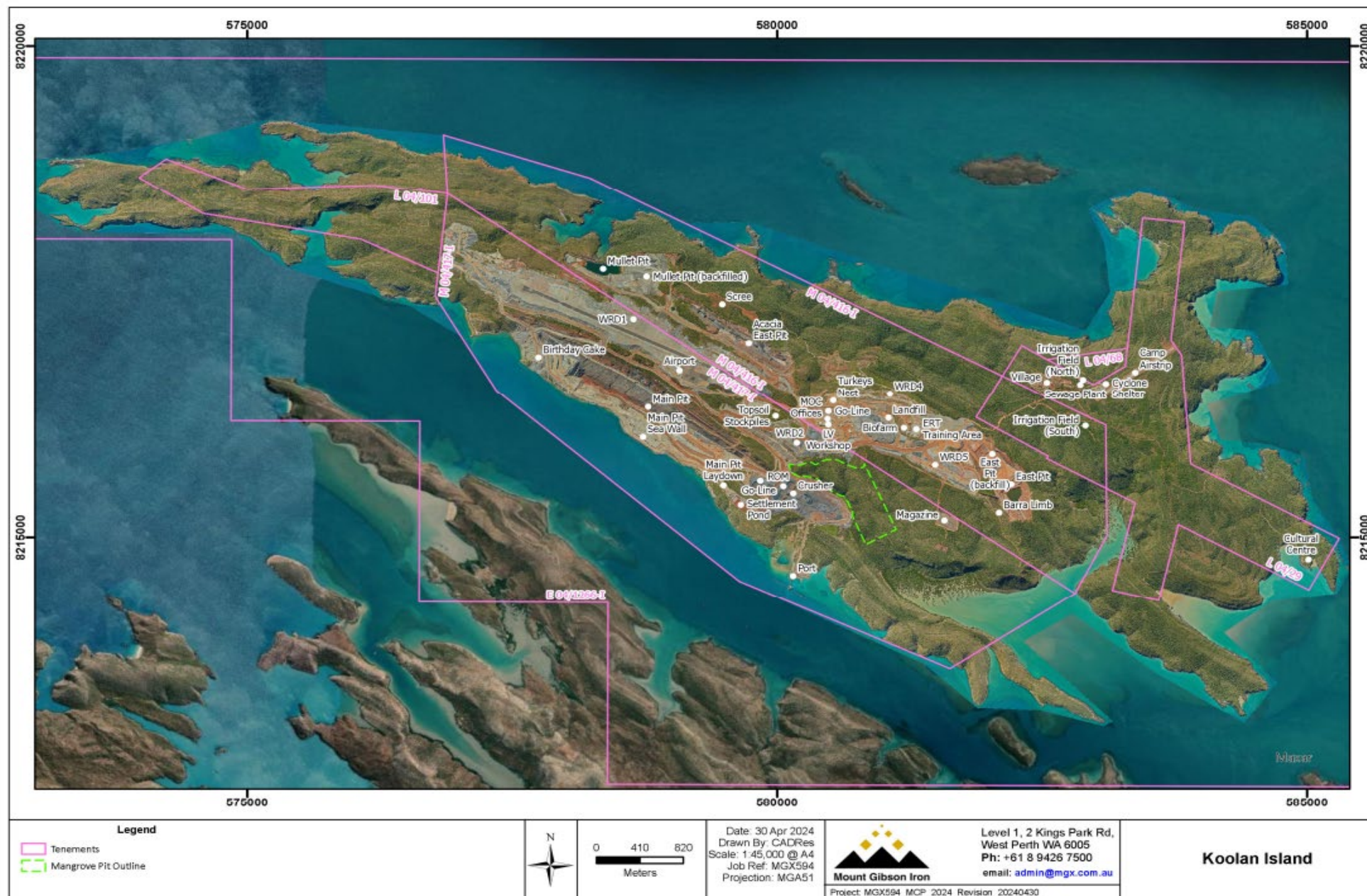


Figure 2: Koolan Island Iron Ore Mine and Port Facility Layout

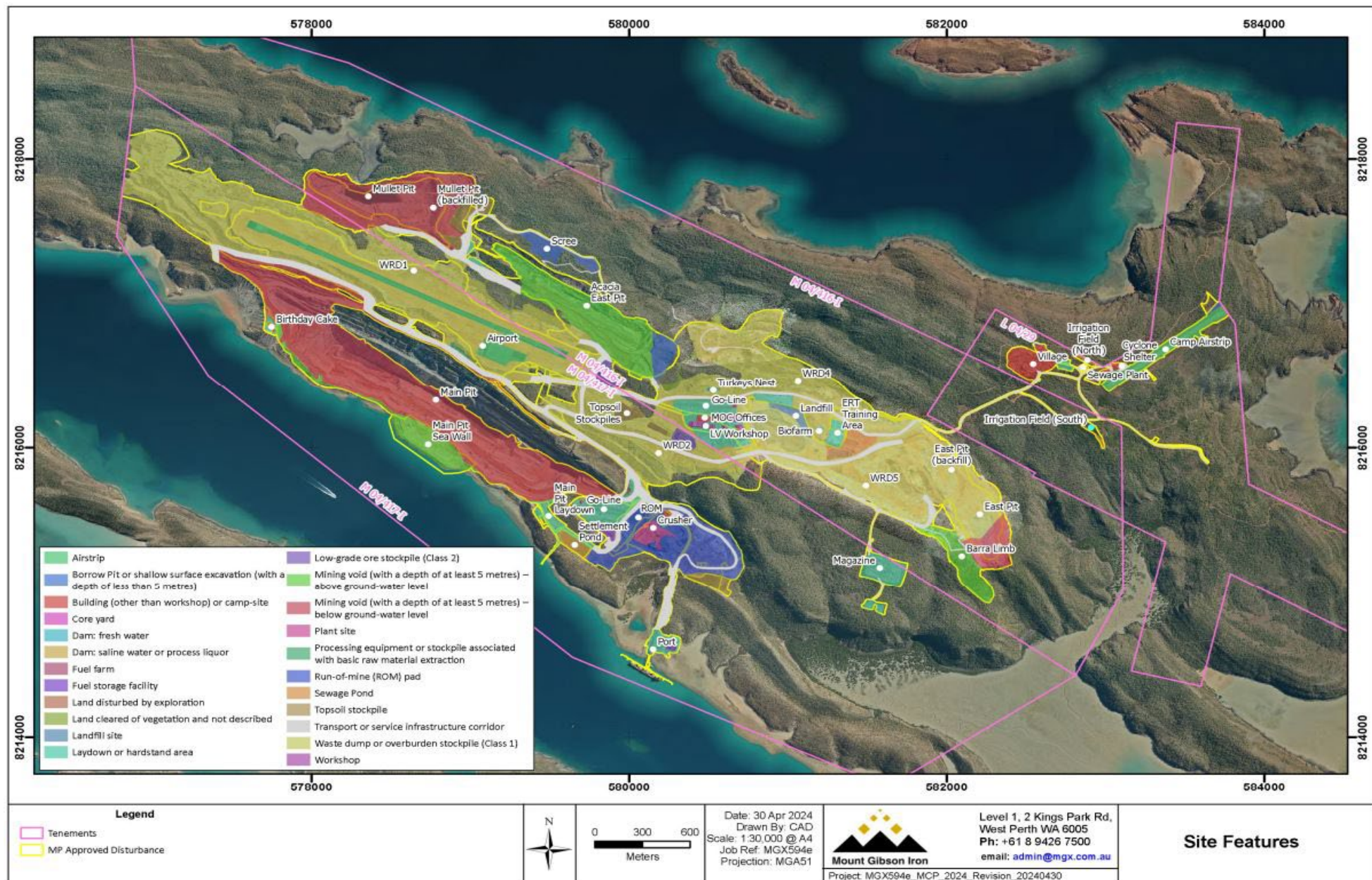


Figure 3: Operational Areas (as at 2024)

2 IDENTIFICATION OF CLOSURE OBLIGATIONS AND COMMITMENTS

Mine closure is subject to the requirements of legislation, mining tenement conditions, commitments made in Mining Proposals (MP) upon approval and conditions on environmental approvals such as MS 715. KIO has established a compliance management system which records obligations arising from various legislation and approvals and has been used to identify Project closure obligations and commitments.

In recognition of mining being a temporary land use, the predominant intent of closure obligations and commitments is to avoid liability to the State by returning the land to a safe, stable, non-polluting and, where possible, self-supporting revegetated landscape. As a result, closure obligations and commitments at Koolan Island cover a range of environmental aspects such as topsoil reclamation, infrastructure removal, landform rehabilitation and environmental monitoring.

The closure obligations and commitments for the Koolan Island Mine and Port Facility are identified within Appendix A. Key sources for closure obligations and commitments include:

- A range of Acts and subsidiary regulations such as the Mining Act 1978, Environmental Protection Act 1986, Contaminated Sites Act 2003, Aboriginal Heritage Act 1978, Soil and Land Conservation Act 1945, Dangerous Goods Safety Act 2004 and Health Act 1911;
- Conditions held in mining tenements M04/416 and M04/417, and Miscellaneous Licences L04/29, L04/101 and L04/68;
- MPs submitted and approved since 2005;
- Ministerial statement 715 (MS 715); and
- Conditioned and approved Environmental Management Plans, including this MCP.

3 STAKEHOLDER CONSULTATION

Stakeholder consultation is an integral component of KIO's mine closure planning. KIO seeks to consult with its key stakeholders on key aspects of mine development and mine closure. As a component of the KIO stakeholder consultation strategy, open consultation meetings with key stakeholders have been and will continue to be held frequently to discuss mine operations and mine closure planning.

The following sections outline the stakeholder consultation strategy, the stakeholders identified and a record of consultation undertaken and planned.

3.1 Identification Of Relevant Stakeholders

Key internal stakeholders for Project closure planning are summarised in **Table 4** and key external stakeholders are summarised in **Table 5**. These tables are limited to stakeholders relevant to Project closure.

Table 4: Project closure internal stakeholders

Category	Internal Stakeholder ¹
MGX	MGX Board Chief Executive Officer Chief Financial Officer Manager – Environment and Approvals
Koolan Island Operations ¹	General Manager Health & Safety Manager Environment & Community Superintendent Technical Services Manager Planning Superintendent Mining Manager

¹ Only managers and superintendents are mentioned as they are the roles ultimately responsible for planning and implementation as well as feedback on the development of the MCP. More specifically, they are considered key stakeholders. At their own discretion managers will draw on staff feedback.

Table 5: Project closure – key external stakeholders

Category	External Stakeholder
Federal Government	Department of Climate Change, Energy, The Environment and Water (DCCEEW)
State Government	DEMIRS EPA DWER Department of Planning, Lands and Heritage
Local Government	Shire of Derby / West Kimberley
Community	Dambimangari (acting for Wanjinna Wunjurr, the Native Title Holders) Kimberley Port Authority Derby Community Australian Customs and Border Protection Services - Broome Department of Fisheries – Broome Department of Biodiversity, Conservation and Attractions (DBCA)

3.2 Stakeholder Consultation Strategy

MGX understands the value and importance of its “social licence” to operate and places significant emphasis on external stakeholder relationships. The communities in which MGX operates are empowered to participate in decision making processes that may affect their community or organisation. Ongoing stakeholder engagement ensures mutual understanding with interested parties and assists the company’s focus on continuous improvement.

To achieve this level of consultation, a specific communication platform is tailored for each stakeholder group. For example, various senior managers are directly responsible for communication and consultation with certain stakeholder groups including customers, stakeholders, employees and suppliers. The communication platforms involve regular open and participative consultation, particularly with landowners, traditional owner groups, regulators, local government, interest groups and each community where MGX operates.

KIO’s stakeholder strategy including stakeholders engaged, and format and frequency of engagement, is presented in **Table 6**.

3.3 Stakeholder Engagement to date

A register of stakeholder engagement has been appended to this MCP as Appendix B.

Table 6 Stakeholder consultation strategy summary

Internal Or External	Stakeholder	How we engage	Key items of interest	Company approach	Frequency
Internal	Employees	Inductions Discussion with supervisors Toolbox meetings Intranet, website, and email Staff meetings Internal newsletter Employee survey	Training and development Cultural and environmental awareness Individual employment circumstances	Encourage open and ongoing dialogue with all employees to ensure that individual concerns are addressed.	Ongoing throughout each year and the life of the mine
Internal	General Manager Planning Superintendent Environmental Superintendent Tech Services Manager Mining Manager	Meetings on key items Reports and their distribution for review	Rehabilitation Geotechnical stability Financial provisioning Completion criteria	The input from internal stakeholders is considered in the development of the MCP	Annual Life of Mine Planning (when held) Quarterly planning meetings (QPP) Or on an as needed basis
Internal	MGX Board Chief Executive Officer Chief Operating Officer Chief Financial Officer	Review and revision of financial provisioning	Mine closure costing and adoption of provision rate	Adoption of provisioning rate. Reporting in Annual Report.	Annual closure provisioning review
External – Traditional Owners	Native Title Holders (Dambimangari)	Ongoing face to face liaison Formal review meetings Annual Report	Protection of cultural heritage Cultural awareness Environmental management Opportunities for business, training and employment	KIO maintains regular dialogue with the Traditional Owners including formal review meetings throughout the year through the Deed of Agreement between parties.	Typically 4 co-existence meetings per year. Or on an as needed basis

Internal Or External	Stakeholder	How we engage	Key items of interest	Company approach	Frequency
		Annual Environmental Report			
External - DMAs	DCCEEW DEMIRS DWER	Annual Environmental Report Management Plans Briefings Individual meetings Annual site inspections	Adherence to Ministerial statements and tenement conditions Environmental management plans Approval of abandonment bund strategy MCP implementation	Environment and Community team manage this engagement.	Annually with reports and site inspections Tri-annually with review of MCP Or on an as needed basis
External	Shire of Derby and West Kimberley Kimberley Land Council Derby Community Australian Customs and Border Protection Services - Broome Shire of Broome Department of Fisheries – Broome Broome Visitor Centre Kimberley Quest	Presentations Site tours Annual consultation meeting Individual meetings Annual Environment Reports Annual Report Website	Environmental management that effects community (amenity; heritage) Infrastructure maintenance Community investment	Senior company and Site managers manage these relationships.	Annual presentations and reports Or on an as needed basis

4 BASELINE AND CLOSURE DATA AND ANALYSIS

The following sections present baseline and closure data for the following topics:

- Climate,
- Geomorphology,
- Soil and Overburden Characterisation,
- Surface Water Hydrology,
- Groundwater Hydrogeology,
- Flora and Vegetation,
- Vertebrate Fauna,
- Short Range Endemic Fauna,
- Subterranean Stygofauna,
- Marine Environment,
- Heritage, and
- Contaminated Lands.

To manage file size and for ease of access, key technical reports have been provided as a separate file rather than being directly appended to the MCP. This file is referred to as Appendix C. This appendix is not exhaustive, and some reports were omitted as they have been superseded, previously submitted or are publicly available documents. Should any of the omitted references be required they can be requested using the details of the contact person in **Table 2**.

5 CLIMATE

The Buccaneer Archipelago has a tropical, sub-humid climate. The Bureau of Meteorology (BoM) climate stations nearest the Project are Cygnet Bay (BoM station #3057, »100 km southwest of Koolan Island) and Kimbolton (BoM station #3073, »64 km southeast of Koolan Island). Based on the amount and continuity of data the Cygnet Bay data has been relied upon for the below assessment.

The average temperature ranges between an average minimum of 21.1°C and an average maximum of 32.4°C. The average maximum temperature varies by less than 8°C through the year (28.1-35.4°C), with the hottest months being November and December (**Figure 4 - Figure 6**). Solar exposure also does not vary considerably (18.3-27.2 MJ/m²), with the maximum and minimum values occurring at the same time of year as the maximum and minimum temperatures. As such, evaporation is also relatively constant throughout the year (Bureau of Meteorology, 2023).

Rainfall is highly seasonal, with the 'wet season' extending from December to April and with little to no rainfall occurring between May and November (**Figure 7; Figure 8**). An analysis of high rainfall annual exceedance probabilities (AEP) is presented as **Figure 9**. Generally, AEP events on Koolan Island are cyclonic activity or ex-cyclone tropical storms driven. They are accompanied by high winds and are destructive. Considering this the Koolan Island engineered structures are designed to withstand cyclonic events. A 1% AEP lasting 72 hours will generate 696mm of rainfall, all operational structures will consider this rainfall event during engineering design (Bureau of Meteorology, 2016).

During closure a probable maximum precipitation and flooding (PMP/PMF) estimates will be considered. As can be seen in **Figure 10**, Koolan Island resides in the GTSMR Coastal Zone for calculating PMP. The corresponding literature provides a depth to area chart, presented as **Figure 11**, it outlines the PMP 72-hour event would create approximately 2,500mm of rainfall (Bureau of Meteorology, 2016). The impact of surface water movement is considered further in Section 7.5.

5.1 Predicted Climate Change Impacts

According to Western Australian Government predictions the change in climatic and weather events in the Monsoonal North (Kimberley) are unlikely to have much effect in the short term (by 2030). Over the longer term (by 2090), assuming a steady state for greenhouse gases, there is likely to be a change in days over 35°C (~+30 days/year by 2030 compared to long term average). There is also expected to be a change in rainfall patterns, with a reduced number of high rainfall events, but those events are likely to be more intense. PMP/PMF predictions are used for closure water management structures, these numbers represent worst case scenario and therefore are considered suitable for closure use. Similarly, predicted sea level change is predicted to be between 0.38m and 0.61m, this is unlikely to impact closure implementation (Department of Water and Environmental regulation, 2022).

Given the short remaining life of mine of the project the likely impacts to climate change are negligible.

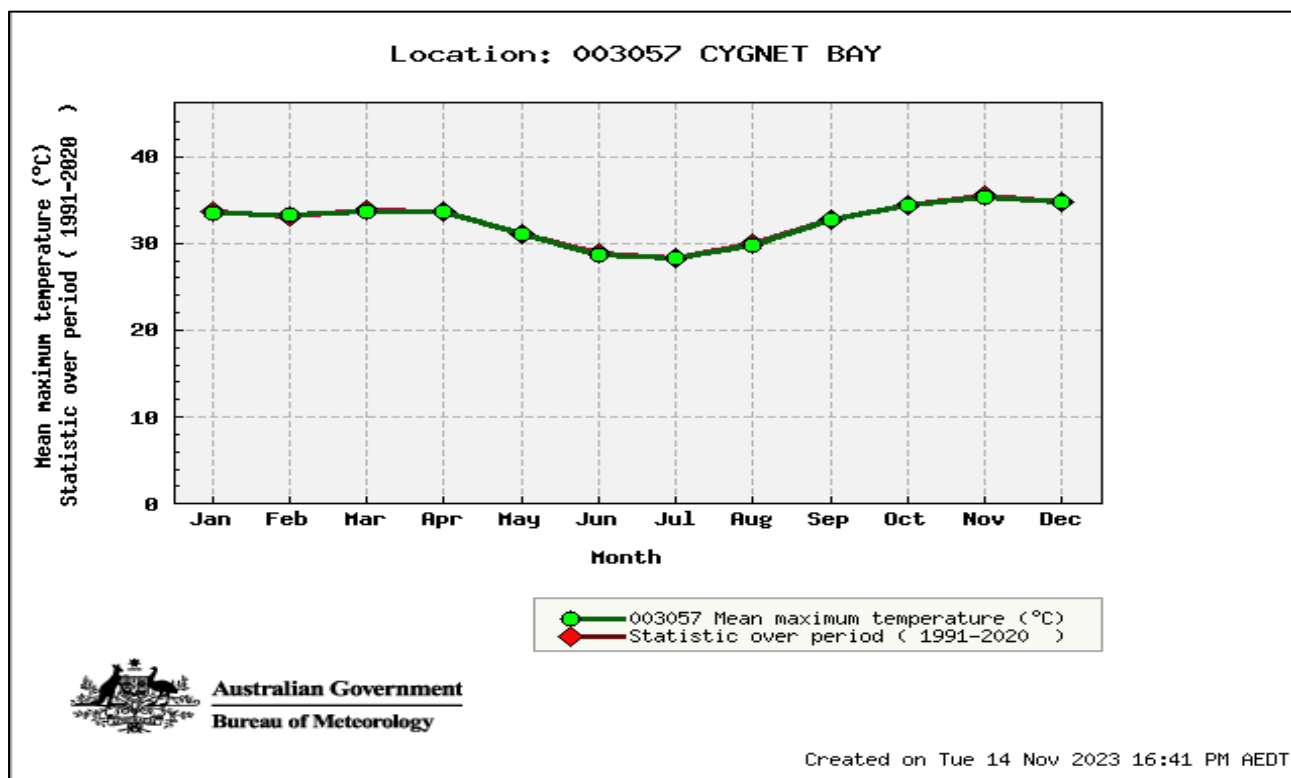


Figure 4: Monthly Average Maximum (1991 - 2022) for Cygnet Bay (BoM, 2023)

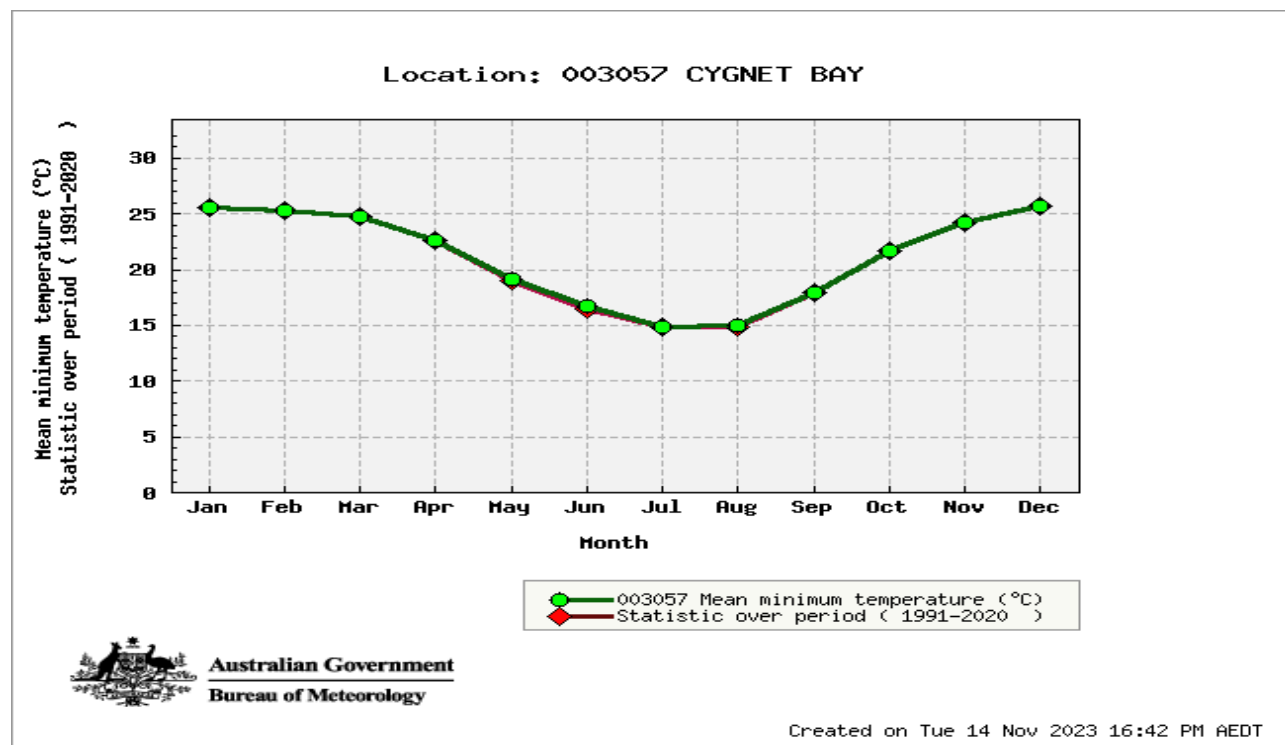


Figure 5: Monthly Average Minimum (1991 - 2022) for Cygnet Bay (BoM, 2023)

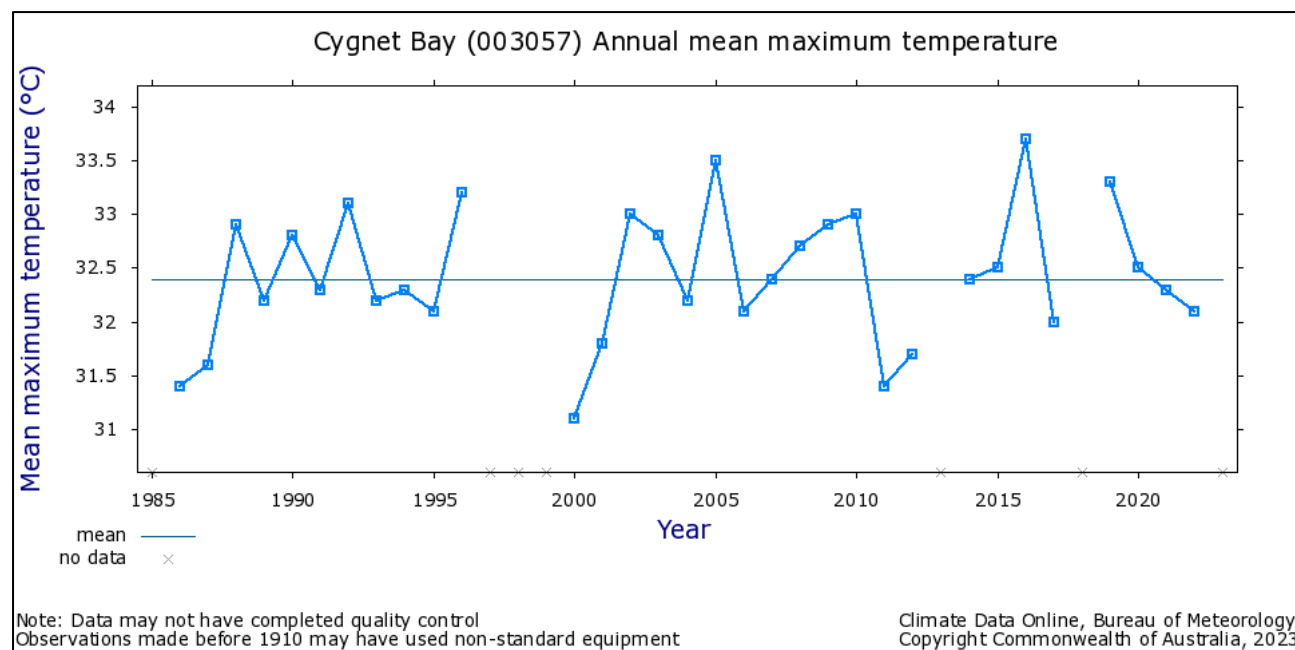


Figure 6: Annual Average Maximum Temperature at Cygnnet Bay (1991 - 2023) (BoM, 2023)

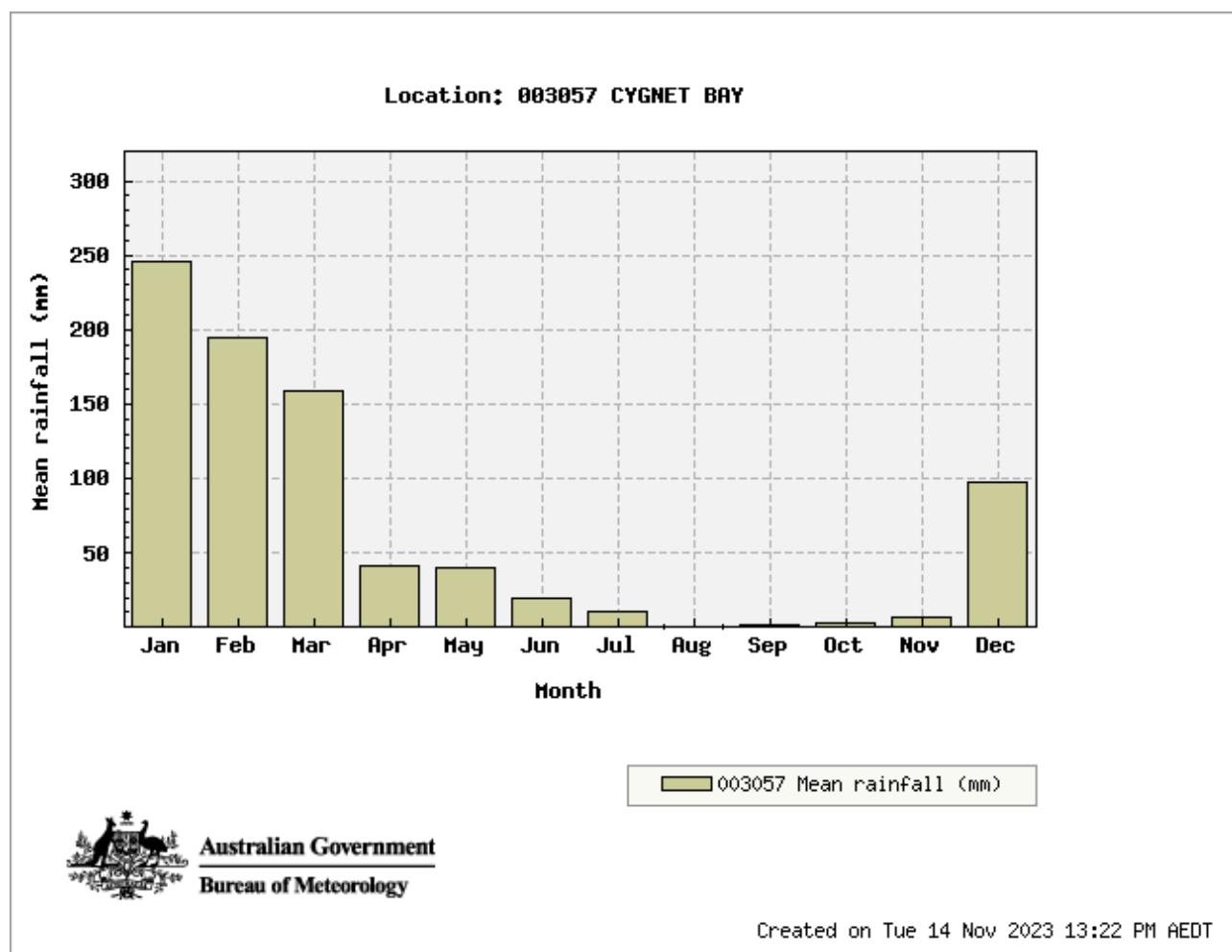


Figure 7: Monthly average rainfall at Cygnnet Bay (BoM, 2023)

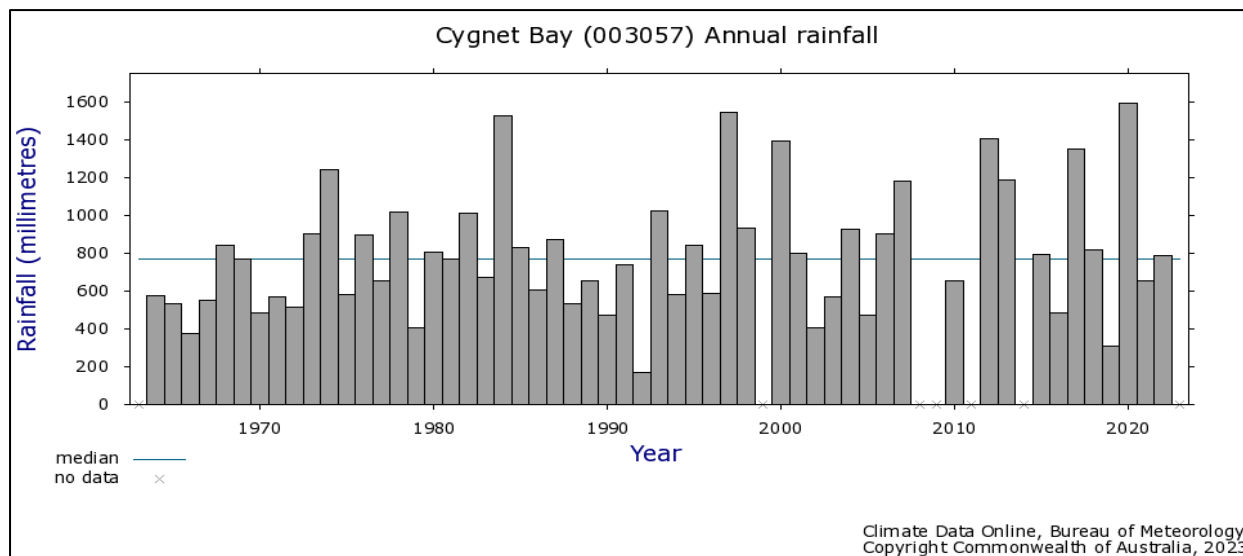


Figure 8: Annual Rainfall (where available) since 1960 (BoM, 2023)

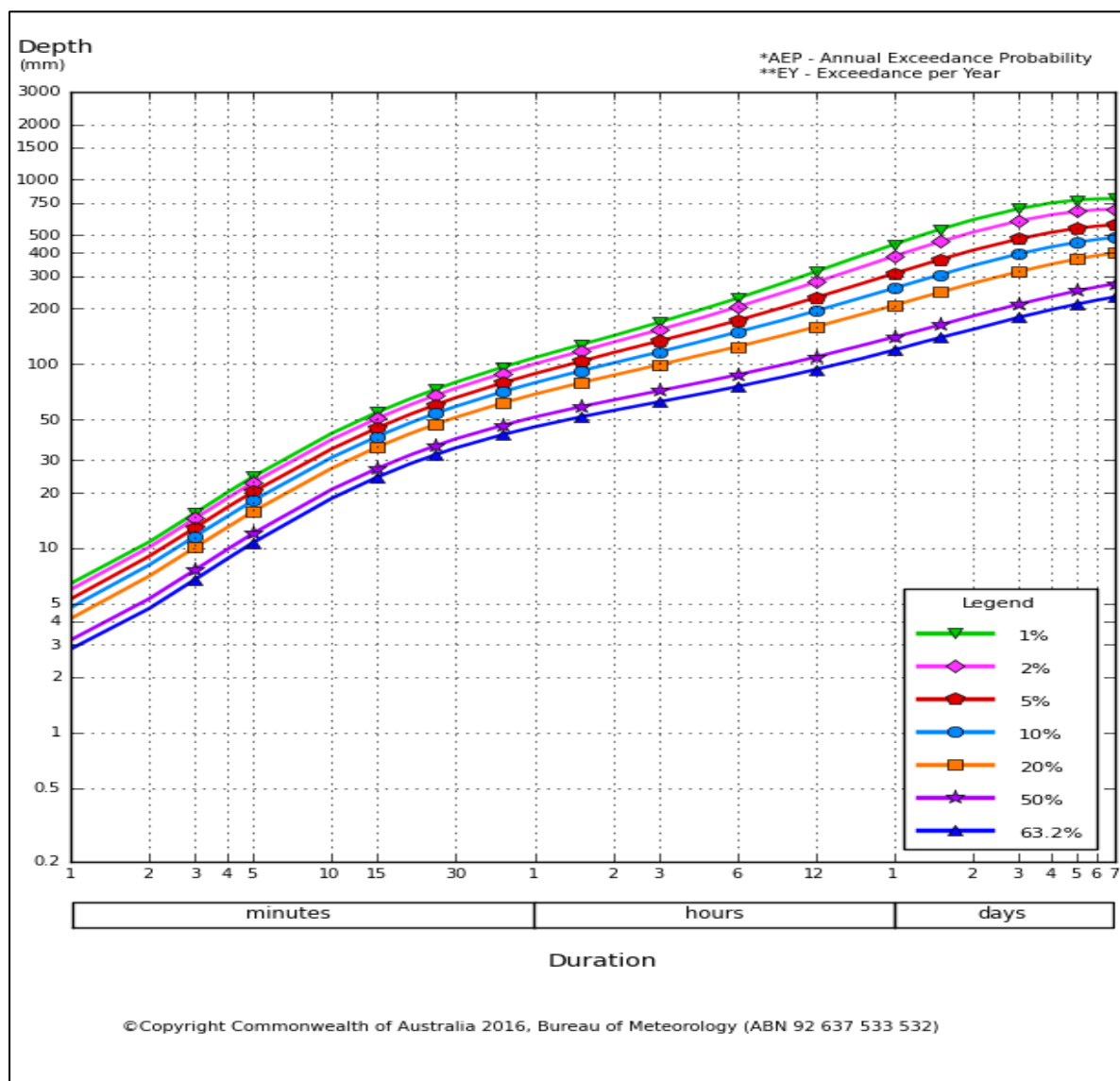


Figure 9: Koolan Island High rainfall event annual exceedance probabilities.

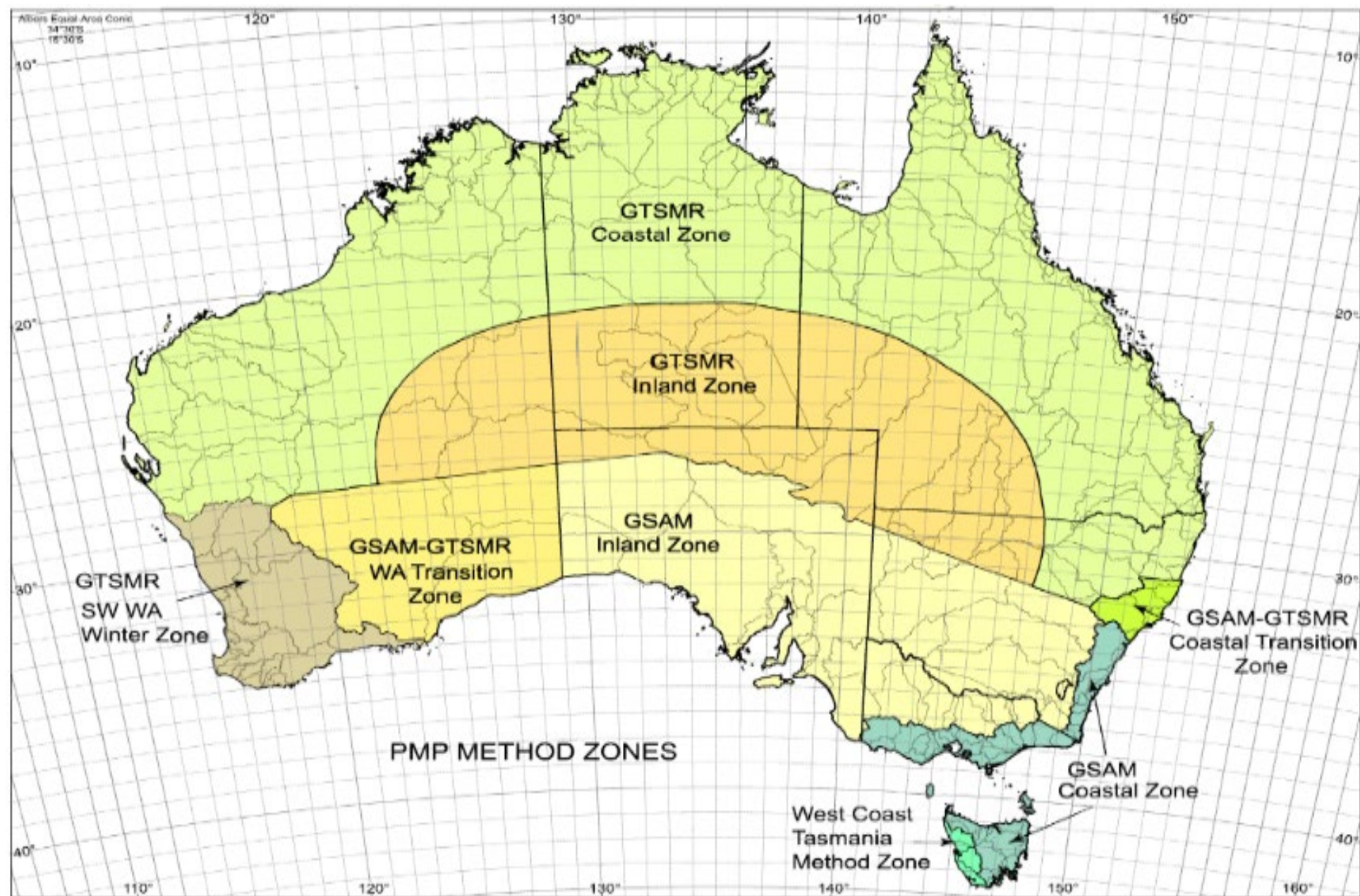


Figure 10: Probable Maximum Precipitation calculation zones

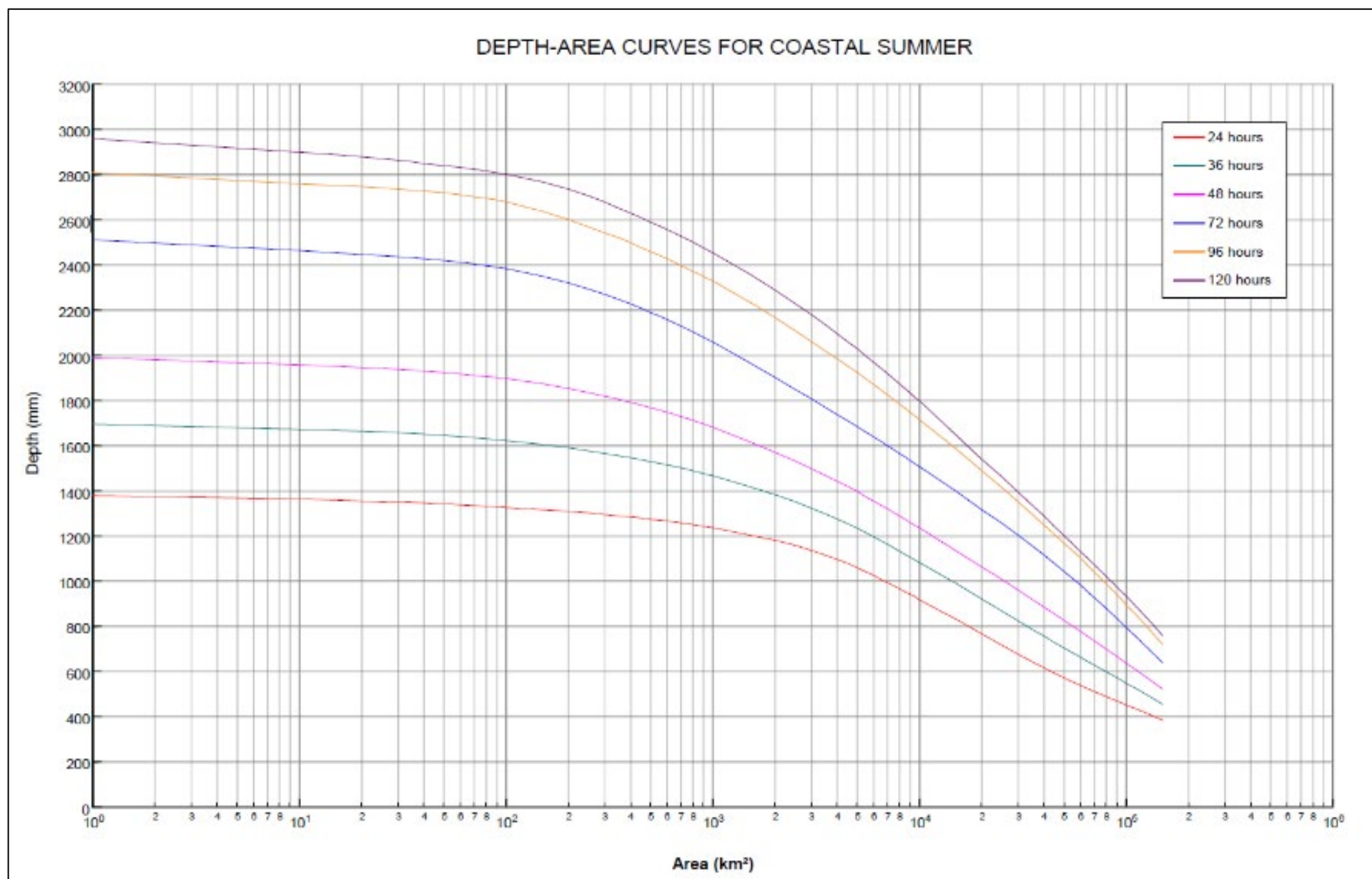


Figure 11: PMP depth/area chart for the GTSMR Coastal calculation area for summer coastal storms.

5.2 Considerations For Mine Closure Planning

The large seasonal variability in rainfall at Koolan Island requires consideration when designing final landforms. Large storm events of an AEP of 1% are factored into operational design considerations. Closure designs will consider the PMP/PMF impacts; however, it is unlikely that engineering solutions would be able to practicably mitigate the natural forces of a 0.01%AEP weather event. At closure, there is no proposed permanent or ephemeral water management features, except for non-backfilled pits.

Given the large fluctuating tides the engineering is unlikely to change given the relatively small change. To err on the conservative side, the largest sea level change due to climate change will be included in all designs for seaward facing infrastructure.

6 GEOMORPHOLOGY

Koolan Island has an area of 2,580 ha and is one of the largest of the 800-1,000 islands of the Buccaneer Archipelago. These islands were likely part of the mainland coast as recently as 8,000 years ago (AHC, 2011).

Koolan Island is situated in the Mitchell subregion (NK1) of the Northern Kimberley bioregion, which is broadly described as a dissected plateau of the Kimberley basin. The Mitchell subregion is characterised by:

- Savannah woodlands over high *Sorghum* grasses and hummock grasses on shallow, sandy soils on outcropping Proterozoic siliceous sandstone strata.
- Savannah woodlands over high *Sorghum* grasses on red and yellow earths mantling basic Proterozoic volcanics.
- riparian closed forests of *Melaleuca* and *Pandanus* along drainage lines.
- rugged, sunken coastline with extensive Mangal occurring in estuaries and deep, sheltered embayments.
- numerous small patches of monsoon rainforest scattered throughout.
- areas of laterite upland with open forests and alluvial floors along major river valleys (Graham, 2002).

Koolan Island's Proterozoic sandstone lithology is expressed as rugged slopes, ridges and uplands mantled with rock scree and shallow skeletal soils (**Figure 12**). The coast is steep with narrow gullies and frequent embayments, but few beaches. There are no known permanent creeks or pools (GHD, 2010). Natural slope angles can be in excess of 40° with frequent outcropping of the bedrock geological units occurring over the entire Island.

Approximately 45% of the 670 ha approved for disturbance by MS715 was formerly disturbed and rehabilitated by BHP at closure and decommissioning in 1993. A prominent feature of this rehabilitation was moonscaping along with a seed mix containing several exotic species. Due to the presence of exotic species, topsoil which otherwise might have been salvaged from certain BHP rehabilitation areas has been deemed low grade and segregated from topsoil salvaged within undisturbed areas. Often, BHP rehabilitation areas didn't contain topsoil; however, due to the time since rehabilitation, surface cover material had developed from the accumulation of leaf litter.

6.1 Considerations For Mine Closure Planning

The rugged topography of the Island coupled with tropical rainfall events naturally limits the formation of deep soil profiles. The prevalence of steep slopes (**Figure 12**) over much of the Island and the extensive rock outcrop makes stripping of the fine skeletal topsoil challenging from an operational and safety viewpoint.

Koolan Island was already a highly disturbed environment due to former mining and human occupation. Presently, these factors limit the available stockpiled topsoil / growth medium resource available for land rehabilitation. Additionally, the rugged topography may impose additional constraints on the practicable alignments of constructed abandonment bunds, but, in that circumstance, the steep natural topography is likely to provide the necessary physical barrier to prevent inadvertent access.



Figure 12: Steep gully feature typical of Koolan Island topography, natural terrain by durable native rock.

7 SOIL AND WASTE ROCK CHARACTERISATION

For the purpose of this section, 'materials' refers to all soils and subsurface material that will be disturbed or extracted by the mining activity, including material that has been physically or chemically processed on site. Soil and waste rock materials at Koolan Island comprise topsoil/subsoil together with four mine waste lithologies: siltstone, quartzite, schist and sandstone.

7.1 Soil Characterisation

Soil materials have been classified according to Schoknecht and Pathan (2013) and supplemented by sampling and analysis of materials in terms of their physical, chemical, and hydrological (erodibility) properties.

A baseline materials investigation was conducted by Outback Ecology Services in 2008. Soil and waste rock samples were collected from sites representative of natural vegetated areas, or analogue sites, rehabilitated areas, waste rock dumps and a topsoil stockpile.

Further investigations of material properties, particularly erodibility, were conducted by Soilwater Consultants in 2013. Soil and waste rock samples were collected from 22 sites via trench excavations or otherwise from stockpiled material. Sites selected for sampling were representative of naturally vegetated areas, or analogue sites, previously rehabilitated areas, overburden (waste) stockpiles and topsoil stockpiles.

The locations of OES (2008) and Soilwater (2014c) (Appendix C1) sample sites are shown in **Figure 13**.

Soil supergroups on Koolan Island are, in order of dominance, rock or stony soils, bare rock, sandy earths, deep loamy duplexes and earths, shallow loam, gravels and tidal soils (Schoknecht & Pathan, 2013). Definitions and key characteristics of each soil supergroup is provided in **Table 7**.

Koolan Island's mine waste lithologies derive from a series of tightly folded Lower-Proterozoic sediments of the Kimberley Group: Pentecost Sandstone, Elgee Siltstone and Warton Sandstone. Sandstones, quartzite with lesser phyllites and schists are the dominant lithologies.

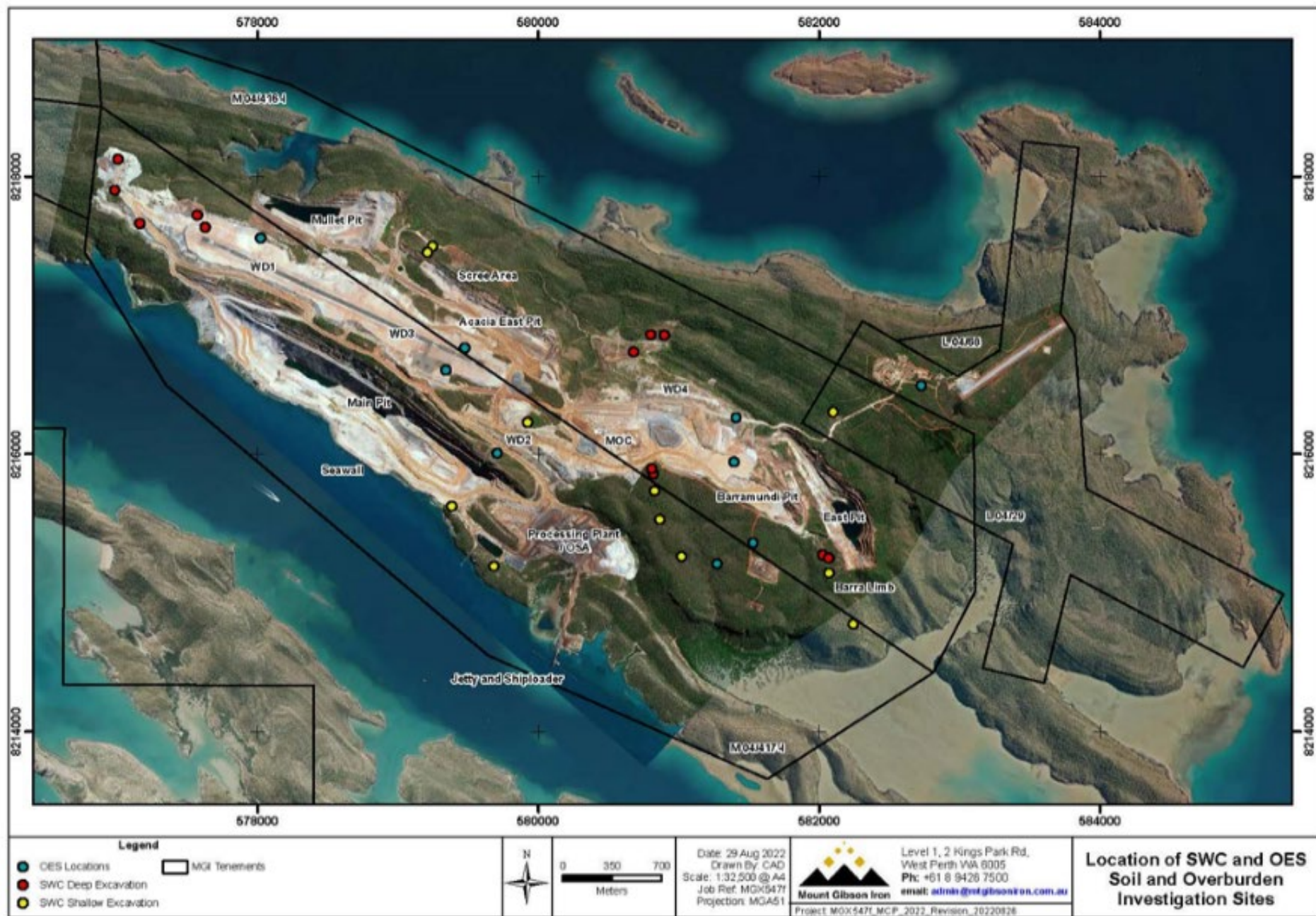


Figure 13 Topsoil and subsoil sampling locations 2008 and 2013

Table 7: Soil groups and key characteristics (Schoknecht & Pathan, 2013)

Soil Supergroup	Definition	Soil Group	Characteristics
Rocky or stony soils	Rocky or stony soils are coarse gravelly, stony or rocky throughout. These soils are generally shallow, with >50% of coarse fragments >20mm in size (coarse gravels, cobbles, stones or boulders) throughout the profile. Includes areas of rock outcrop (all lithologies).	Stony soil (203)	- Rock and stones or coarse gravels dominant throughout the profile - Usually very shallow - Sandy, loamy, clayey or gravelly soil matrix - Neutral to acid pH
Bare rock	Rock outcrop	Bare rock (201)	- Areas generally bare of soil on outcropping rock strata or bare rock surfaces - Includes some areas with minimal soil development. - Excludes ferricrete/duricrust outcrop
Sandy earths	Soils with a sandy surface and grading to loam by 80 cm depth. May be clayey at depth.	Brown sandy earth (462)	- Brown topsoil - Sands grading to loams by 80 cm depth. - Neutral to acid pH - Usually, alluvial - May be clayey at depth
		Yellow sandy earth (464)	- Yellow to within 30 cm - Neutral to acid pH - Gravels (mainly ironstone) may be present. - May be clayey at depth. - Usually massive or poorly structured - Usually porous (sometimes called earthy fabric)
Loamy duplexes	Soils with a loamy surface and texture contrast at 3 to 80 cm depth.	Red loamy earth (544)	- Red top 30 cm - Usually massive or poorly structured - Usually porous (sometimes called earthy fabric) - Neutral to acid pH or sometimes calcareous at depth - Hard setting or crusting - Sometime with red-brown hardpan at >50 cm depth - Gravels (usually non-ironstone) may be present
Shallow loams	Loams ≤80 cm over rock, hardpan or other cemented layer.	Red shallow loam (522)	- Red loam over rock, hardpan or other cemented layer by 80 cm depth, and often <30 cm depth - A surface mantle of stones may be common - Gravel may be present - Usually neutral to acid pH
Gravels	Ironstone gravel soils, with a predominantly sandy matrix, usually over clay, cemented	Deep sandy gravel (301)	- Yellow, brown and grey colours common - Neutral to acid pH

Soil Supergroup	Definition	Soil Group	Characteristics
	gravels (ferricrete) or reticulite at >80 cm depth		- High gravel content (>20%, often much higher) throughout - Usually over sandy loam to sandy clay loam (reticulite), sandy clay loam to clay, or cemented gravels (ferricrete) at >80 cm depth - Native vegetation, especially proteaceous species, appears to have a role in the formation of these soils
Tidal soils	Soils that are subject to tidal inundation.	Tidal soil (104)	Variable saline soils subject to tidal inundation

Pentecost Sandstone forms the majority of the outcrop on the island as a thinly bedded, intercalated sequence of sandstone and siltstone with minor phyllite.

The Pentecost Sandstone is underlain by Elgee Siltstone, which rises to outcrop in the central anticline and again along the southern shoreline of the island. In turn, the Elgee Siltstone is underlain by the Warton Sandstone, a unit of interbedded quartzite and siltstone. Outcrop of the Warton Sandstone is limited to the southern side of the island on the southern limb of South Syncline.

The Yampi Member of the (lower) Pentecost Sandstone is haematite-bearing and, where enriched, forms the orebodies of Koolan Island. The Main Pit orebody occurs is exposed in the southern limb of the southern syncline, with mining following the orebody down. The footwall of the pit (northern wall) is formed in a schist unit of the Pentecost Sandstone.

Most soil materials are either sandy loam, or clay loam sandy, with an increase in clay content with depth typical through the soil profile (OES, 2008). Siltstone and sandstone materials are classed as silty loam and sandy clay loam, respectively. Siltstone has a notably high percentage of silt-sized particles (~35 %) present due to weathering. Soil materials contain variable gravel content, with laterite ridge and topsoil stockpile samples having high gravel content (75-80%) whereas samples from slopes and creeks have generally lower gravel content (i.e., <50%) (Soilwater Consultants, 2014c). Sandstone waste rock has a higher coarse (gravel and rock) fraction than siltstone, and a corresponding lower silt and clay content than siltstone.

The dominant soil structure at undisturbed sites comprised single grained soils, with some weak aggregates, whereas rehabilitated areas generally comprised moderately structured soils with weak polyhedral aggregates. Siltstone and sandstone materials are generally single-grained in structure. The behaviour of these materials over time, once deposited and rehabilitated, is uncertain; however visual observations of similar materials coupled with soil analyses suggest that problematic soil structural characteristics (e.g., 'massive' soils with poor root penetration) are unlikely to develop (OES, 2008).

Most materials are classified as slaking and non-dispersive (Emerson Class 6). Although slaking can reduce the infiltration capacity of soil, the lack of dispersion indicates that these soils are unlikely to be hard-setting.

Soil materials at shallow depth (0-20 cm) within analogue site A1 demonstrated dispersive properties upon remoulding, indicating the potential to become dispersive and problematic (hardsetting/erodible), particularly following severe disturbance. Siltstone materials may become

dispersive following extended leaching salts from the soil matrix. Two of the soil material samples exhibited a capacity for hard-setting with samples collected from 50-100 cm and 100-200 cm having Modulus of Rupture (MOR) values of 87.4 kPa and 67.8 kPa respectively. The average MOR of the siltstone materials collected (32 kPa) was comparative to the strength of the materials observed under field conditions where, while coherent, the materials had not hard-set. Note that the MOR test is conducted on reconstructed soil blocks composed of the < 2 mm soil fraction - it does not take into account the effect of gravel content or soil structure on soil strength, nor any degree of compaction that may be present in the field. The MOR test does, however, provide insight into the potential for layers to hard-set and compact with repeated wetting and drying cycles, and the ability of roots to fracture the soil and penetrate crack faces.

All soil materials are classed as not significant hydrophobic, with water taking less than one second to infiltrate into the soil, to very low hydrophobicity, with water taking less than 10 seconds to infiltrate into the soil. Soil materials (excluding coarse fraction >2mm) were measured to retain from 27 to 43% water content by volume at field capacity (upper storage limit). The volumetric water content at the maximum dryness likely to be achieved by plants (lower storage limit) ranged from 5 to 15%. The actual level of soil water extraction able to be achieved differs between species, but an indicative level of pF 5.6 (39000 kPa) was used for these estimates. By comparison, pF 4.18 (1500 kPa) is typically used for agricultural species. The difference between the upper and lower storage limits is the amount of water likely to be available to plants, and it ranged from 21 to 28%. Assuming that the coarse material (>2 mm) present in each of the materials has a negligible water holding capacity, the corrected plant-available water holding capacity ranged from 11 to 17% (**Table 7**).

The well-structured nature of the <2 mm fraction and the generally low gravel content can be seen in the relatively high plant-available water contents present in the soil materials, which are like the silt and clay-rich siltstone profiles (Soilwater Consultants, 2014c).

Given the high annual rainfall received on Koolan Island (over 800mm), it is unlikely that water availability is likely to be a limiting factor for the majority of the year, with the ability of plant roots to deeply penetrate the soil profile and access stored water, integral to the survival of rehabilitated species during the dry season. Root abundance within the analogue and rehabilitated soil profiles examined was generally classed as 'abundant' within the upper 30 – 50 cm and depending on the proximity to plants and the number of plants present, generally decreased with depth.

Physical soil restrictions, such as compacted or massive soil structures, were not observed, however high gravel / rock contents were common in both the analogue and rehabilitated profiles. While this has obvious restrictions to the volume of root proliferation, observations of root growth to, and beyond the depth of excavation at each site, indicates no vertical impedance to root penetration deep into the soil profile.

7.2 Geochemical Waste Rock Characterisation

Exploration and infill drilling of the Koolan Island iron ore deposits has been carried out for the last 60 years generating databases of drilling information. This data enables desktop risk analysis of potential problems such as potential for sulfidic material to be disturbed during mining or by previous mining and the development of AMD from sulfidic materials to be assessed with a large degree of confidence.

Geochemical risk assessment has included:

- pH, pH_{FOX} and EC in material from investigation drillholes;
- Geochemical Abundance Index (GAI) and total sulfur in historical assay data (pre – 2007 drilling) for approximately 1800 drill holes taken from across the site; and
- Sulfur concentrations in the current Main Pit block model.

The results from 1,800 drill hole assays analysed showed that the pH of the materials at all depths ranges between 5.0 and 8.0, with the exception of PKRC 1543 which recorded a pH value of 8.25 at a depth of 55m (Yampi Schist).

In general, the values measured for pH are higher than for pH_{FOX} for all drill holes across all depths. The exceptions to this are for PKRC 1538 (below -50 m; Elgee Siltstone). Only one sample tested returned a result where the pH_{FOX} was found to be significantly lower than natural pH; PKRC 1534 at -115 m the pH_{FOX} and pH values were 2.76 and 6.28 respectively. The significant difference between the two values (change of >1 pH unit) and the pH_{FOX} value of <3, indicates the possible presence of sulphides in the material.

Results for the EC data in contrast show a high variability both between drill holes and with depth. There was a wide range of EC values recorded across the site with overall EC ranging from 0.93 mS/m and 986 mS/m (both Elgee Siltstone). The greatest variability in EC values was recorded for borehole PKRC 1529 which was logged entirely as Elgee Siltstone, with minimum and maximum EC of 10.7 and 986 mS/m respectively. The lowest variability was found in borehole PKRC 1544 with minimum and maximum EC values of 0.933 and 4.08 mS/m.

The results of the drill hole assays show that there is great variability across the site in terms of geochemical parameters. A comparison of analyte values against the Average Crustal Abundance (ACA) yields a Geochemical Abundance Index (GAI) which provides a measure of how enriched material is with a given element compared with normal background levels through the equation shown below, where C = element content.

Equation for GAI:

$$GAI = \log_2 \left(\frac{C}{1.5 * ACA} \right)$$

A GAI of 0 indicates that the content of the element is less than, or similar to, the ACA. A GAI of 3 corresponds to a 12-fold enrichment above the ACA whilst a GAI of 6 indicates a 96-fold or greater enrichment above the average crustal abundance. In general, a GAI > 3 indicates a significant level of enrichment. In 2023 MBS undertook a review of all available chemicals data for waste and concluded that there are only two elements that are considered enriched, Antimony (GAI 3 to 6), Bismuth (GAI 3 in only 2 samples) and no other enrichments are reported (MBS Environmental, 2023) (Appendix C2). Given the very small number of enriched samples of Bismuth (enriched in 0.11% of samples) these do not present environmental risk. While Antimony was considered enriched in all samples, the environmentally available concentrations are low, indicating tightly bound mineral forms of antimony. All other metalloids reported below relevant Environmental Investigation Limits (MBS Environmental, 2023).

The results from the desktop analysis show that although high maximum sulfur values (>2%) from samples do occur, the average values for Total S are uniformly well below the accepted 0.3 % Total S criteria adopted by AMIRA (AMIRA International, 2002). Additionally, the standard deviation for the Total S contents of each lithology show that the distribution of Total S values within each

lithology is limited, with the majority of values falling close to the calculated mean. This indicates that large volumes of materials containing elevated sulfur are not likely within the Koolan Island mined deposits, with only isolated high Total S values in non-mined geologies.

Summarised Main Pit block model tonnages and sulfur concentrations are listed in **Table 8**. The sample locations from which these values were obtained are shown in **Table 9**. These show that all points within the final Main Pit design have < 0.3% sulfur. Thus, no sulfur laden materials are destined to be mined out of Main Pit during the remaining life of mine.

Table 8: Main Pit Tonnages and Sulfur Concentrations

% S range	Volume (m ³)	Mass (T)	% Sulfur
0.0 -> 0.01	14,457,480	46,021,398	0.004
0.01 -> 0.02	8,712,207	23,607,488	0.01
0.02 -> 0.03	5,268	17,120	0.021
Grand Total	23,174,955	69,646,006	0.006

Table 9: Koolan database of sulfur assays

Stratigraphy/Lithology		# of Samples	Min S (%)	Max S (%)	Mean S (%)	Median S (%)	95th Percentile (%)	No. of Samples > 0.3% ¹
Top Cover		1,385	0.001	1.5	0.03	0.02	0.07	12
Warton Quartzite		185	0.001	0.020	0.005	0.005	0.01	0
Elgee Siltstone		3,838	0.001	0.52	0.007	0.005	0.02	1
Yampi Formation	Conglomerate	1,647	0.001	0.22	0.006	0.005	0.02	0
	Hematite	4,464	0.001	0.58	0.007	0.005	0.02	2
	Schist	2,880	0.001	5.0	0.02	0.002	0.02	24
	Sandstone	15,610	0.001	2.4	0.01	0.003	0.02	80
Total		30,009						

¹ Less than 120 samples of the 30,000 records in total exceeded 0.3% sulfur content

7.3 Physical Waste Rock Characterisation

Soils within analogue sites display 'self-armouring' properties; fine silt and clay particles naturally leaching down the profile resulting in coarse, gravelly topsoils that exhibit a high surface roughness and are likely to be resistant to erosion under field conditions. Conversely, rehabilitated or waste stockpile slopes showed evidence of excessive erosion rates, with OES (OES, 2008) reporting visual observations of tunnel and gully erosion within historic rehabilitation areas. Overall, the fine nature of the siltstone waste (54 % of the <2 mm soil fraction silt sized or smaller), the sodicity of the material (ESP of 26 %), and the high annual rainfall received result in potentially high rates of erosion in the field. OES (2008) recommended "erodibility assessment of the siltstone and sandstone waste materials and assessment of slope and armouring effects on the rate of soil loss" be conducted.

Work by Soil Water Consultants (2014c) was based on these recommendations. Sample sites are shown in **Figure 13**. Several bulk soil and waste rock samples were collected during field

investigations and have been tested for erosion resistance and infiltration capacity. Testing was completed using a rainfall simulator and rill erosion flume. The results of the laboratory testing were used along with local climate information to create a 100-year WEPP erosion model. This model was used to predict average annual erosion rates for a range of WRL slope configurations.

No runoff was measured during laboratory testing of quartzite, even under simulated rainfall intensities of ≥ 80 mm/hr. While more intense rainfall is expected at Koolan Island at times (e.g. 1:1-yr 5-min rainfall = 139 mm/hr; 1:20-yr 30-min rainfall = 151 mm/hr; 1:100-yr, 5-min rainfall = 411 mm/hr) very little erosion is expected from this material after first events, as it is made up primarily of coarse fragments, and the majority of rainfall is expected to directly infiltrate.

Contrastingly, siltstone profiles have moderate to high gravel content (i.e. > 2 mm fraction) with undisturbed profiles generally containing smaller fractions of gravel when compared to rehabilitated and waste rock profiles. Their silt and clay contents are appreciably higher and lower respectively within the waste rock profile as compared to the undisturbed profiles. This suggests that clay formation has not sufficient time to occur to any degree within the recently exposed waste rock profiles, with the finer fraction more heavily weighted towards fine silt. This was even more pronounced within the siltstone material, with silt contents averaging 28% within non-rehabilitated profiles.

The increase in silt content and slightly higher clay contents (as compared to quartzite) result in Plant Available Water (PAW) being slightly higher within the waste rock siltstone. As was the case with quartzite, rehabilitated and undisturbed profiles contain higher PAW contents. In contrast to the quartzite and sandstone profiles, siltstone rehabilitated and undisturbed profiles contained significantly increased PAW (up to 4 times) content, suggesting that the on-going physical and chemical weathering of this material will provide larger increases in fine materials (and therefore PAW) than other materials tested. The siltstone material with higher PAW confirms this waste rock type as a suitable rehabilitation cover system. SoilWater Consultants (Soilwater Consultants, 2014c) did note that different blends of siltstone waste rock have different erodibility ranging from low (Main Pit Schist), moderate (1170) to high (WD1) (**Figure 14**).



Figure 14 Quartzite (LHS) and WD1 Siltstone (RHS) before and after rainfall simulation

7.3.1 Slumping and Collapse of Outer Batter Slopes

Erosion modelling was carried out to determine the stability of the batter slopes under various rainfall and water content scenarios (Soilwater Consultants, 2014e). The results showed the design of the batter surface area and structural integrity of the landform to be stable under a variety of scenarios. Monitoring since publication of previous MCPs supports the modelling outcomes, with negligible slumping observed.

The results of previous point load testing and unconfined compressive strength testing work (Coffey, 2019) (Appendix C3) indicates quartzite is generally high to very high strength rock and is also very durable. The results also show that the analysis methods provided suitable means for assessing the physical characteristics of rock in waste dumps, and thus should be further considered for detailed closure studies.

Previous erosion testing and modelling has shown that the majority of materials which display favourable characteristics for revegetation (e.g. siltstone and stockpiled topsoil) perform poorly on constructed landform slopes. Conversely, those materials which have shown good erosion resistance (e.g. quartzite and schist) have less favourable rehabilitation characteristics as a plant growth medium. Consideration of ground medium and erosion resistance is therefore a key management issue.

Examining the stability of the outer faces of WRL based on the batter angles to inform a perpetuity design. Further field analysis and modelling is proposed in relation to geotechnical assessment of the WD1 landform. By intensive analysis of waste rock lithologies, slopes and settings further evidence will be generated to determine:

- specific sections of WD1 where work can be safely undertaken to complete the closure criterion of final batter slope angles;
- alternate solutions to making sections safe and stable long-term including by:
- capping or reshaping all existing waste dump surfaces for final WRL design;
- 'do nothing' based on evidence of durability / stability of materials on sections of the WRLs.

Coffey (Coffey, 2019) particle size distribution testing (**Figure 15**) indicated that material is fairly consistent across each of the WRLs, with grading curves indicating that the material on average contains approximately:

- 15% sand;
- 35% gravel;
- 40% cobbles (>50mm); and
- 10% boulders (>200mm).

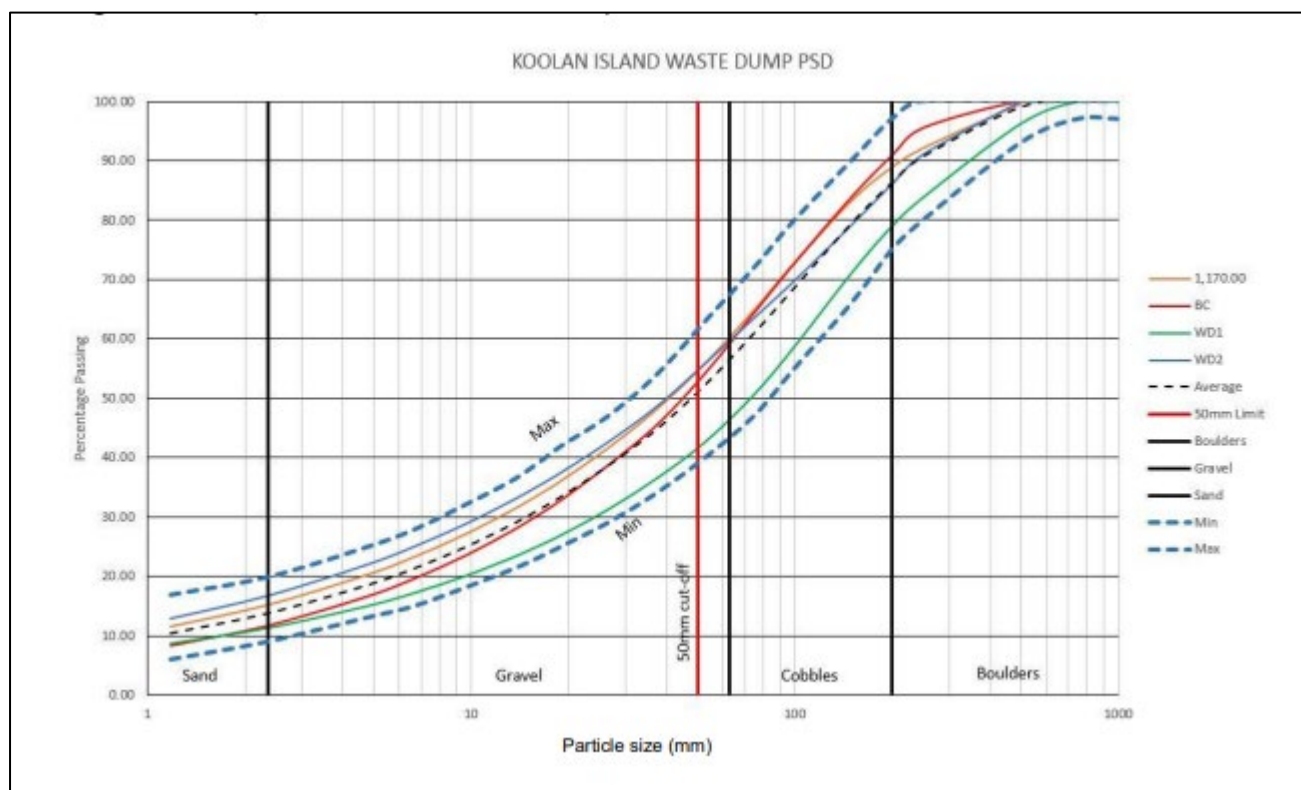


Figure 15 Koolan Island Waste Rock Landform Particle Size Distribution

Grading envelopes for a range of sizes of materials in WRLs is summarised as follows:

- 2.4mm - 9% to 20% (sand)
- 63mm - 43% to 68% (gravel)
- 200mm - 70% to 97% (cobbles)

Most of the fill material is gravel, cobbles and boulders so the landforms are known to be stable because of high friction angles. The natural angle of repose is around 37 degrees.

7.3.2 Existing Slopes

Coffey reviewed recent topographic survey of WD1 as shown in **Figure 16**. The figure shows a colour shaded plot, with higher elevations presented as 'brown; yellow' and lower elevations presented as 'blue/purple'. The black line on the figure shows the approximate toe of the WRL on which the airstrip is situated.

A slope analysis of the existing slopes on and around WD1 in **Figure 17**. All berms and crest areas of WD1 are generally flat, with surface gradients < 20 degrees. However, the majority of external slopes have angles > 20 degrees, with many slopes (red and pink) in the order of 30-40 degrees.

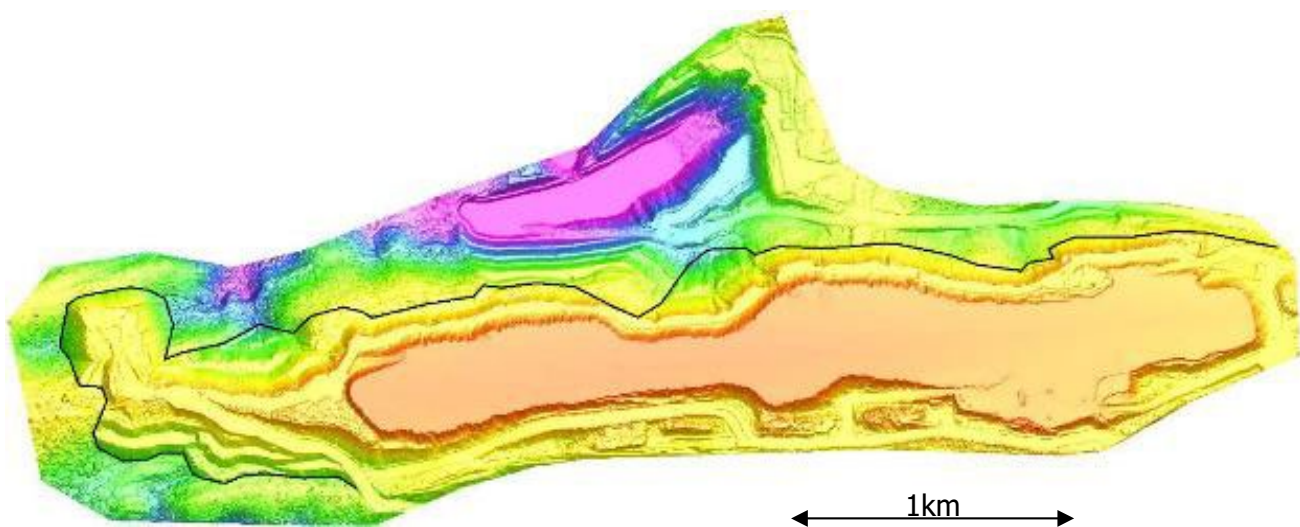


Figure 16: Topographic (colour shaded) contour drawing.

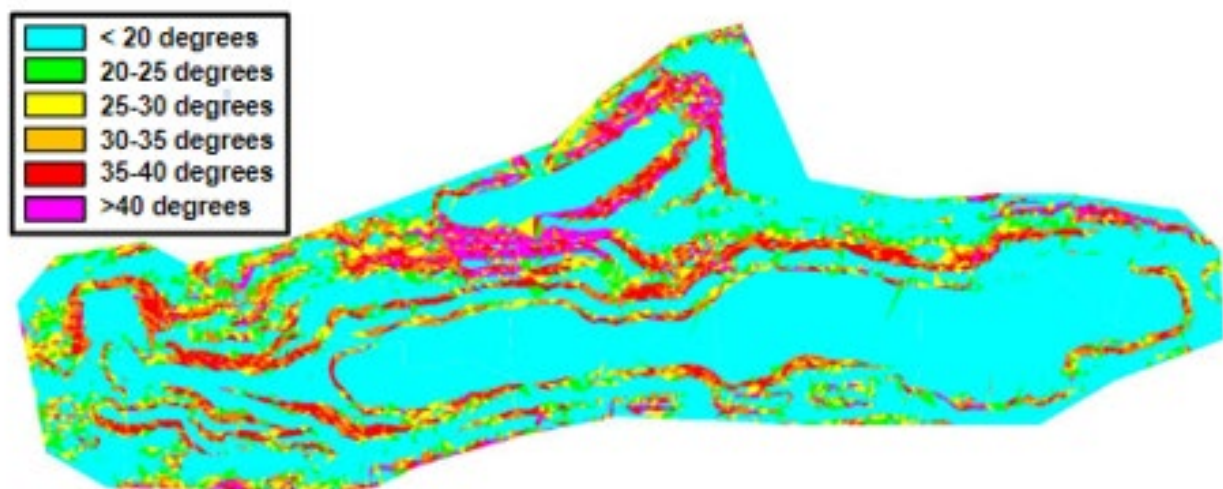


Figure 17: Slope Analysis of WD1 and surrounds

7.3.3 Testing Regime to inform stability modelling

Multiple test locations (27 pits) are identified based on the surface topography and slope gradients, and to be representative of the wider rockfill mass including their dominant lithographies. Indicative locations are marked in **Figure 18**. Excavations would be made to the *order of a cubic metre* to make available representative near-surface rock in a near crest situation potentially prone to future erosion, weathering, and failure. Points of test pitting by backhoe excavation situated on berms and/or beneath outer slopes of lifts, example of which can be seen in **Figure 19**.

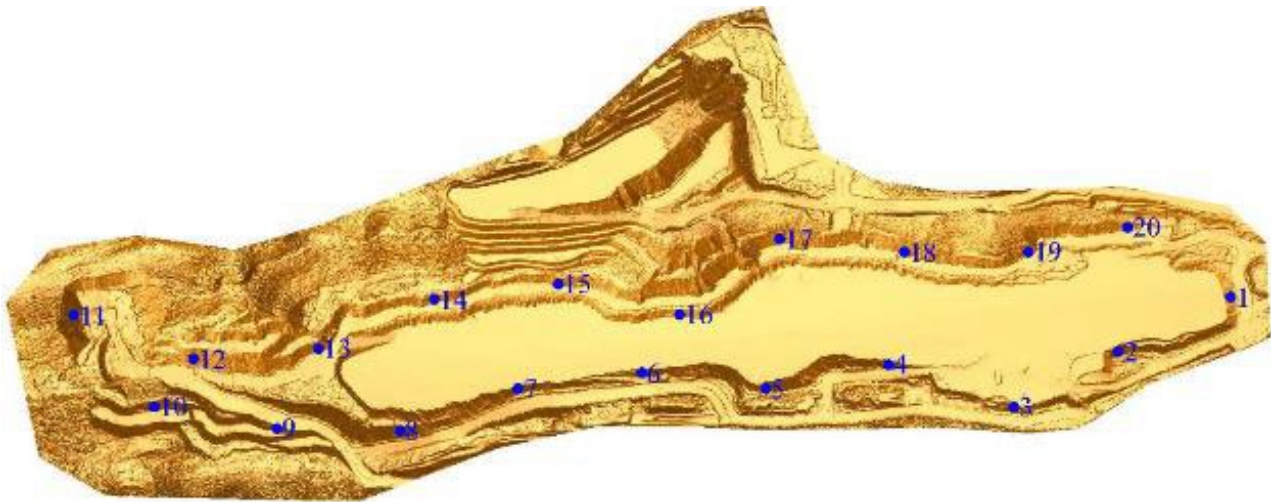


Figure 18: Testing Plan – direct measurement and DIP method test sites



Figure 19: Test site on a berm below a lift on north side WD1.

7.3.4 Measurement and Analysis of waste rock materials

Two methods are adopted:

- Direct method (physical measurement by traditional methods in field for large particle size fragments and laboratory method for particle sizes less than cobble sizes); and
- Using Digital Image Processing (DIP) method

This traditional method involves grain size analysis of gravel, cobble and boulder materials. For smaller rockfill size distributions, standard methods can be adopted which involve passing the material through a series of different sized sieves and weighing the material that passes each sieve. To verify the measured mean diameter shall be derived by immersing the pebble in water to determine the volume of water displaced. Material passing gravel sizes shall also be carried out using traditional particle size analysis in the laboratory for selected sample locations.

7.3.5 SPLIT System for Size Distribution Analysis

The split system is an image-processing program designed to calculate the size distribution of rock fragments by analysing digital grayscale images. Digital grayscale images shall be acquired manually using a digital camera and each location shall be recorded using GPS for future reference.

Once the images are taken, the Split-Desktop software has progressive steps for analysing each image including:

- the scale to be determined for each image taken in the field.
- the automatic delineation of the fragments in each of the images.
- editing of the delineated fragments to ensure accurate results.
- calculation of the size distribution based on the delineated fragments.
- graphing and various outputs to display the size distribution results.

7.3.5.1 Fragment Delineation

Binary images from acquired digital images show outlines of all the particles. Split-Desktop software performs automatic delineation of these particles. The binary images shall be in three colour levels: white for particles, black for boundaries and fines, and grey for areas that do not count in the size distribution such as the scaling object (**Figure 20**).

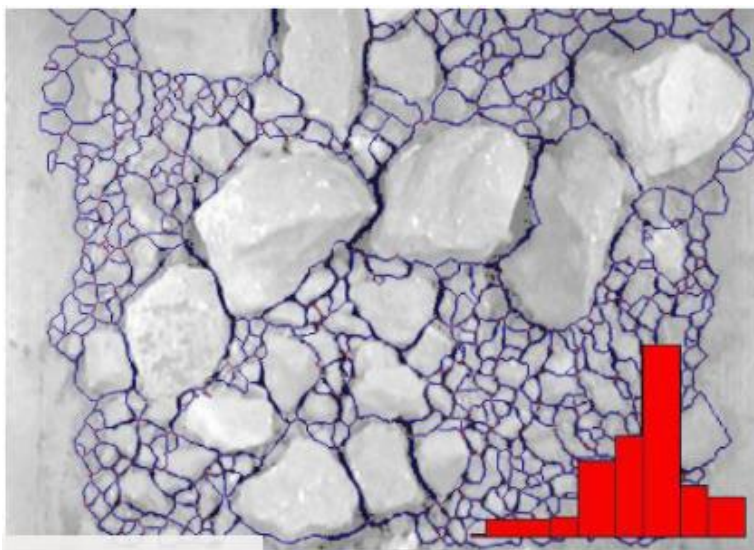


Figure 20: Example of the fragment delineation image analysis

The three most important delineation parameters are Noise size, Watershed and Gradient ratios.

7.3.5.2 Computation of Size Distribution Curves

Once the images have been edited, computation of size distribution can be carried out. In this step, the distribution of fines in each image can be calculated using two approaches: Rosin-Rammler or Schumann distribution. The most critical influence on the size calculation is the Fines Estimation. Split-Desktop can measure particles automatically, but in every image, there is a point below the resolution of the image where particles can no longer be "seen" and delineated. At this point, Split-Desktop will estimate the remaining finer material. The "fines" cutoff shall be adopted based on the estimation of the direct method.

7.3.5.3 Analytical Regime to inform Stability Modelling

Two-dimensional stability analysis will be conducted using the test data collected in 2022 from the field test pits. Data are grouped likely based on setting and lithography of the test materials and cross-sections would then be selected for production based on topography with the intent of:

At least half of the sections in the WD1/WD3 landform (beneath the Airfield) which have not been modified to a large extent since the original waste rock dumping; and remaining sections being produced in newer areas of WD1/WD3 and WD2 and may be potentially undergo further settlement and deformation.

Then, in areas where the Stability Modelling OUTPUT shows that the Factor of Safety (FoS) is lower than the minimum value, outer slopes would be preferentially designed to a batter angle to attain the required FoS yet to reduce the volume of overall earthworks but to favour solutions that:

do not require extended earthworks into large naturally-vegetated (undisturbed) areas and can be built safely.

Note this assessment and modelling exercise may show that hard competent, inert and durable outer rock materials may remain in situ at angles exceeding an outer slope of > 20 degrees and in some sections potentially at angle of repose. A preliminary concept using the technique, discussed further in section 17, where a mined back solution for the west end of WD1 is prospective to attain the design criteria including avoiding additional undisturbed country (ie disturbance toe unchanged).

7.3.6 Rehabilitation Material Volumes

A database of volumes for different material types available for rehabilitation was developed to enable rehabilitation planning and recently reviewed and updated by MBS Environmental (MBS Environmental, 2023). The database is based on mine plans (i.e. planned waste material movements) and the various topsoil stockpiles located on site. Main Pit waste material makes up the vast majority of material available for use in rehabilitation as the continued expansion of the Main Pit has constituted the majority of mining activity within the mine plan. A breakdown of the material movement by pit stage of waste lithologies from the Main Pit is provided in **Table 10**. Waste material types are broken into four categories: siltstone, quartzite, schist and sandstone. The siltstone and quartzite are the more abundant materials, together comprising over 80% of the total waste material scheduled to be moved from the Main Pit (and 90% towards the end of the mine plan). This is beneficial as siltstones are suitable for a cover medium for rehabilitation and quartzite can be used to armour slopes.

Table 10: Main Pit waste volume movements by stage

Mine Stage	Siltstone	Quartzite	Schist	Sandstone
1322	256,865	19,213	54,899	24,324
1323	248,171	17,804	39,718	27,684
2022	479,055	59,036	75,049	14,477
2023	2,458,128	1,350,438	453,232	179,763
Total	3,442,219	1,445,491	622,898	246,248

Other rehabilitation material that is stockpiled and available for the rehabilitation of land (typically WRLs) consists of topsoil reclaimed during clearing activities and a range of other material reclaimed opportunistically. The limited volume of topsoil due to natural conditions has inspired alternative approaches to the reclamation of topsoil (or growth media) and resourceful management practices. KIO will continue to seek out and identify opportunities to increase topsoil and growth media resources throughout the life of the Project. Examples of those approaches so far include:

- Acacia East Backfill – as mining operations commenced in Acacia East a mixture of weathered sandstone and clay material backfilled by previous operators was identified as potential rehabilitation material. This material was reclaimed and stockpiled on WD2 for later use in rehabilitation and has subsequently featured in rehabilitation trials.
- WD4 Spur –KIO undertook significant drainage works within the area known as the WD4 spur in 2014. These works enabled the reclamation of material with demonstrated capacity to support vegetation and relative erosion resistance if surficial treatment such as deep ripping is applied. It has been utilised to cap saline sediments and it will support vegetative growth across these areas. If necessary, it could be reclaimed, provided there is other mine waste rock material available to cap the saline sediments.
- Topsoil east of WD3 – whilst preparing an area for clearance to the east of WD3, which included the translocation of a previously known volume of topsoil, it was identified that a higher volume of resource was available which displayed characteristics similar to that necessary for topsoil / growth media. This resource was removed and relocated using appropriate plant and equipment, with some 20,000 - 30,000 m³ more reclaimed than initially anticipated.
- Crusher stockpile – with minor increases in the approved disturbance area during 2014 and 2015, a potential resource and considerable volume of caprock / growth media was identified adjacent to the product stockpile area.
- Scree area – the area was mined for a surficial deposit of iron ore. Following the completion of stripping for iron ore, it was identified that respreading of topsoil was not required as a layer of topsoil supporting vegetation lay beneath the ore. The area was rehabilitated immediately with no need to draw on existing topsoil or growth media resources.

All domains across the island were recently reviewed to estimate amounts of siltstone and quartzite required for either rehabilitation on flat areas, or as a surficial capping medium on slopes. In addition, an initial thickness of 0.5m LCM (loose cubic metres) is forecast to be applied to the surface areas of each domain. The results of this work are illustrated in **Table 11**.

It is estimated that approximately 1.5 million LCM of siltstone would be needed as an alternative growth medium (to topsoil) for rehabilitation on flat areas. Likewise, in the order of 700,000 LCM of quartzite may be required as capping material on the steeper slopes and those not currently dressed in durable materials. These initial estimates will be further refined following the outcome of geotechnical investigations currently being conducted by Coffey Tetrattech in 2023.

Table 11 Landform cover requirements

Volume growth media (LCM)	1.52 Million	Topsoil from stockpiles and siltstone
Volume growth media (BCM)	1.14 Million	
Volume growth media (Tonnes)	3.0 Million	
Volume Quartzite (LCM)	0.7 Million	Quartzite can be sourced from west end of WD1 or waste dumps
Volume Quartzite (Tonnes)	1.4 Million	

Most recent survey results, undertaken in 2024, have indicated that there is currently approximately 129,000m³ of topsoil stockpiled across site (**Figure 21** and **Figure 22**). There is an ongoing scope of work to understand the availability of siltstone and quartzite. While there is an overarching surplus of siltstone that has been mined from Koolan Island there is an outstanding knowledge gap to understand the availability and quality of growth medium and the final closure geometry to understand the final balance.

7.4 Geotechnical Investigations

During the course of mining operations at Koolan Island, ongoing geotechnical investigation, including mapping, monitoring, drilling, and modelling will continue to be undertaken.

Mapping of structures has been undertaken on both the footwall and hanging wall of Main Pit, and more locally on the Mullet-Acacia footwall. Both large-scale (faults) and smaller-scale (joints) have been mapped, and the areas where these features control stable slope geometry identified.

Monitoring has been undertaken both manually and remotely via instrumentation. Manual monitoring has comprised weekly inspections of pit faces including photographing critical areas, the results of which are communicated weekly to management through a formal memorandum-style report. Instrument-based monitoring consists of automated prism monitoring, using the Softrock Autoslope/Quikslope system, and a slope stability radar (MSR), to track slope movements. A limited number of piezometers have also been installed behind the footwall of Main Pit, and locally on the Main Pit hanging wall to monitor water levels. Instrument-based monitoring has concentrated on Main Pit as the main producing component of the operations. The results of this monitoring provide crucial information as to the behaviour of the pit slopes in the long-term and can be used to predict the most likely modes of failure (if any) that may be anticipated post-closure.

Geotechnical drilling (and associated testing) programs have been conducted on a campaign basis throughout the entire period of operations at Koolan Island. Geotechnical holes have been drilled in or near all of the pits, but with the majority concentrated on Main Pit, and in particular, the Main Pit footwall (highwall), which is regarded as the most critical area from a geotechnical perspective. The results of the geotechnical drilling programs since the 1990s are maintained in an electronic database.



Figure 21: Location and Volumes of Topsoil Stockpiles on WD2



Figure 22: Location and Volumes of Topsoil Stockpiles at Mullet / Acacia Pit

7.4.1 Seawall Geotechnical Testing

All geotechnical investigations were reviewed and collated (Coffey, 2016) (Appendix C4) to inform reconstruction of the Main Pit seawall. In 2016 Coffey drilled through remnant seawall embankment rock fill and seafloor rubble reef to test underlying low strength materials, and sampled seawall embankment and foundation materials for laboratory testing. The information collated from Coffey's geotechnical study informed a detailed 3D model of the various geological layers present in and around the seawall area.

The Coffey (2016) investigation study further sought to establish and agree the definitive location and parameters of materials that would be used within numerical analysis of the new seawall design. Golder peer reviewed the study, confirming it was "reasonable and sufficient for the preliminary design of the seawall". Subsequently a remediation design report was released for the rebuilding of the seawall, this highlighted that the seawall design has only considered operational life that that further consideration is required to satisfy a closure scenario; these options are still under consideration (Coffey, 2017) (Appendix C5).

7.4.2 Main Pit Geotechnical Testing

Geotechnical modelling of the pit slopes (both actual and designed) has been carried out on an on-going basis. Back analysis modelling, based on slope performance, is used to calibrate the model parameters (which are derived in the first instance from logging and testing of samples from the geotechnical boreholes). These can then be used for 'forward modelling' to predict the behaviour of future design slopes.

The above processes are carried out with a view to maintain a safe working environment for personnel during operations. The results of these studies are integrated into the mine plan, with remedial works undertaken as necessary. These remedial works include and may not be limited to:

- depressurisation via horizontal drain holes to reduce water pressure behind the Pit walls;
- cable bolts installed for shallow and deeper support of batter faces; and
- spraying of shotcrete to reinforce foot wall slopes.

7.5 Considerations For Mine Closure Planning

The results of pHFOX and Total S analysis suggest that the potential for AMD formation is very low as any occurrence of sulfidic material on the site will necessarily be isolated and low occurrence. The lithologies of schist and sandstone in the Yampi Formation stratigraphy showed statistically higher sulfur concentrations than the other two lithologies (hematite and conglomerate). The majority of samples with higher than 0.3% total sulfur were also found to be fully or partly oxidised, suggesting again the occurrence of already oxidised sulfur - and hence risk of oxidisable sulfides and AMD was very low (**Figure 23**).

The generally low salinity reported in materials from the Acacia East drill holes contrasts with the considerable variability of salinity values found within the Elgee Siltstone of the Main Pit. This suggests further investigation is needed to ensure that materials with unsuitable characteristics as growth medium (i.e. high salinity) are identified and materials with suitable characteristics are also identified so that appropriate management strategies for their handling and utilisation are developed.

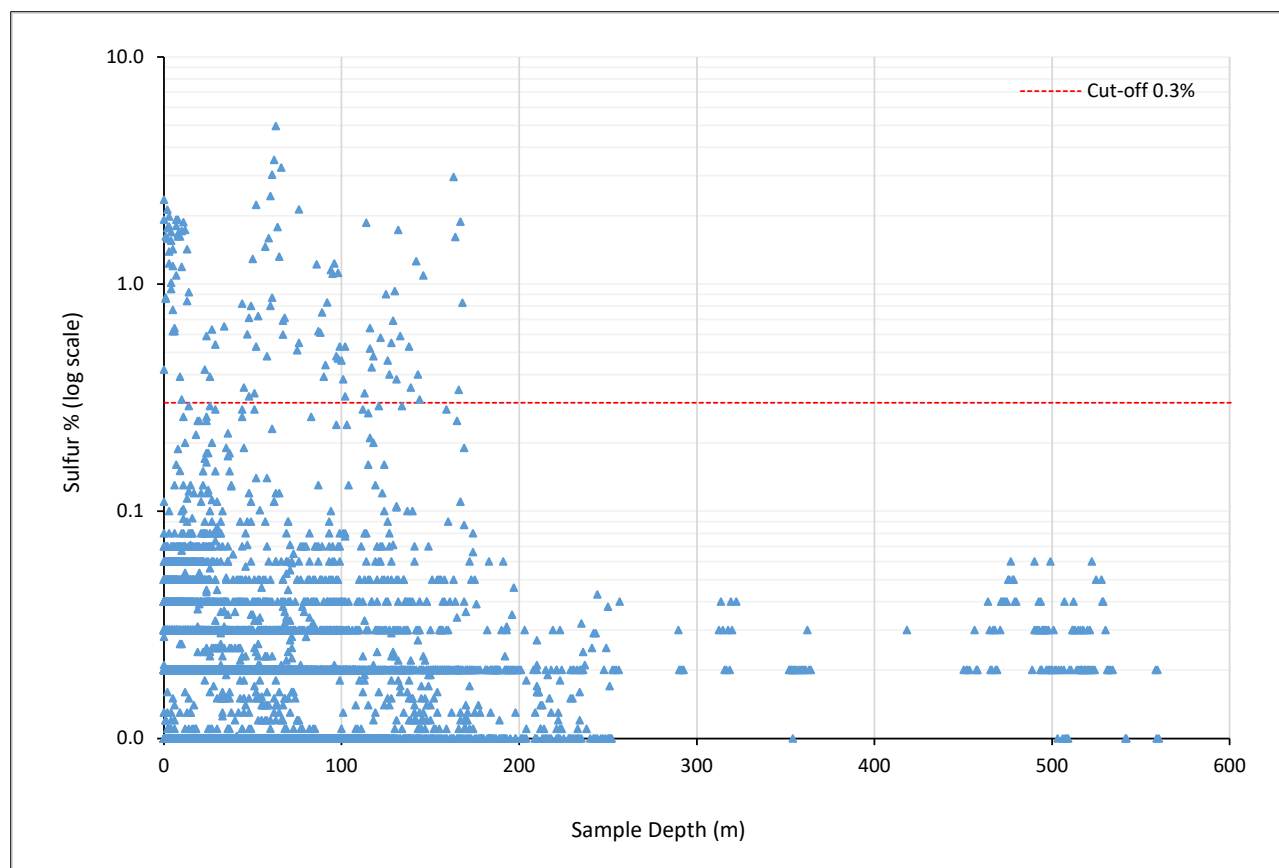


Figure 23: Breakdown of Koolan Island Sulfur Assays across all stratigraphies/lithologies

The results of geochemical assay analysis have shown that the majority of metals and metalloids can be considered at or below the average crustal abundance (i.e. natural background levels) and are therefore not considered to be of environmental concern. The measured levels of arsenic exceed the corresponding EIL and are considered significantly enriched in comparison with natural background levels, however the bonding behaviour of the most common arsenic species, and in particular the similar ionic radius with Fe, suggests that the element will be strongly bound within the crystal mineral structure and therefore likely to be highly insoluble.

Based on the above analyses the material AMD risk has been assessed as negligible.

The amount of topsoil available on site is limited due to its inherent scarcity (i.e. shallow soil profiles) and compromised by *Passiflora foetida*. Also given difficult operational environments (i.e. high relief of landforms), careful management and handling of this resource will influence optimal final rehabilitation outcomes.

Siltstone, which is high in abundance, has been demonstrated to be a viable surrogate / growth medium for seed germination and establishment of vegetation. Erosion testing and modelling has shown that certain types of siltstone performs poorly on constructed landform slopes (SWC, 2014e). SWC (2014; 2015) recommended it will only be utilised for rehabilitation on flat areas. Where it is known that the siltstone is saline (ie. sourced from newly mined substrates), it will be allowed to flush with rainfall prior to the application of native seeds to allow for germination. Soil EC tests can establish suitability for use. Quartzite is resistant to erosion (SWC, 2014e) and will be used as a surficial capping medium on slopes. The WD1 surface treatment trials show that both siltstone and quartzite matrices are viable growth media. Ongoing LFA studies, proposed to be undertaken

biennially, will continue to assess the success of progressive rehabilitation at the Project and provide further surety that the preferred rehabilitation strategy meets environmental objectives.

As with the closure of any open pit, the guidelines covering abandonment requirements will be adopted. This includes the provision of appropriately located abandonment bunds, which are situated to constrain inadvertent vehicular access to potentially unstable areas, such as pit crests.

Although the Main Pit was previously inundated at the closure of operations in 1993 and remained relatively stable during this period, the overall stability of the saturated Main Pit footwall has still to be demonstrated. Though the Main Pit footwall was constructed and continues to be operated in accordance with the DOIR Guidelines (Department of Industry and Resources, 1997), the re-introduction of seawater upon full closure may be expected to slowly weather and degrade the existing geotechnical control systems and rock reinforcements (i.e. anchoring, mesh and shotcrete).

Observations of the footwall behaviour since the previous flooding suggest that continuing erosion of gullies on the main footwall face and erosion of friable layers behind the facing layer of quartzite on the face of the footwall may also continue due to a combination of rainfall run-off and groundwater percolation. As a result of the degradation of the ground support, and erosion of weaker materials in and behind the face, it is assessed likely that small-scale failures of the footwall, and progressive erosion of gullies on the footwall will continue post-abandonment. It should be noted, however, that the failures are anticipated to be 'thin-skinned' rather than circular in nature, as are those which have occurred to date. The bedded structure of the footwall (where the bedding planes, which constitute the vast majority of observed failure planes, are parallel to the footwall face), reduces the risk of otherwise. The existence of a wide berm (c. 16 m) at 38 m Relative Level over most of the length of the footwall mitigates against these failures propagating the full height of the footwall.

Further geotechnical stability analysis is required to confirm the overall stability of the Main Pit foot wall. Inundation of the pit from 2015 to 2018 is likely to have increased stability of the overall wall due to the buttressing effect of the weight of water in the pit; this can also be demonstrated by slope stability modelling. It is considered very unlikely that tidal fluctuations have any effect on the stability of the footwall, as no such effects were noted after the pit had been dewatered in 2007 and 2018.

The other pits on Koolan Island do not extend to the depth of Main Pit; additionally, their pit walls are constructed with a batter-berm configuration typical of open pit mines. They are also excavated in areas where the structural geology is more complex; thus, large-scale thin-skinned failures are less likely to occur than in Main Pit. Observed failure in these pits consists of small-scale 'fretting' and 'sloughing', with occasional berm-scale failures. Notwithstanding this, a geotechnical assessment of long-term slope stability will also need to be made for retained open pits, taking weathering and erosion into account. This will enable an appropriate alignment for abandonment bunds to be determined.

Detailed closure studies will comprise a combination of physical and photogrammetric analysis of the rock in existing outer WRL slopes and near crests, to categorise the rock size distribution around the perimeter of these landforms. The required ultimate slope angles should be based on this rock size distribution, with the slope angle generally being proportional to the average rock size and its durability and frictional properties.

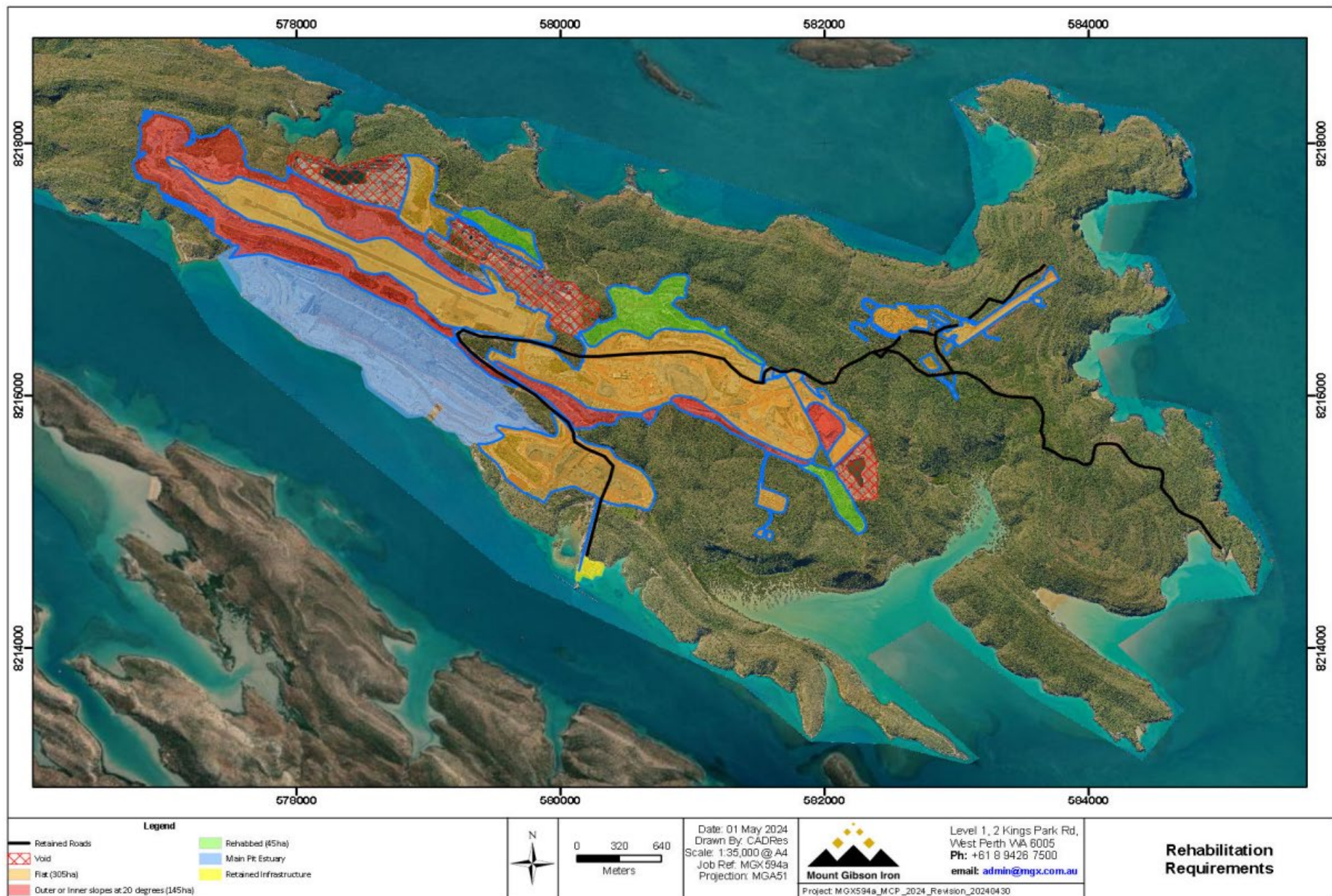


Figure 24: Overview of landform surface rehabilitation requirements

8 SURFACE WATER HYDROLOGY

A hydrological investigation (Soilwater Consultants, 2014d) (Appendix C6) was conducted to determine how the mining-related constructed landforms interact with the natural landscape, and to establish any long-term environmental risks. The tasks completed as part of this study included:

- establishing the hydrological properties (erodibility; durability) of the waste rock materials;
- undertaking detailed surface flow analysis of the pre-mine and as-built land surfaces;
- undertaking unsaturated zone hydrological modelling of the WRLs; and
- assessing the need for sedimentation and drainage structures.

8.1 Catchment Delineation

A surface flow analysis was completed to assess how the as-built landforms fit and function within the surface hydrological system of Koolan Island (Soilwater Consultants, 2014d). This analysis identified 92 surface water catchments of ≥ 1 ha across the Island. Eight surface water catchments were identified that intersect waste dump footprint areas and these are shown on **Figure 25**, along with a number of additional smaller catchments that intersect open cut Pits, ROM Pad, and Crusher areas. As depicted, the majority of these catchments have their outlets into the ocean. However, Catchment 1 partially empties into Main Pit, Catchment 2 and the balance of Catchment 1 end in a basin, and the majority of Catchment 7 flows into Mullet Pit.

For the purpose of this analysis, the WRLs were assumed to be largely internally draining, with the upper surfaces being bunded to contain the majority of surface water runoff. Further, the WRLs constructed of waste rock materials are expected to allow rapid infiltration of rainfall. Surface water runoff from the WRLs is expected to occur primarily along the access ramps, and the modelled flow lines shown on **Figure 25** reflect this.

The WRLs are primarily located over higher elevations within the upper portions of the island's catchments and constitute a combined total disturbance area of approximately 200 ha. The percentage of each catchment that is disturbed varies greatly by catchment, but ranges from 20-100%. As disturbed surfaces generally contribute more sediment to runoff water than undisturbed surfaces, increased sediment load is therefore the primary concern with respect to the WRLs contribution to surface water flows. The impact to surfaces water catchments is highlighted in **Table 12**.

Catchments 1 and 7 currently drain into mine pit voids and Catchment 2 drains into a basin (Soilwater Consultants, 2014d). Therefore, any sediment entrained in surface water flows in these catchments does not currently reach the ocean, resulting in no risk to the marine environment. Catchment 1 would drain into a re-inundated tidally fluxed Main Pit after closure.

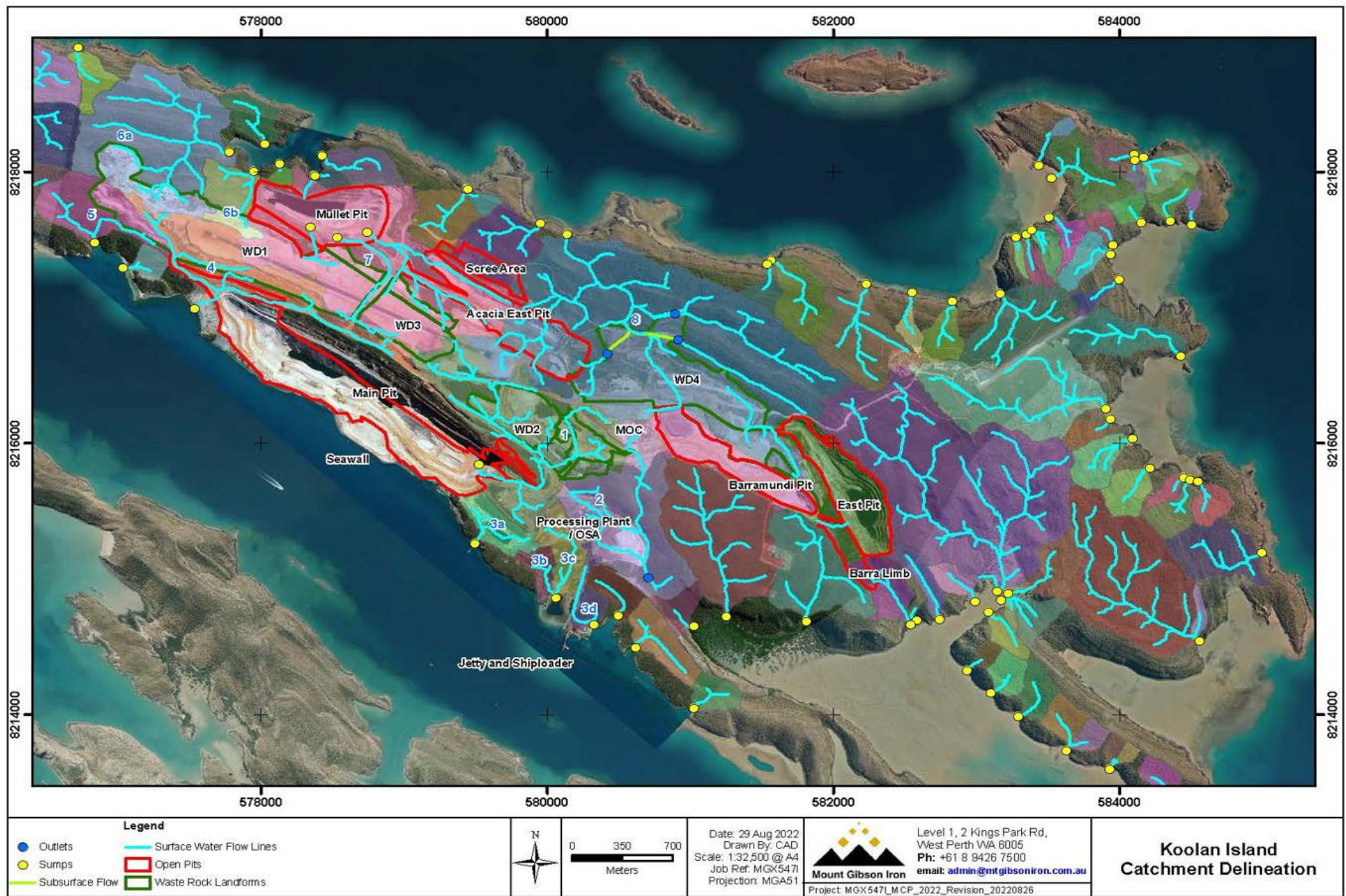


Figure 25: Catchment Delineation

Table 12: Summary of the primary "modified" surface water catchments in the as-built environment.

Catchment	Area (ha)	Percent disturbed	Description
1	92	60%	50% steep hills, and 50% flat infrastructure area Includes WD2, partial flows into Main Pit, partial flows to Catchment 2 sump
2	72	33%	60% steep hills, and 40% flat infrastructure area Flows to the southeast into a sump
3a–3d	41	85%	4 small catchments draining the ROM Pad / Crusher Mostly flat infrastructure area
4	49	100%	Flows down western side of WD1, along Main Pit ridge Enters ocean just north of Main Pit
5	29	33%	30% runoff from NW corner of WD1, rest "native" Outlet is in its natural location
6a–6b	100	20%	20% runoff from NE side of WD1, rest "native" Outlets is in its natural location
7	139	80%	35% runoff from E side of WD1, 35% Mullet Pit (cuts off catchment) and Acacia East Pit (top of the catchment)
8	243	33%	25% runoff from WD4, rest of catchment is undisturbed Outlet is in its natural location WD4 cuts off two major drainage lines (~40 ha)

Catchments 3, 4, 5, 6 and 8 outlet to the ocean and, while sediment and water quality monitoring is conducted in the receiving waters, no additional sediment control measures are known to exist in these catchments. Of these catchments, 3 and 4 are modified but occupy a much smaller area in comparison to 6 and 8.

Due to the low percentage of disturbance within Catchments 5, 6 and 8, the relative potential risk on the receiving environment is low. Whilst Catchments 3 and 4 are modified, Catchment 3 consists mainly of flat infrastructure areas thereby reducing the potential risk of erosion or liberation of suspended sediment associated with surface runoff. The outlet for Catchment 4 enters a modified coastline environment due to former historical mining operations and the added control of non-erosive materials on the batters of WD1 (quartzite) reduces the relative risk to the receiving environment.

8.2 Peak Flow Analysis

Peak flow analysis was conducted to estimate design event flows (e.g. the 1:100-yr peak flow) at selected locations within the as-built and proposed post-mine landscape (Soilwater Consultants, 2014). The following generalised locations were analysed:

- All surface water outlets into the Ocean;
- All surface water channels flowing into open cut pits; and
- Two surface water channels intersected by sump lands adjacent to WD4.

The specific locations analysed for each of the as-built scenarios is presented in Figure 26. Peak flow analysis at these locations provided estimates of design flow rate for a range of storm sizes

that can be used for a number of purposes relevant to management and closure of the mine site, including (but not limited to) pit in-flow volumes, sediment loads, and diversion sizing requirements.

The Rational and Index Flood Methods were utilised for this analysis, according to the guidelines presented in Australian Rainfall & Runoff – A Guide to Flood Estimation (ARR) (Pilgrim, D. H., 2003). Input parameters for the “Kimberley” region of Western Australia were adopted, as recommended in the ARR (Book II, Section 3 and Book IV, Section 1).

The peak flow rate predicted to enter the Main Pit during a 1:100-yr peak flow event is 19 m³/s using the Index Flood Method, and 45 m³/s using the Rational Method. The large discrepancy between the results from the two methods is typical and highlights the need for more detailed hydraulic modelling for areas where accurate flow rate predictions are necessary (e.g. design and reconstruction of a waterway). More weight should be placed on the results obtained by the Index Flood Method, as the regression equation on which it is based has a stronger correlation with field data measured in the Kimberley Region (Pilgrim, D. H., 2003).

The peak flow rate predicted to enter Mullet Pit during a 1:100-yr peak flow event is 19 m³/s and 49 m³/s using the Index Flood and Rational Methods (respectively).

The peak flow rate predicted to enter each of the sumps adjacent to WD4 during a 1:100-yr peak flow event is 5 m³/s and 14 m³/s using the Index Flood and Rational Methods (respectively).

Analysis of peak flow rate in catchment 8d could not be calculated as part of this analysis, as the effects of subsurface flow are not accounted for by the Rational or Index Flood Methods. Subsurface flow is addressed as part of the HYDRUS model assessment (Soilwater Consultants, 2014).

8.3 Storm Runoff Volumes

Basic storm runoff volume analysis was conducted to estimate the volume of runoff water that may be expected to accumulate at key locations onsite for design storm events of different sizes (SWC, 2014a). This analysis used the rainfall Intensity-Frequency-Duration data published by the Bureau of Meteorology (Bureau of Meteorology, 2019), and assumed an initial storm loss of IL=15 mm, based on site observations which indicates that unsaturated conditions predominate for storm events smaller than 25 mm (pers. comm. C. Hamence, 2014). After the initial 15 mm, a continuing loss of CL=10 mm/hr was applied, based on saturated hydraulic conductivity measurements conducted on a range of onsite soil materials as part of the WRL design process (Soilwater Consultants, 2014d).

Stantec (Stantec, 2019) modelled the catchment reporting to Mullet Pit (currently being backfilled as WD6) and determined the pit capacity required to store runoff generated during 1% AEP and PMP 72-hour storm events. The surface water assessment involved delineation of catchment area draining to the pit and determining the pit stage storage curve, rainfall excess generated during the designated storm events, and the volume of runoff collected in Mullet Pit during the designated storm events. The report concluded that:

- a catchment area of 61.27 ha drains towards Mullet Pit;
- the volume of Mullet Pit at 14 m Australian Height Datum (AHD) (i.e. the height of the invert to Mullet Bay) is 2,296,500 m³;
- runoff volume draining to Mullet Pit during the 1% AEP 72-hour storm is 189,000 m³; and
- runoff volume draining to the pit during the PMP 72-hour storm event is 1,629,860 m³.

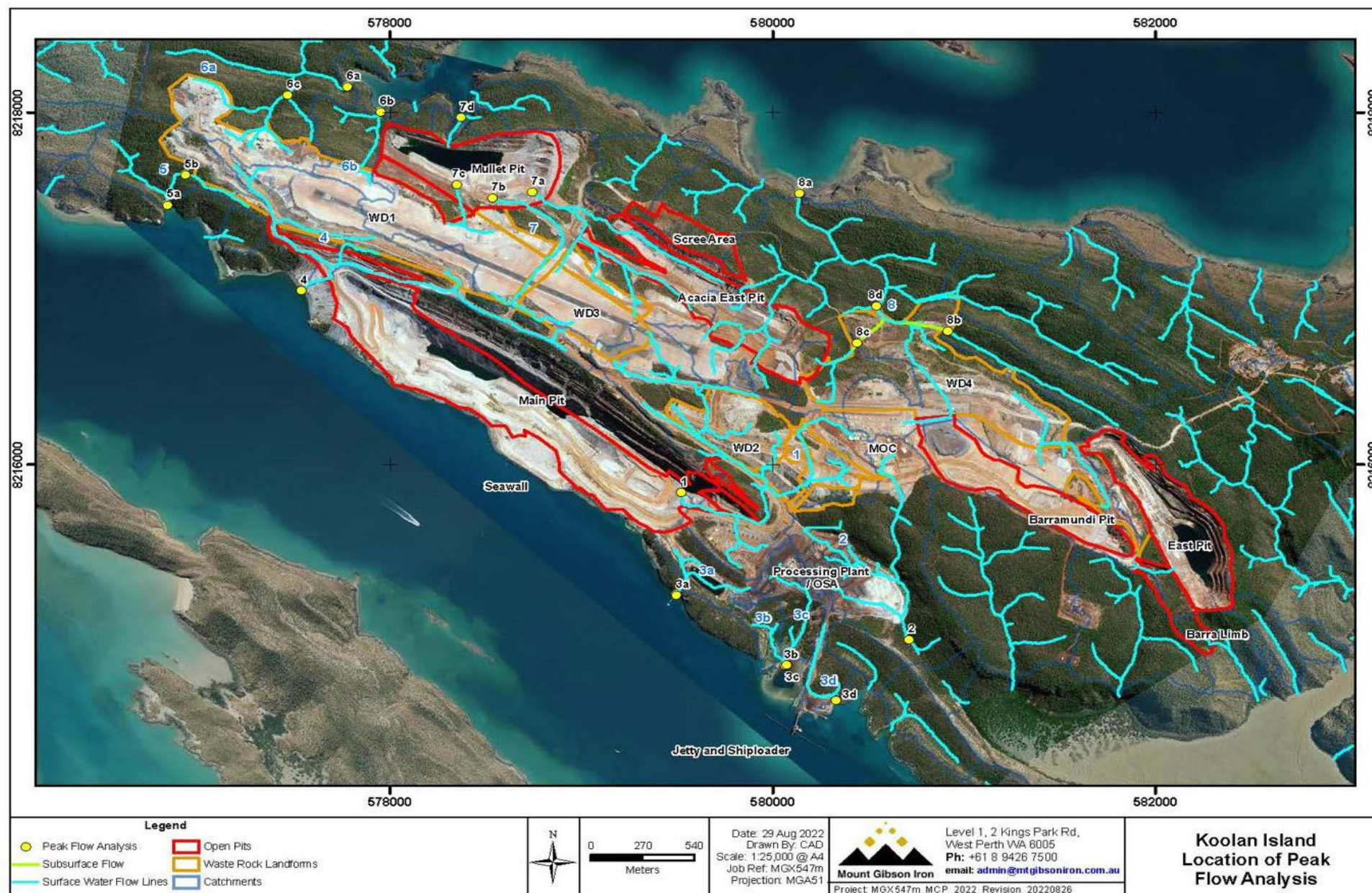


Figure 26 Location of Peak Flow Estimates

8.4 Sediment Emission Control

A marine monitoring program commenced in 2007 to monitor the potential effects of sediment on the receiving environment. The results for turbidity in near coastal waters have been variable in time and do not indicate a chronic effect from runoff. While recent marine monitoring detected slightly elevated turbidity at the wharf sites (4 NTU) relative to the south reference sites (3 NTU), the elevated levels were determined to be due to Project activities. (MScience, 2019). This is a strong indication that no additional effect on the surrounding environment is likely to occur from erosion of constructed landforms post closure, so long as no further major changes are made to the existing surface water. Sediment exported in surface runoff is expected to decrease with time post-closure as rehabilitation of the Island progresses and cover systems stabilise and vegetation cover increases.

Following the partial collapse of the seawall in 2014, a post event marine monitoring program was developed and agreed to by both the EPA and DEMIRS. This involved monitoring of both water quality and benthic habitat and a comparison of the results, before and post event. Extensive effects were not identified, however further bi-annual marine monitoring was required by the marine management plan to further support these findings.

8.4.1 Reshaping of Steep Slopes

Reshaping of steep WRL slopes should align, as far as practicable, with the design criteria (i.e., 20-degrees maximum slope). Shallower slopes help reduce sediment loads transported as well as long term stability. These slopes in some sections approach angle of repose, and subject to erosion in the short term until full closure. Certain areas will not be readily reshaped due to access and topography.

A general guide to slopes, erosion performance and vegetation coverage is illustrated in **Figure 27**. Although the guidance was developed for arid sites, it provides a reasonable qualitative guide as to expected performance from different slope angles. Slopes steeper than 20-degrees are unlikely to meet erosion objectives without additional reshaping or cover strategies.

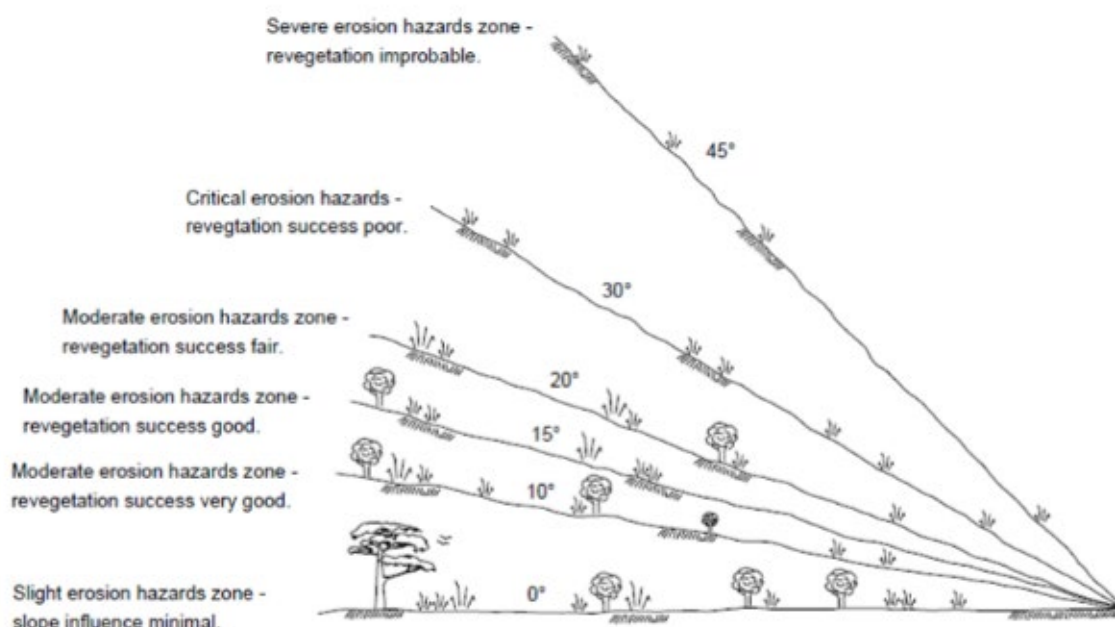


Figure 27 Influence of batter gradient on revegetation and erosion (DME, 1996)

8.4.2 Removal / Relocation of erodible rock fill

Along some sections, it may be impractical to reshape steep, angle of repose slopes due to spatial and access constraints. An option may be to return erodible sediments and waste rock to completed pits. This approach is included for completeness in outlining source-control strategies and applicable generally and economically approach for large volumes of waste.

8.4.3 Armouring / Capping Erodible Wastes

Key sediments sourced are from formerly disturbed or dumped into areas in the catchment. Substantial sediment load reductions can be achieved by 'capping' these areas with armour/rock blankets. Placement of a cap has significant advantages with respect to sediment management by:

- protecting finer particles from detachment by rain splash erosion;
- protecting finer particles from detachment by shear stresses from surface water runoff;
- increasing surface infiltration rates and therefore reduces surface water runoff flow rates;
- providing rougher surfaces, which reduce surface water velocities, leading to reduced shear stresses.

Armouring is an effective approach to reducing sediment loads and can alleviate sediment loads from highly disturbed areas one to two orders of magnitude (i.e., 1-10% of loads from under-performing areas). Rock caps are well-suited to placement on steeper, disturbed slopes where it is impractical to reshape and/or revegetate the slopes. Notably, these caps are often unable to support vegetation, as they are deficient in media interstices, nutrients and a vadose zone for plant-available water. Rock covered slopes therefore will be useful in arresting erosion on steeper slopes but unlikely to achieve revegetation objectives.

8.4.4 Vegetated Covers

Rapid or medium-term re-establishment of vegetation is an effective strategy for minimising sediment loads. The main benefits of increasing vegetation coverage include:

- substantially reducing erosion and sediment loads reporting to Pindan Bay;
- increasing stability of WRL surfaces;
- Achieving targets for flora diversity;
- Improving aesthetics.

In the longer term, vegetation cover reduces erosion to similar levels as a rocky cap (i.e., by 1 to 2 orders of magnitude), thus providing effective sediment control. Construction of a vegetated cover is relatively more difficult on steep slopes (than shallow ones) and vegetated covers are most suited to disturbed catchments, on flat areas or with slopes much less than approximately 15-degrees. Short term erosion control should be included too, as vegetation will take several seasons to develop sufficient ground coverage.

8.4.5 Diversion of clean water sub-catchments

Diversion of large clean water catchments away from modified or erosive areas effectively reduces sediment laden hydrograph volumes from the catchment. A diversion may act to:

- minimise clean water from also becoming sediment laden.
- minimise clean water from further entraining sediments by volumetric forces.

Reducing the hydrograph volume into drainage and sediment control systems by reducing flow rates and volumes (e.g., volumes in ST-4 and modified flow paths). This increases effectiveness of those control systems with a design capacity. An example in Pindan catchment is approximately 27

hectares of relatively undisturbed land that flows through to a renovated Sediment Trap (ST-4) as illustrated in **Figure 28**.

The feasibility of constructing such a diversion needs to be considered further, given specific site constraints and the relative effectiveness of other strategies for sediment control. Furthermore, the reduction in hydrographs (**Figure 31**) gives stronger effect to volumes past a cross section. In 2022, creek bed improvements were made at the toe of the lowest WD4 lift to control risk of scour and under-cutting of the landform. Any adaption of drainage diversion would likely require a Mining Proposal approval.



Figure 28: Clean sub-catchment on north side of Pindan Creek reporting to Sediment Trap 4

8.5 Pindan catchment management

The Pindan Creek catchment is located on the central, northern ridge of the Island with ephemeral runoff reporting into Pindan Bay. The catchment covers approximately 57 ha including the following notable features:

WRLs, notably WD4 and the waste rock previously tipped from the access road, as indicated by the catchments shaded red (high risk) in **Figure 29**. These areas are likely to constitute prominent sources of transportable sediments from WD4 into the Pindan Creek. Note the areas in Red are to be addressed by the closure work to be done upon batter down of the outer WRL slopes.

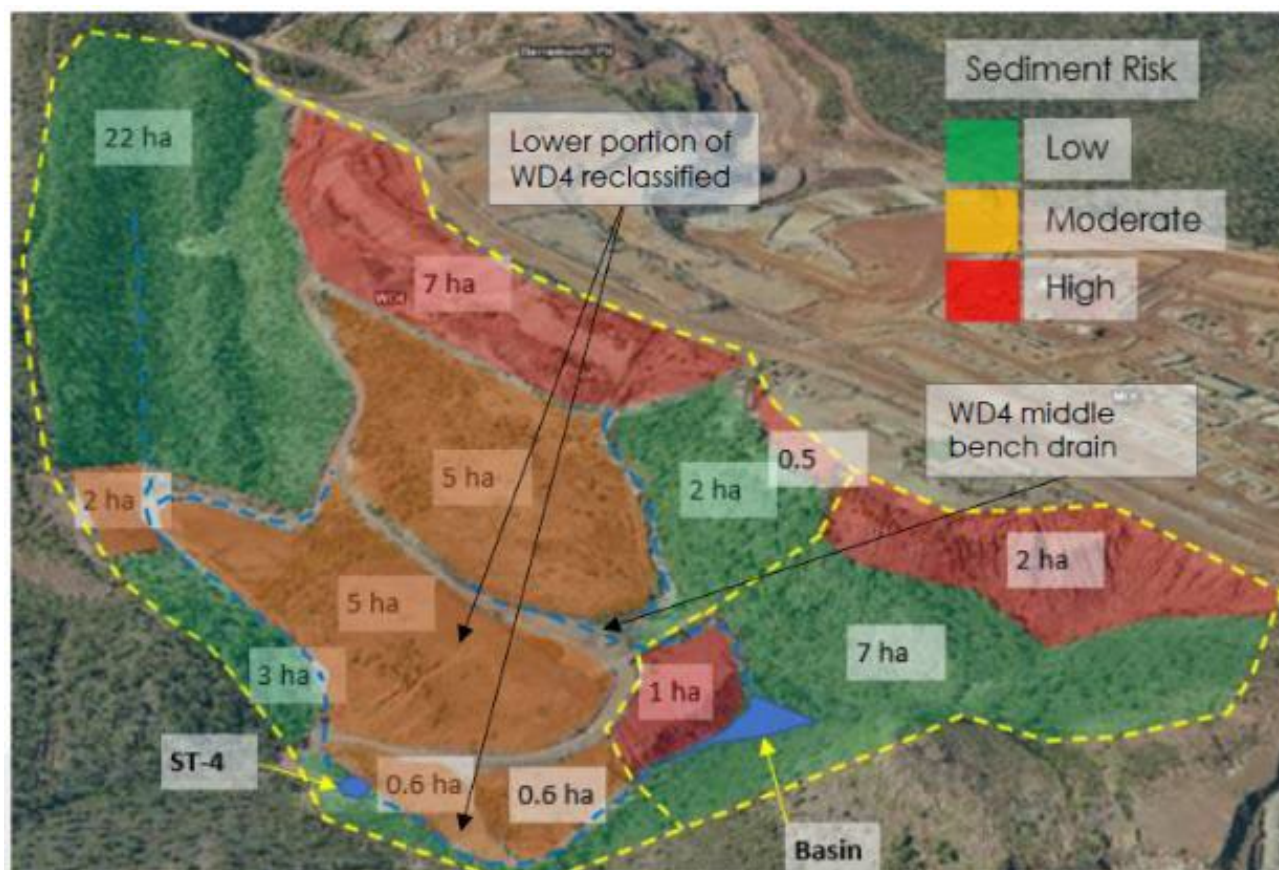


Figure 29: Sediment emission risk map after completion of 2022 dry season works

Areas of medium disturbance (approximately 7.6 ha shaded orange) comprising predominantly rehabilitated central areas of WD4. These areas are contour-ripped and partially revegetated.

Sediment Trap 4 (ST-4) constructed and operated by approved stormwater management plan for control of drainage water reporting to Pindan Bay. This has been used to date as the principal form of sediment control (**Figure 30**).

The impounded sub-catchment (labelled 'Basin') formed from western extents of waste dump 4 (WD4). This area forms a local depression, where surface waters can seasonally pond before surcharge to the creek.

There are a number of available sediment control strategies with various levels of effectiveness for reducing sedimentation rates. In order to improve outcomes for the Pindan Creek, a combination of sediment control strategies are being adopted.

8.5.1 Pindan Catchment drainage improvements

Specific local area drainage improvements substantially reduce sediment loads generated from more erodible cells of landforms, including WD4 (**Figure 31**). There had been erosion down the centre of the upper lift of WD4 slope (**Figure 32**), which is exacerbated by surface water down the slope's face. Re-grading the upper surface to minimise the surface water flowing downslope will reduce sediment load substantially. A drainage improvement has already been implemented to improve outcomes on reshaped slopes and covers (**Figure 33**).



Figure 30: Sediment Trap (ST-4) after excavation of entrained sediments during 2022 dry season.



Figure 31: Drainage improvement on the bed of Pindan Creek below WD4. Earthworks to stabilise the bed and installation of rock baffles

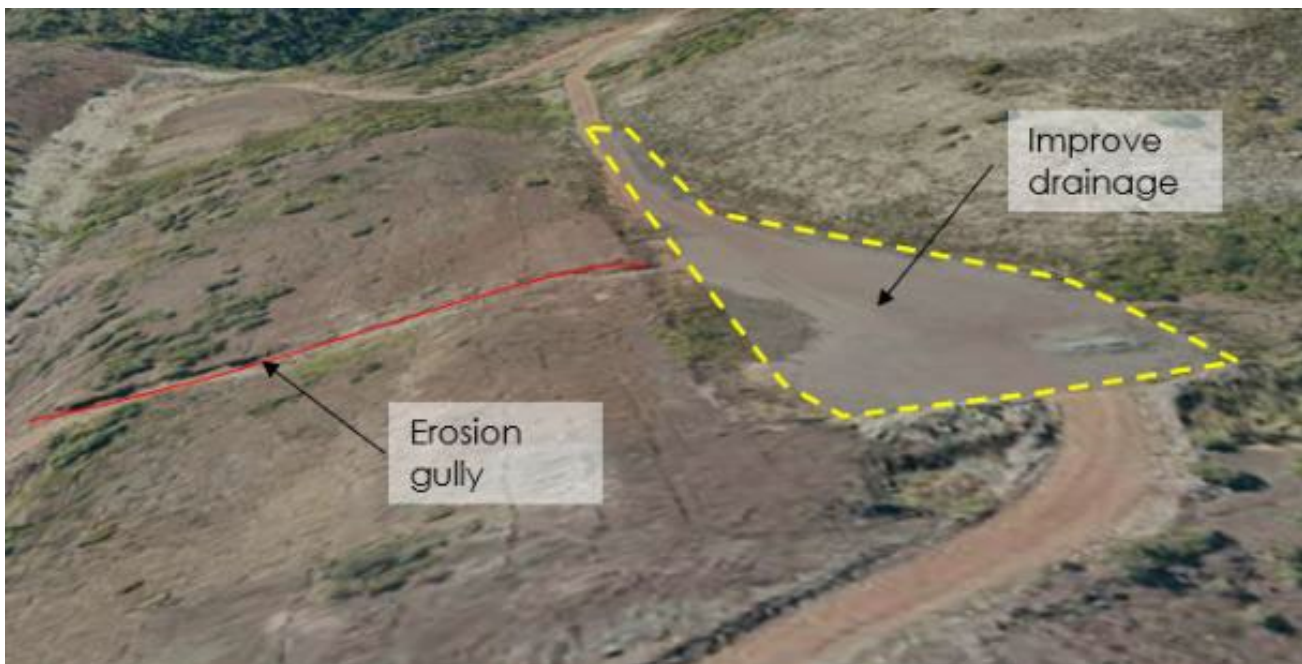


Figure 32: Drainage improvement at the crest of WD4 between waste dump lifts. Past rainfall-runoff meandered overland to form Erosion gully



Figure 33: Drainage improvement at the crest of WD4 between waste dump lifts (July 2022). Water from runoff on upper lift is intercepted and directed away from erosive face of a lower lift.

8.6 Landforms Constructed over Backfilled Pits

KIO has amended its approach to the retention of some of the mine's open pit voids at closure, and now proposes to backfill as many and as much of the voids as possible with available waste rock.

8.6.1 Mullet Pit

Mullet Pit is currently partly backfilled with mine waste on its eastern and southern sides. The former mine pit will be backfilled with waste rock; An earlier approved current design (approved by MP 34572) allowed for complete backfilling of Mullet Pit. However, since the approval of that Mining Proposal, through dialogue with DEMIRS, an alternate design has been identified which contains a post-closure runoff retention sump. The revised design incorporates a retention sump – at 335,000 m³, it exceeds rainfall runoff 1:100 ARI 72hr event (by an extra 20%) which will retain any sediment mobilised in catchment runoff. It is worth re-iterating that infiltration of rainfall is a significant factor as the materials are conducive to vertical movement through coarse durable surface and sub-surface rocks. The exact closure design and backfill level is currently under review.

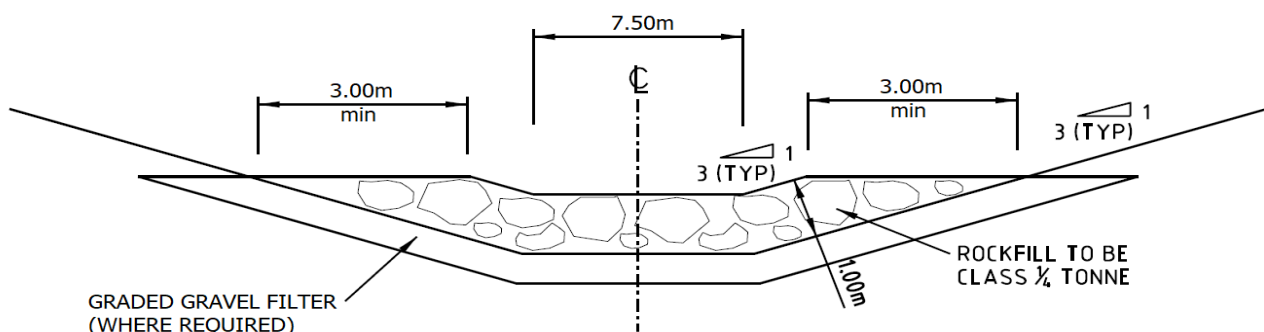
Based on mine planning it is unlikely that the final full extent of the Mullet Pit backfill will be reached. Based on predicted waste volumes to remaining the pit will likely not receive further waste. This will mean that the mullet pit will be closed out inline in accordance with the Safety Walls around abandoned open pit mines guidelines (Department of Industry and Resources, 1997). Closure design and analysis is discussed in detail in section 17.3 and 21.2

8.6.2 Barramundi and East Pits

Barramundi and East pits will be backfilled also, such that they quay with the existing adjacent WRL WD4, with batter slopes mimicking local natural forms where elevated above the former pit voids. The actual waste volume to be generated since this landform was first approved; and the current block model indicates there is unlikely to be sufficient waste material generated between now and closure to complete the landform to capacity, although the surface design is to be met. Detailed closure design and analysis is presented in section 17.3 and 21.2 .

Potential was foreseen at a head-cut erosion knickpoint at the drainage outlet at RL 1157m between RL 1160 and RL 1100 levels in the design. Armouring and rip rap is to be installed at the potential knick-point at the eastern end of internal drainage. (as shown in **Figure 34**).

Figure 34: Type cross section for knickpoint between Barramundi Pit backfill into East Pit backfill.



Landform Slope Integrity

The backfilling procedure will follow design principles of outer and internal batters at $\leq 20^\circ$ other than the divergences explained above. Barramundi and East Pit backfill batters will be separated by ($\approx 5 - 10$ m) berms, as per the adjacent existing WRLs. The backfilled Mullet Pit landform face will aim to be in line with the natural fall of the pit crest to maintain an overall slope which

approximates and is slightly lower than the original land surface. The backfilled Barramundi and East Pit landform faces will follow local slopes or existing WRL forms, as appropriate, to integrate closely with the surrounding land surfaces. Batter heights and berm widths are likely to vary across the surface of the backfilled pits for a more natural appearance.

Backfilled pit batters will be constructed of material containing competent coarse waste rock (e.g. quartzite) which would retard erosion rates and influence vertical infiltration of rainfall rather than surface runoff. Geotechnical modelling of batters (Soilwater Consultants, 2014e) showed stable batter surfaces provided that the batter slopes are constructed from material with competent quartzite waste rock. Furthermore, existing WRLs with faces constructed to these specifications from the proposed surface material mix are demonstrably stable even at steep un-closed angles. Management of this issue will therefore depend on correct use of waste rock material when completing outer surfaces of the backfilled pit WRLs. Other details for managing the risk of poor performance are the same as for WRLs.

Surface Water Flows Entering Backfilled Pits

Within each of the Mullet Pit and Barramundi-East Pit, local drainage from incident rainfall will be contained within the confines of the constructed landform itself. Note, a forecast undersupply of waste rock means a terminal sump can be retained in East Pit, and one is designed within Mullet Pit. Modelling 100-year synthetic climate data has shown that no overtopping of crests on these landforms would occur, with the design having the additional safety measure of not overtopping due to the resistant surface of the batters and the remnant void volume. The upper surfaces of the WRL will be back-sloped inwards to retain modelled rainfall events and vertical infiltration of incident rainfall. The berms will be designed and operated in accordance with section 21.4.

Surface flow analysis and mapping may be undertaken to determine if surface water is expected to pond against bunds. In areas ponding, the land surface will divert water away from the bund. This will be undertaken prior to abandonment bunds being constructed.

Visual Amenity

The location and outer surface design of the rehabilitated landforms have been designed to integrate with the surrounding landscape. Provenance vegetation species to be seeded will be matched to the surface treatment; so, it is expected that sustainable rehabilitation can be achieved, thus contributing to the visual amenity of the Island. The berm areas of the preferred WRL design have the potential to support woodlands that will provide a partial screen of the rocky batter slopes (from ground level) and improve the visual amenity values of the rehabilitated areas for visitors and from to the Island.

8.7 Considerations For Mine Closure Planning

The management of erosion and sedimentation are the primary closure-related concerns highlighted by the surface water assessment. Land condition (LFA), marine and monitoring of other factors would continue for a period post closure (section 22).

Mullet Pit will be backfilled to a design surface, leaving a storage sump for design runoff retention at its base (section 8.6/Reg ID 83724). Constructed drainage lines to reduce sediment yields from the WRL face will be considered; they may not be required, however, as batter slopes will be constructed from competent rock at an average slope $\leq 20^\circ$ surface water management around the WD1 toe / Main Pit crest would be required, as per the approved MP Reg ID 79171.

A constructed surface water channel may be required to direct surface water runoff from Catchment 2 to the desired outlet point (presently a stormwater sump adjacent to the Crusher / ROM Pad) after the disturbance areas have been ripped and rehabilitated. This may involve rock armouring of constructed drainage with competent rock (Soilwater Consultants, 2014d)

With regard to the crusher and ROM pad, in order to avoid undue erosion of these areas and facilitate drainage, some re-grading, channel, outlet construction may be necessary. This may allow Catchments 3a, 3b, 3c, and 3d to flow to the desired controlled outlet points (Soilwater Consultants, 2014d).

9 HYDROGEOLOGY AND GROUNDWATER

A baseline groundwater survey focused on developing a groundwater abstraction program was conducted by Aquaterra (2005). Previous work and drilling conducted by BHP on the Island has shown that there are three broad hydro-geological provinces, corresponding with the three main structural geology elements underlying the Island (i.e. the South Syncline, the Central Anticline and the North Syncline). The southern synclinal basin can be divided into two zones; an inland zone (which is used as a water supply area) and the ore body zone. These two zones are hydraulically isolated by an impermeable siltstone formation. An overview of the aquifers present on the Island is shown in **Figure 35** and described in **Table 13**.

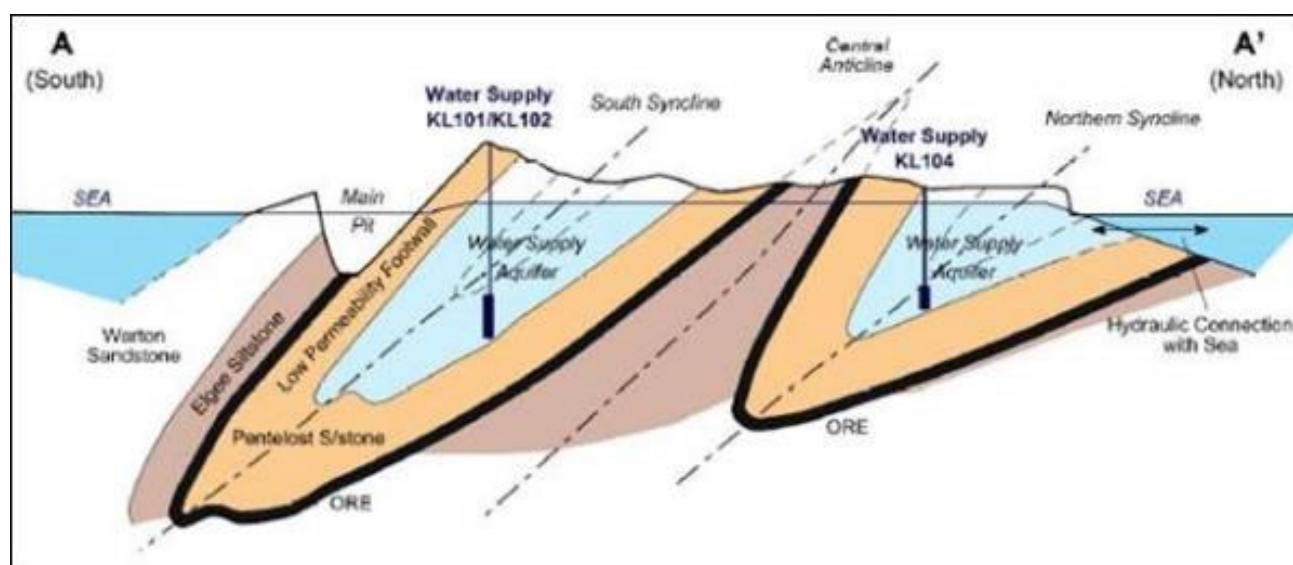


Figure 35: Conceptual hydrogeology of Koolan Island

Table 13 Properties of Koolan Island Aquifers

Formation	Unit/Member	Lithology	Hydrogeology
Pentecost Sandstone	Pentecost sandstone (footwall of Main Pit formation)	Sandstone inter-bedded with siltstone and schist; some conglomerate horizons	Main aquifer in Southern syncline; strongly fractured along regional bedding resulting in moderate to high permeability. Contains fresh groundwater over most of the Island
	Ore body (mineralised Yampi member)	Hematite enriched sandstone and siltstone	Moderate to high permeability along joints in sandstone unit. Originally a fresh water aquifer now likely to receive seawater
Elgee Siltstone	Elgee Siltstone (hanging wall of Main Pit formation)	Siltstone, schist to phyllite	Effectively impermeable, acts as a hydraulic isolation unit between North and South synclines and South syncline and the sea
Warton Sandstone	Arbitration cove quartzite	Inter-bedded quartzite and schist	Moderate to high permeability along bedding in quartzite. In direct hydraulic connection with the sea and contains brackish to saline water

Groundwater is highly-localised within fractured-rock aquifers. These aquifer systems, as seen from previous exploration, have a high degree of variability and the success of water supply is dependent on encountering one or more structure-related features. The localised and poorly-resolved extent of

the fracture systems means that these aquifers can be difficult to locate, manage and monitor (Hydroconcept, 2013).

Large-yielding bores (more than 20 L/s) are rare owing to the tightness of the geological structure and lack of significant fracture development. This is also highlighted with many drill holes, only metres away from yielding bores, being effectively dry as they did not encounter a permeable feature (Hydroconcept, 2013).

As there is potential for fracture systems to be readily dewatered, ongoing water-level monitoring is critical for assessing resource condition. This monitoring can be challenging as it requires the monitoring bore to be positioned within the same fracture system as the production bore for observing changes in the same aquifer (Hydroconcept, 2013).

Despite the broad-scale geological structure on Koolan Island being well resolved, there are localised structures that influence aquifer extent and development.

Potable water supply is currently obtained from three groundwater aquifers. The Northern Syncline (abstracted through Bore V01) is used for potable water supply to the mine accommodation village. The Southern Syncline (abstracted through Bore I01) is used predominantly for industrial purposes but does also supply potable water to the MOC. Monitoring Bore K3, located in the Central Anticline (originally constructed by BHP), was re-developed and in July 2011, becoming the primary potable water supply for the accommodation village.

Hydroconcept (2013) concluded that:

- contamination risk is very low owing to the tight and low-permeable nature of the hydrogeology;
- groundwater resources are associated with a localised, fractured-rock aquifer preventing the development of a meaningful, regional groundwater monitoring network;
- groundwater monitoring should focus on collecting frequent basic water quality and levels from production bores;
- saline intrusion and / or upconing could potentially impact water quality as one of the water supply aquifers (KL104) is hydraulically connected with the sea;
- the Southern Syncline is the most at risk of seawater intrusion owing to progressive deepening of the Main Pit. The northward movement of seawater will be minimal, however, as there is limited permeability across and between the stratigraphic units. There is some potential along the direction of the bedding (west to east); this is also considered a low risk owing to the tightness of the geological structure. In the temporary inundation of the main pit by seawater between 2014 and 2018, no seepage into this aquifer was evident, and
- there is potential for dewatering of fractured-rock aquifers as the fractures are highly localised and contain finite groundwater storage. While low rates of groundwater abstraction suggest that the risk of overexploitation is minimal, it is important to monitor water levels in the production bores as a protective measure.

These potential effects cease or largely reduce upon cessation of abstractions or full closure of the site. The risk to ambient groundwater quality on Koolan Island is considered very low due to the depth of aquifers, in the absence of contaminating or oxidation processes and associated inert geology (ref. Koolan Island Water Management Plan 2018).

9.1 Groundwater Management

A Koolan Island Water Management Plan (WMP) and Groundwater Operating Strategy (v2) study were submitted to the OEPA in June 2015, receiving approval for implementation on 25 September 2015, and a revised WMP was provided to DWER with the 2018 Compliance Assessment Report. KIO is currently implementing Version 5 of the WMP.

Bore and surface water quality testing is a requirement of both the EP Act Licence and the WMP. The Annual Aquifer report submitted in 2016 documented further changes to monitoring and reporting to align the WMP to groundwater monitoring conditions under the Environmental Operating Licence (L8148/2006/4) and the Koolan Island Drinking Water Quality Management Plan.

There are no targets, limits or conditions specified within Licence L8148 or the WMP relating to indirect emissions to groundwater. No injections or seepage of water to groundwaters is made by KIO. Groundwater aspects are managed under a Groundwater Operating Strategy and Water Management Plan approved by DWER EPA Services. The Project is not located within a “proclaimed area” under the *Rights in Water and Irrigation Act 1914* and is therefore not regulated by the Water Division of the DWER. Monitoring is undertaken to identify any potential changes to groundwater quality that may potentially have an effect on subterranean fauna.

The monitoring regime was adjusted in March 2016 to reflect the low risk of groundwater from site abstraction and operations on groundwater quality once the site entered C&M. Water quality monitoring is undertaken annually. Additional monitoring of production bores was undertaken in accordance with Groundwater Operating Strategy commitments approved by the DWER EPA Services. Licence L8148/2006/4 groundwater monitoring requirements are listed in **Table 14** and bore locations are shown in **Figure 36**.

Table 14 Licence L8148 / 2006 / 4 Groundwater Monitoring Program including bores sampled and water quality parameters.

Monitoring Bores	Water Quality Parameters		
V01 (M1)	Standing Water Level	Arsenic	Manganese
K9 (M3)	Electrical conductivity	Barium	Mercury
K3 (M4)	pH	Boron	Molybdenum
K2 (M5)	Total Recoverable Hydrocarbons	Cadmium	Nickel
K1 (M6)	Hardness	Calcium	Nitrate
K9 (M3)	Total Alkalinity	Chromium	Potassium
I01 (M10)	Total Nitrogen	Copper	Sodium
	Total Phosphorous	Iron	Sulphate
	Bicarbonate	Lead	Selenium
	Carbonate	Magnesium	Zinc
	Aluminium		

In 2021, KIO had Rockwater (Appendix C7) review Koolan Island hydrogeology and it considered that the production bores appeared to be operating sustainably based on generally stable water levels and water quality. Rockwater (2021) confirmed assignment of bores to northern, central and southern synclines.

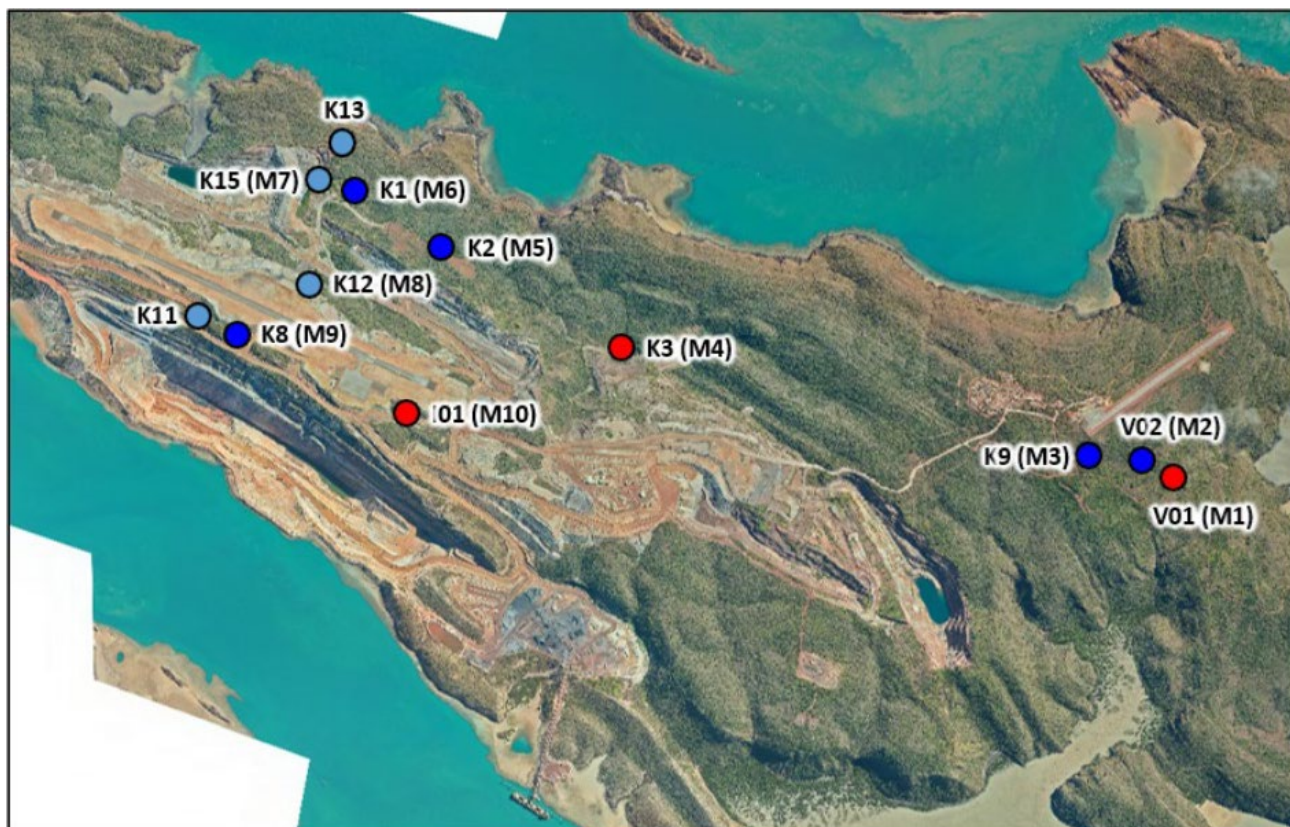


Figure 36 Location of Production Bores (red) and Monitoring Bores (blue)

9.1 Groundwater Level Monitoring

Groundwater levels are currently monitored at bores around the Island. Levels have fluctuated across and between years in response to abstraction and recharge associated with rainfall events (MGX, 2014). Water abstraction was higher in 2018 compared with previous reporting years due to the increased water demands of the mine restart and re-commencement of operations. There were no anomalies reported within groundwater monitoring results for 2018.

KIOP abstracts water for industrial and domestic purposes from production bores I01 (South Syncline Aquifer), V01 (North Syncline Aquifer) and K3 (Central Anticline). Total Abstraction from production bores was 91,289kL during 2018 and gradually increased through to 2021. Water usage data from 2014 to 2023 is presented in **Table 15** while changes in standing water levels from the base year and 2024 are shown in **Table 16**.

Table 15: Groundwater abstraction volumes 2014 - 2023

Years	Volume (m ³)			
	I01 (M10)	V01 (M1)	K3 (M4)	Total
2015	31,485	10,998	30,003	74,501
2016	11,978	11,081	20,759	45,834
2017	25,611	20,654	23,107	71,389
2018	41,567	17,124	30,580	91,289
2019	50,639	252	54,830	105,721
2020	66,133	1,000	63,100	130,233
2021	73,528	2,193	78,335	154,056
2022	66,699	6,493	60,339	133,531
2023	74,158	6,383	71,768	152,309

Table 16: Groundwater bore standing water levels – base year and 2024

Syncline	Bore Id	Coordinates		Elevation – RL (mAHD)	Base SWL - RL (mAHD)	17/03/24 SWL (mAHD)
		mN	mE			
Southern	I01	8216509	579433	136.5	24.1	129.40
	K8	8216906	578608	136.1	75.3	48.360
Northern	V01	8216195	583445	137.1	17.1	120.44
	K9	8216263	583047	145.8	28.3	108.40
Central	K3	8216860	580563	38.7	22.3	11.40
	K1	8217612	579148	97.6	13.9	74.80
	K2	8217331	579676	107.5	19.6	79.08

9.2 Groundwater Quality Monitoring

Historical groundwater quality data are limited in availability. Salinity was measured in previous groundwater resource exploration work conducted by Tahal Consulting from 1978 to 1981 in both the northern and southern syncline aquifers (GHD, 2010). The water encountered was essentially fresh with chloride concentrations ranging from 60 mg/L to 240 mg/L. An exploration bore interpreted as intercepting the freshwater mound / saline sea water interface near the southern coastline reported 1,500 mg/L of chloride.

There are no results indicating a significant change in aquifer chemical quality characteristics triggering monitoring requirements for potential effects on subterranean fauna and stygofauna or requiring further investigation.

All water sampling undertaken at Koolan Island conformed with site procedures aligned to the applicable Australian Standards (AS/NZS 5667). The groundwater sampling procedure employed at KIO has previously been submitted to the DWER. Samples were dispatched for offsite analysis at a NATA accredited laboratory in Perth (SGS Laboratories). Copies of laboratory reports and chain of custody forms for annual groundwater monitoring are available on request.

As part of the closure planning process KIO are undertaking a review of all groundwater data collected to date to understand any statistical trends and undertake a tier 1 risk assessment. This will provide insights into the groundwater quality and potential post mining land uses.

9.2.1 Southern Syncline Aquifer

Standing water level measurements were limited during the reporting year. Monthly dips were taken at I01 (M10) showed some variation in standing water level at the production bore between 123mBGL in October 2021 to 130mBGL in November 2021. K8 (M9) had not been sampled since December 2019 due to it being lost due to collapse. The bore was recorded at 86.1mAHD in December 2019. During the reporting period the bore was unearthed and cleared, recording a standing water level (SWL) of 87.5mAHD and water samples being obtained October 2021.

The depth to groundwater at I01 (M10) may be attributed to increased abstraction rates from the bore during 2021 that were greater than preceding years; however, rainfall for the 2020-21 wet season was higher than in the 2019-2020 season suggesting higher recharge rates. Also, the SWL for IO1 Bore (M10) was obtained whilst the pump was running which may have also affected the result.

The pH results for IO1 (M10) remained consistent with previous years at 4.5 compared to 4.2 in the previous year. Since 2014 pH at the IO1 (M10) bore has varied from 4.1 to 5.2 with an average of 4.5. The aquifer is acidic and results were typical. Conductivity was relatively consistent over the reporting period and preceding two years at 1100 $\mu\text{S}/\text{cm}$. TSS remained steady at $<5\text{mg}/\text{L}$. Conductivity and salinity values suggest that groundwater in the Southern Syncline remains fresh but acidic. There has been a trend for acidity and conductivity to increase however the changes are slight.

The aquifer is separated from the ocean by an apparent impermeable layer of siltstone. Despite the inundation of the Main Pit in 2014, there has been no evidence of saltwater intrusion into the aquifer as indicated by these and historic results. Field testing has shown no significant change in conductivity or pH as indicators of water quality in IO1 (M10) Bore since mining operations recommenced.

Geochemistry results for metals and organics were unremarkable and characteristic for the aquifer. Total phosphorous in IO1 (M10) showed a decrease in October 2021 of $0.13\text{mg}/\text{L}$ compared to $2\text{mg}/\text{L}$ in July 2020 and $2.2\text{mg}/\text{L}$ in November 2020. Total phosphorous in K8 (M9) was $0.23\text{mg}/\text{L}$. Results from 2020 appeared to be isolated to the IO1 (M10) bore and could have been related to adhesives used during pipe repairs on the bore in 2020.

Using the Australian Drinking Water Guidelines (ADWG) as a standard for water quality the southern syncline aquifer meets health criteria for dissolved metals except for Barium which is characteristically at or above $4.5\text{mg}/\text{L}$ in all years measured and attributed to surrounding geology. In 2021 the result for Barium at IO1 (M10) Bore was $5.5\text{mg}/\text{L}$ and $2.4\text{mg}/\text{L}$ at K8 (M9) Bore. Total Recoverable Hydrocarbon (C10-C36) levels were below limits of detection.

9.2.2 Northern Syncline Aquifer

In July 2019, the V01 (M1) bore was placed into reserve and K3 (M4) bore provided camp water supplies. SWL in V01 (M1) did not vary significantly during 2021. Measurements for standing water level ranged from 20.4 to 22.7m AHD. The SWL for K9 (M3) bore was 35.0m AHD in October 2021 compared to the SWL of 28.2m AHD in November 2020.

Water quality for the V01 (M1) Bore and K9 (M3) Monitoring Bore did not show significant change from previous years. Values for pH were pH 5.5 for V01 (M1) in 2021 compared to pH 5.2 in 2020 and 5.7 in 2019. Conductivity in V01 (M1) bore continued to lower in 2021 at $520\text{ }\mu\text{S}/\text{cm}$ compared to $590\text{ }\mu\text{S}/\text{cm}$ in 2020 and $640\text{ }\mu\text{S}/\text{cm}$ in 2019. The pH levels at K9 (M3) were consistent at 6.3 in 2021 compared to pH 6.4 in 2020 and pH 6.6 in 2019. Conductivity remained almost constant from the previous year with a value of $1100\text{ }\mu\text{S}/\text{cm}$. The water quality is fresh and moderately acidic, characteristic of the Northern Syncline aquifer.

Geochemistry results for metals were unremarkable and characteristic for the Northern Syncline Aquifer. The presence of metals in V01 (M1) appear local to the bore. Hydrocarbon (C10-C36) levels were below detection limits.

9.2.3 Central Anticline Aquifer

The Central Anticline showed no significant changes during the reporting period based on measurements taken from K3 (M4) Production Bore and K1 (M6) and K2 (M5) Monitoring Bores. The K3 (M4) Bore continued to be used as the primary source for Village drinking water in 2021. K1 (M6) was unable to be sampled in 2021 due to it being dry.

In October 2021, SWLs for most monitoring bores showed no significant difference to previous years. K2 (M5) bore was 25.2m AHD in October 2021 compared to 22.2m AHD in November 2020

and 23.9m AHD in November 2019. K3 (M4) SWL lowered five meters from 2017 to 2020. However, results in October 2021 at 24.60 mAHd appear to have rebounded. Previous recordings include SWLs at 20.9mAHd in November 2020, compared to 21.7mAHd in November 2019, 24.9mAHd in August 2019 and 26.49mAHd in July 2017 when the bore was offline. The K3 (M4) Bore was in furlough from May 2016 until June 2017.

Water quality results were unremarkable and typical of the aquifer. The Central Anticline is weakly acidic. The pH value in K2 (M5) was pH 4.4 and identical to the figure in 2020. K3 (M4) also had an identical pH to last year's figure of 4.1. Conductivity also remained consistent in 2021 compared to previous years. While no recording was taken for 2021, K1 (M6) conductivity has on average been 900 $\mu\text{S}/\text{cm}$ from 2014 to 2020, compared to an average of 700 $\mu\text{S}/\text{cm}$ at K2 (M5) for the same period. The result for K2 (M5) in 2021 was slightly lower at 500 $\mu\text{S}/\text{cm}$. K3 (M4) Bore was 1,000 $\mu\text{S}/\text{cm}$. Regardless these results indicate that the aquifer remains characteristically fresh.

Geochemistry results for K2 (M5) did not vary widely from previous years for any parameters. The water quality in both monitoring bores meet ADWG health criteria. Water quality in K3 (M4) Bore met ADWG apart from manganese (0.87mg/L) which exceeded ADWG health criteria (0.5mg/L). Manganese in K2 (M5) was 0.30mg/L. This result does not vary from previous years and associated with surrounding mineralogy. Results for Total Recoverable Hydrocarbons (TRH) were below detection limit in all bores tested.

9.3 Considerations For Mine Closure Planning

Monitoring of groundwater levels and quality to date demonstrates the groundwater resource has not been adversely affected by production water abstraction and pit dewatering associated with mining operations. Today, fresh water expressing on the Main Pit floor is hosted in an ore body aquifer. The daily removal of surface water from Main Pit does not result in a lowering of the southern syncline aquifer as very low permeability of Pentecost sandstone serves as an aquitard. This means that the southern syncline aquifer will not leak and mix with the Main Pit upon re-flooding with seawater.

KIO will continue to monitor ground water levels and quality in accordance with the approved Water Management Plan under MS 715, as well as Licence 8148/2006/4 and the planned ground water monitoring schedule.

To ensure that the groundwater quality meets the post closure requirements KIO is undertaking a risk-based assessment process. Once a definitive post closure land use is selected the synergistic tier 1 groundwater assessment limits be applied, all analytes below the applicable guidelines will be considered suitable for the post mining land use.

Any analytes that exceed the guidelines will be compared to the baseline groundwater concentrations, if the post closure concentrations are within two (2) standard deviations of the pre-mining concentration these will be considered to be unimpacted by mining and therefore not require further analysis.

Should any analytes fail both of these tests a tier 2 risk assessment will be undertaken to understand the risk quotient of the analyte of concern, this will determine based on local conditions and specific toxicological data if the analyte is suitable for the proposed post closure scenario.

Should any analytes still remain above the risk threshold KIO will implement further measures to either determine the water is suitable for the post closure usage, actively manage the water via a site management plan or actively remediate to improve water quality. Based on current

groundwater chemistry results KIO believes that it is unlikely that any analytes will exceed tier 2 risk thresholds. Monitoring methodology and criteria are outlined in Section 22.3.

10 FLORA AND VEGETATION

10.1 Baseline Flora Data

Early flora inventories were compiled following closure of BHP's operations (Keighery, G. J., Gibson, N., Kenneally, K. F. and Mitchell, A. A., 1995). As part of the baseline studies Conservation Significant flora was mapped in 1995 (Ecologia, 2005). Initial surveys identified a total of 282 species from 79 families forming five major vegetation units, including: open woodland, very open woodland, vine forest, mangroves and beach. 12 new naturalized alien flora species were identified post-closure of the BHP mine-site operations (Keighery, G. J., Gibson, N., Kenneally, K. F. and Mitchell, A. A., 1995).

The dominant *Eucalyptus miniata* - *Corymbia* spp. open woodlands over *Triodia* hummock grassland covers > 80 % of the non-disturbed area of the Island and is a common vegetation unit on the mainland (Beard, 1979). The understorey was composed of a diverse herb layer with species such as *Tacca leontopetaloides* and *T. maculata* being common. The density of shrubs in this community is variable but several species of *Terminalia* and *Acacia* are common.

The floristic communities of Koolan Island are well represented on the mainland, and fairly uniform across the Island (Ecologia, 2005). Noxious weeds were a problem, with several highly invasive weeds, most notably *Passiflora foetida* (Stinking Passionfruit) which is invasive in moist habitats of naturally vegetated gullies, and across rehabilitated areas.

The local variation in floristic composition within the dominant *E. miniata* open woodland (e.g. *Callitris intratropica* groves) does not appear to be correlated to slope, aspect or underlying soil materials across the Island.

Subsequent surveys by KIO have confirmed several priority species 'sightings' of past surveys, including *Eucalyptus kenneallyi* (P1) and have reconciled previously misidentified *Acacia* spp. (e.g. *A. pyrifolia*).

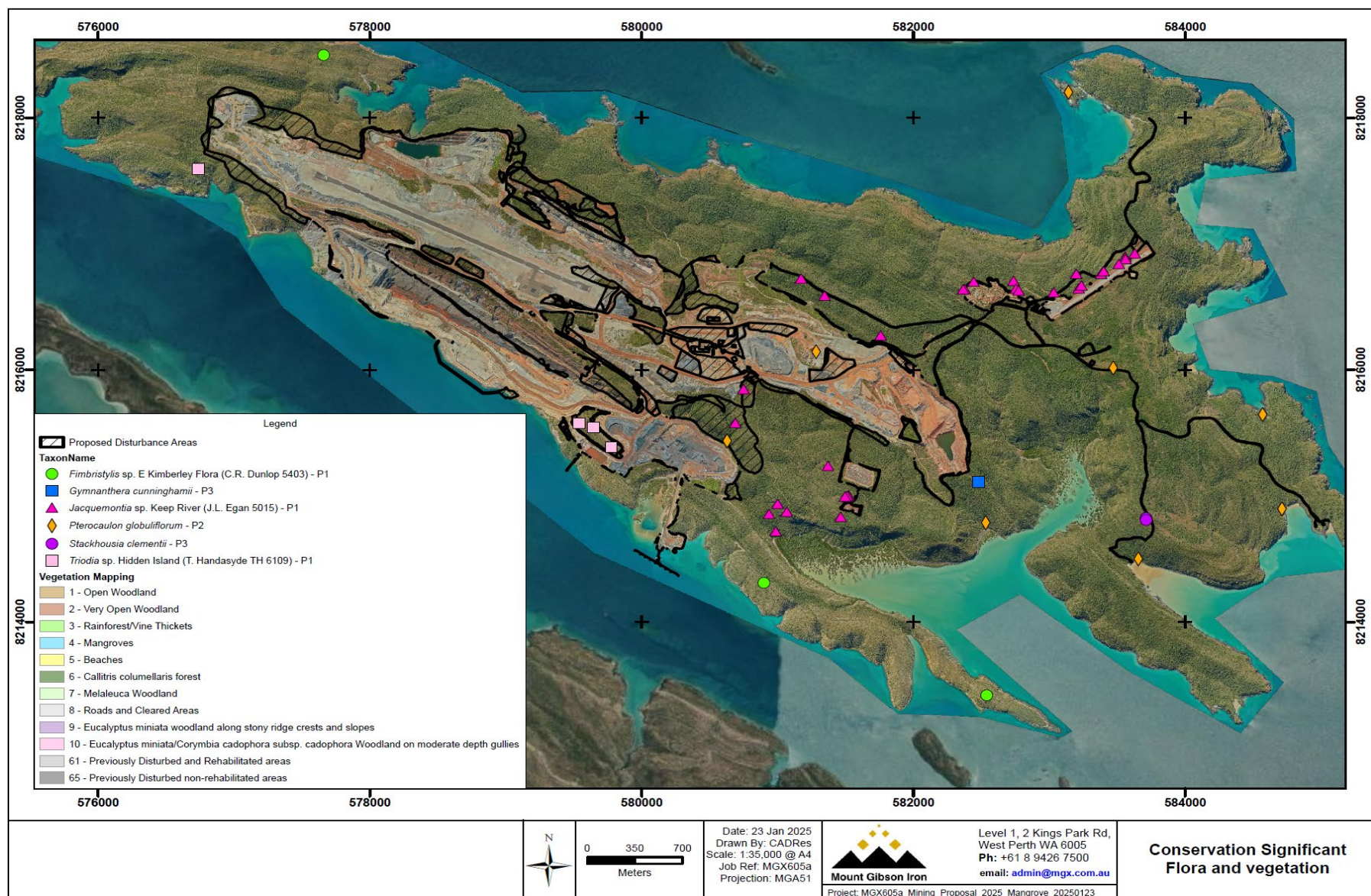


Figure 37 Conservation Significant Flora at Koolan Island

10.2 Species Selection

Species selection for revegetation will be comprised of those that provide a mix of functions including colonisation, stabilisation, organic enrichment and soil nutrition, and tolerance to low water and high desiccation. One long term plant monitoring trait is height, however the establishment of species in emerging areas is also important. Areas subjected to progressive rehabilitation and fire activity provide valuable indicators of species which proliferate in emerging areas (Soilwater Consultants, 2015a).

The selection of framework species for use in progressive rehabilitation has considered the following:

- Species mix which provides a range of plant growth forms;
- Species present in rehabilitation trials provides confidence that germination within disturbed waste rock material is plausible;
- Inclusion of species selected for trait analysis monitoring (which underwent similar selection processes) to extract maximum value from the database being built upon through ongoing monitoring; and
- Species which are known to have adapted to conditions similar to those which will exist in areas targeted for rehabilitation.

Based on this, provenance species selection at Koolan Island is to be biased towards those which have adapted to thin soil cover and low water requirements (Soilwater Consultants, 2015a). Animal Plant Mineral Refined this list in 2020. This has led to the following target species list:

- *Cajanus marmoratus*
- *Ampelocissus acetosa*
- *Cassytha filliformis/candida*
- *Arivela viscosa* (formerly *Cleome viscosa*)
- *Triodia bynoei*
- *Triodia microstachya*
- *Triodia bitextura*
- *Acacia hippuroides*
- *Acacia multisiliqua*
- *Acacia stigmatophylla*
- *Dodonaea hispidula*
- *Templetonia hookeri*
- *Grevillea agrifolia*
- *Petalostigma quadriloculare*
- *Senna goniodes*
- *Jasminium didymum*
- *Triodia microstachya*
- *Triodia bitextura*
- *Acacia colei*
- *Acacia monticola*
- *Acacia tumida*
- *Grevillea pyramidalis*
- *Acacia amplex*

This species list may alter in time depending on the abiotic factors for specific areas subjected to rehabilitation trials.

10.3 Invasive Species

The locations of weeds prior to KIO operations are shown in **Figure 38**. As part of requirements under MS 715 and the KIO Quarantine Management Plan, Island wide surveys for weeds has been undertaken since the commencement of operations. The most recent weed survey was by AECOM (2022) (Appendix C8) post wet season.

Thirty-six (36) weed species were recorded and mapped during the 2022 program (AECOM, 2022). One weed species has not been previously documented on the island, namely, *Aloe vera*. Their populations were scarce and small within the Old BHP township footprint.

This latest work included an inventory of flora species recorded by Department of Conservation and Land Management (CALM) in 1993 (Keighery, G. J., Gibson, N., Kenneally, K. F. and Mitchell, A. A., 1995), and the baseline flora and vegetation assessment undertaken by Ecologia between 2003 and 2004 (Ecologia, 2005) reporting 41 and 36 weed species respectively. This was before the approved project under MS715 commenced as shown in **Figure 39** while **Table 17** lists the current weed inventory.

Annual weed monitoring was carried out by APM from 2015, and Ecologia and MBS Environmental (MBS) in previous years. Each survey had conclusively shown that the weed populations appear to be concentrated in and around the old BHP townsite and disturbance areas.

Following the closure of the BHP townsite, it was thought that weed invasion and spread would cease throughout the dry season and in the absence of sewage water discharge (Keighery et al., 1995). Of course, the island has not been without ongoing disturbance, however, that theory of weed reduction is disproven. The BHP townsite continues to be densely infested with all weeds originally as recorded (with a few exceptions such as African Tulip Tree and Candle Bush).

The current effects observed from weed occupation is the displacement of native species and a hinder on recent and planned rehabilitation. In particular, the Stinking Passion Vine smothers regenerating native vegetation on rehabilitated landforms and from there extends into adjacent native vegetation.

The key weed species associated with mine closure for successful rehabilitation outcomes is Stinking Passionflower (*Passiflora foetida*). The 2018 weed survey indicated this weed is abundant at various sites, with the report finding the species to be "has spread significantly since 2007" (Mount Gibson Iron, 2018). Stinking Passion Flower is generally constrained by soil moisture. Following rains the plants grow vigorously and tend to form monocultures where moisture is abundant through the year. The distribution of Stinking Passion Flower also appears to be very strongly correlated with the presence of artificial barriers to natural water flow: Windrows along roadsides, moonscape legacy rehabilitation and abandonment bunds around the mine pits. These artificial mounds of unconsolidated material hold water for longer than the normally skeletal soils and give the passion vine soil medium in which to establish a more robust root mass. BHP legacy areas including old stockpiles, waste dumps and rehabilitated areas tend to present the highest occurrence of Stinking Passion Flower.

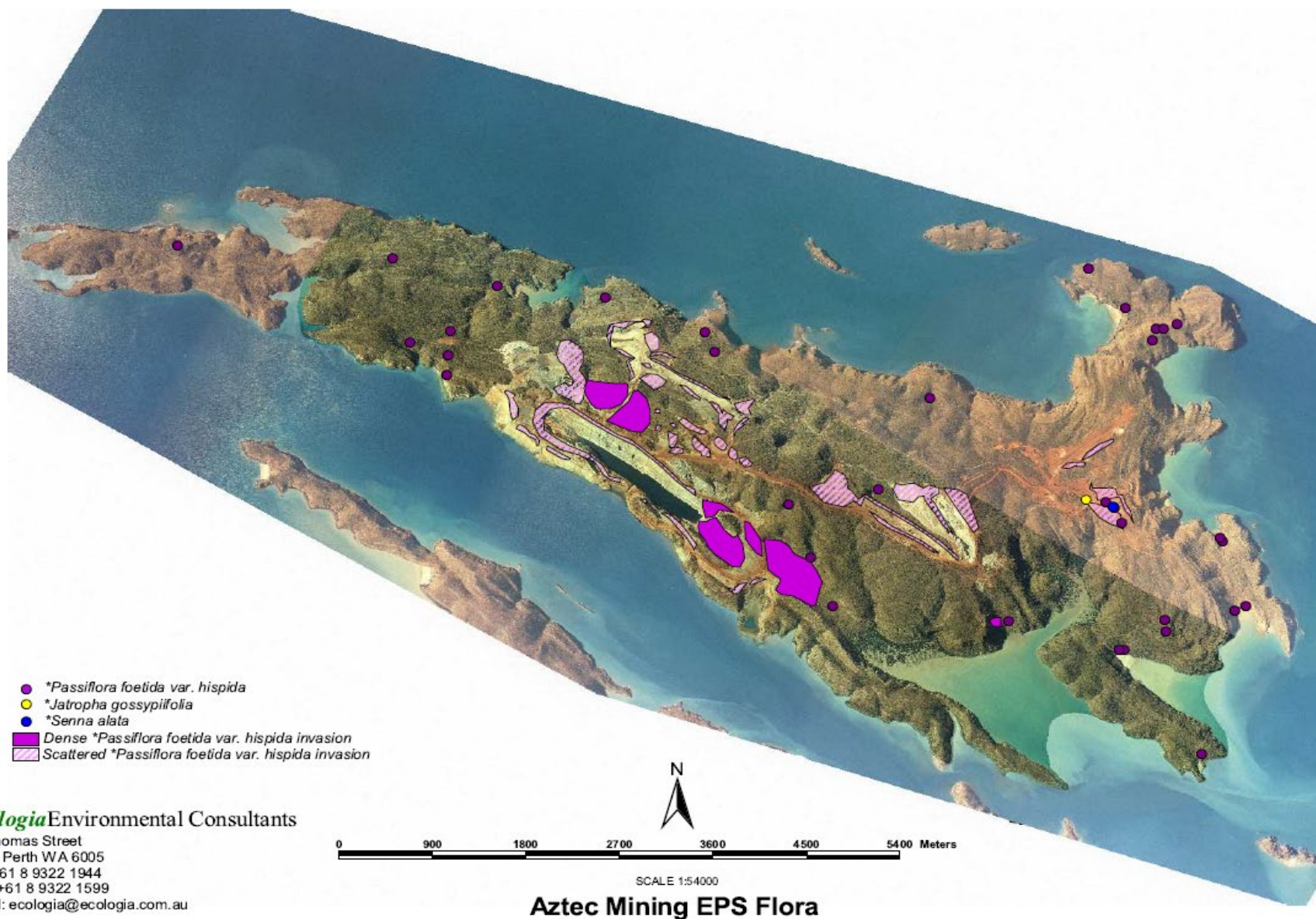


Figure 38 Weed Locations (2005) Prior to Mining under MS715

Table 17: Weeds recorded during 2022 weed monitoring (AECOM, 2022)

Taxon	Common Name	National Weed Status	EWSWA Rating	Location	Extent	Known on the Island
Declared Pest Species						
<i>Calotropis procera</i>	Calotrope	Declared Pest - s22(2) (Exempt)	High	Port, conveyor and laydown	2 pop., 1 mature and 4 juveniles, Figure 2	Yes ³
<i>Cryptostegia madagascariensis</i>	Rubber Vine	Declared Pest - s22(2) (Exempt)	Moderate	BHP townsite	1 pop., 34 locations, Figure 2	Yes ^{1, 4}
<i>Jatropha gossypifolia</i>	Bellyache Bush	Declared Pest - s22(2), WONS	Unlisted	BHP townsite, major gully	3 pop., 17 locations, Figure 2	Yes ^{1, 3, 4}
Target Species						
<i>Arundo donax</i>	Giant Reed		Low	BHP townsite	2 locations	Yes ^{2, 3}
<i>Cenchrus pedicellatus</i> subsp. <i>unispiculus</i>	A variety of Annual Mission Grass		Unrated	Edge of footprint	Widespread, mostly 'thickets' Figure 6	Yes ^{1, 3}
<i>Gliricidia sepium</i>	Mexican Lilac		Low	BHP townsite	Widespread, mostly 'thickets' from 100 locations, Figure 7	Yes ^{1, 3, 4}
<i>Leucaena leucocephala</i> subsp. <i>leucocephala</i>	Leucaena / White Lead Tree		Moderate	BHP townsite, major gullies, KIO camp, edge of footprint	Widespread thickets, 190 locations, Figure 3	Yes ^{1, 3, 4}
<i>Mesosphaerum suaveolens</i>	Hyptis		Moderate	BHP townsite, edge of tracks, gullies	Widespread, 268 locations, Figure 4	Yes ^{1, 3, 4}
<i>Passiflora foetida</i>	Stinking Passion Flower		High	Edge of footprint across entire island	703 locations including single individuals and thickets, Figure 5	Yes ^{1, 3, 4}
Other Species						
<i>Acacia auriculiformis</i>			Unlisted	BHP townsite and access track	1 pop, 29 records, with 'few' individuals at each location	Yes ¹
<i>Agave americana</i>	Century Plant		Low	BHP townsite	4 pop., small patches of 10+ individuals	Yes ¹
<i>Ailanthus altissima</i>	Tree of Heaven			BHP townsie	1 individual	No

Taxon	Common Name	National Weed Status	EWSWA Rating	Location	Extent	Known on the Island
<i>Aloe vera</i>	Aloe Vera		Unlisted	BHP townsite	7 patches of 5-10 individuals	No
<i>Alternanthera brasiliana</i>			Unlisted	BHP townsite	1 pop.	Yes ³
<i>Antigonon leptopus</i>			Low	BHP townsite	1 pop., 5 locations of 'few' to 'many'	Yes ¹
<i>Bauhinia corymbosa</i>	Butterfly Vine		Unlisted	BHP townsite	6 locations of 1 to 'few' individuals	Yes ¹
<i>Bidens bipinnata</i>	Bipinnate Beggartick		Unrated	Along access track	1 location adjacent to KOI camp.	Yes ^{1,4}
<i>Bougainvillea</i> sp.	Bougainvillea		Unlisted	BHP townsite	1 location	Yes ¹
<i>Cascabela thevetia</i>	Yellow Oleander		Unlisted	BHP townsite	15 locations of 1 to 'few' individuals	Yes ^{1, 4}
<i>Cassia fistula</i>	Golden Shower Tree		Unlisted	BHP townsite	15 locations of 1 to 'few' individuals	Yes ^{1, 4}
<i>Cenchrus ciliaris</i>	Buffel Grass		High	Edge of footprint, KIO camp, BHP townsite and east pit	5 pop. of 'few' to 'ticket'	Yes ^{1,4}
<i>Cenchrus setiger</i>	Birdwood Grass		High	Edge of footprint, rehabilitation areas	Widespread, up to 7 populations of 'many and 'thickets'	Yes ^{1, 4}
<i>Chloris barbata</i>	Purpletop Chloris		Low	BHP townsite, edge of footprint	Widespread, 45 locations of 'few' to 'many'	Yes ^{1, 4}
<i>Clitoria ternatea</i>			Moderate	BHP townsite, three major gullies, one beach.	Widespread, 36 locations of 'few' to 'many'	Yes ^{1, 4}
<i>Cynodon dactylon</i>	Couch		Moderate	Airstrip	1 pop., 1 location of 'few'	Yes ¹
<i>Delonix regia</i>	Royal Poinciana		Unrated	BHP townsite, KIO camp, edge of footprint	1 pop. (assumed), 51 locations	Yes ¹
<i>Distimake dissectus</i>	Vine		Low	BHP townsite, major gully along east pit	2 pop. 107 records	Yes ^{1, 4}

Taxon	Common Name	National Weed Status	EWSWA Rating	Location	Extent	Known on the Island
<i>Echinochloa colona</i>	Awnless Barnyard Grass		Mild		1 pop. 'few' individuals	Yes ^{1, 4}
<i>Euphorbia cyathophora</i>	Painted Spurge		Low	BHP townsite	1 pop. (assumed), 9 locations	Yes ^{1, 4}
<i>Euphorbia hirta</i>	Asthma Plant		Moderate	BHP townsite	1 pop. (assumed), 6 locations	Yes ^{1, 4}
<i>Ixoria ?coccinea</i>	Flame of the Woods		Not listed	BHP townsite	Two individuals	No
<i>Macroptilium lathyroides</i>	Phasey Bean		Low	BHP townsite	1 pop., 1 location of 'many' individuals	Yes ^{1, 4}
<i>Magnifera indica</i>	Mango		Unlisted	BHP townsite	1 pop., 1 location of 'few' individuals	Yes ³
<i>Melinis repens</i>	Natal Grass		Unrated (different to unlisted)	BHP townsite, edge of tracks, footprint	Widespread, 1 pop. (assumed), 217 locations	Yes ^{1, 4}
<i>Nerium oleander</i>	Oleander		Unlisted	BHP townsite	1 pop., 1 location of 'few' individuals	Yes ³
Onion sp.	Onion		Unlisted	BHP townsite, planted	6 locations of 'few' individuals	NA
<i>Stylosanthes scabra</i>	Stylo		Mild	BHP townsite, tracks	1 pop. (assumed), 193 locations of 'few' to 'many' individuals	Yes ^{1, 4}
<i>Tamarindus indica</i>	Tamarind		Low	BHP townsite	1 pop., 4 locations including seedlings and adults	Yes ¹
<i>Tecoma stans</i>	Yellow Bells		Low	BHP townsite, tracks	1 pop. (assumed), 66 locations of 'few' to 'many' individuals	Yes ^{1, 4}
<i>Tridax procumbens</i>	Tridax		Moderate	Edge of footprint, KIO camp	5 pop, 13 locations of 'few' to 'many' individuals	Yes ^{1, 4}

¹AECOM (2022), ²Ecologia (2005), ³APM Annual Weed Survey (2018-2021), ⁴Koolan Island Herbarium, ⁵Keighery et al. (1995)

Stinking Passion Flower is spread by *Cacatua sanguinea* (Little Corella) and *Dasyurus hallucatus* (Northern Quoll) feeding on the fruit, and also vehicle movement. The number of West End populations increased significantly following exploration drilling in 2012.

Webber *et al.* (2014) published a report which included data collection from research plots established on Koolan Island. This report concluded that control of Stinking Passion Flower is unlikely to be effective using conventional methods such as spraying and manual removal while conditions remain favourable for regeneration.

10.3.1 Passiflora eradication programme (CSIRO)

CSIRO are currently trialling a biological agent to act as a control on Stinking Passionflower in Northern Australia. CSIRO was commissioned in 2021 and commenced in August 2022 to further assess the control options as part of its regional study.

Targeted control of weeds using herbicides and manual removal is undertaken at Koolan Island in areas of infestation, focussing on infrastructure and areas under rehabilitation. Target species include declared weeds species near the airport and environmental weeds such as annual grasses, *Passiflora foetida* and *Leucaena leucocephala* in the Mining areas and Village.

The key weed species associated with mine closure for successful rehabilitation outcomes is Stinking Passionflower (*Passiflora foetida*), which is generally constrained by soil moisture. Distribution appears to be very strongly correlated with the presence of artificial barriers to natural water flows. A key management measure is therefore minimising land forming and other activities that impede surface flows, causing the formation of ponds, soaks, and other artificially damp areas. Other key management measures include treatment of weed infested topsoil stockpiles prior to spreading.

CSIRO is currently assessing the viability of using any of four insect enemies leaf sucking mirid, a stem galling weevil, a leaf feeding beetle, and leaf sucking stilt bugs (**Figure 40**). The four insects are at various milestones of testing and require clearance of strict quarantine requirements. The four insect enemies have all shown promise during international field research or isolated lab testing (CSIRO, 2024).

Research into Northern Quoll dietary requirements shows evidence in scat samples that *P. foetida* fruit is a source of food and moisture. Research opportunities to provide further data on a potential relationship between Northern Quoll and weeds on Koolan Island is being considered. Bird life is often observed feeding on the *P. foetida* fruit, contributing to the spread of the weed seeds.

10.4 Seed Program

Opportunistic seed collection has occurred across site over many years in readiness for the application onto cover systems to activate germination of vegetation taxa of local provenance. Seed holdings are described in APM (2020b) (Appendix C9) and amount to 121kg, this figure has been refined by site staff based on collection and usage; up-to-date figures are managed using the TytonEI system.



Figure 40: Insect enemies of stinking passionflower currently under testing include (a) a leaf sucking mirid (*Engytatus passionarius*) from Argentina, (b) a stem galling weevil (*Philonis inermis*) from Columbia, (c) a leaf feeding beetle (*Cacoscelis* spp.) from Brazil, and (d) leaf sucking stilt bugs (*Pronotacantha* sp.) from Colombia.

Native seeds have again been actively collected in 2024 by site environmental staff and Dambimangari cultural rangers. The seed collection program aims at ensuring the following factors are met:

- Use a targeted list of plant species suitable for seed harvesting that provides optimal rehabilitation results and meets cultural interests.
- Collect available seed at optimal times based on a collection calendar.
- Review of MGX seed management documents and procedures and update to align with completion criteria.
- Topsoil and growth medium stockpile audit and nursery trials.
- Nursery viability and treatment trials of seed.
- Opportunistic direct seeding rehabilitation trials using collected seed.
- Collaboration with rangers from the Dambimangari Aboriginal Corporation.

A major aspect of the 2023 seed program was a germination trial that is currently underway to assess the ability of locally collected native species to germinate within an Elgee siltstone growth medium applied at different depths across a 2.56Ha slope. This trial included the direct seeding of 17.97kg of seed at a rate of 7kg/Ha. The Elgee siltstone trial was developed to find a solution to limited topsoil stocks that exist across site, and if successful will allow optimum rehabilitation results by direct seeding thus reducing the need for pelletised seed dispersal.

Supplementary (or infill) seeding may also use pelletized seeds as an action to correct underperforming re-vegetation in already rehabilitated areas. Pelletized seed mixes have been created, and in some cases, used. This could be targeted to include certain taxa in canopy strata which are under-represented i.e. groundcover, trees etc. The benefits of pellets include an economic use of seed amounts and a proven higher germination rate.

10.5 Considerations for Mine Closure Planning

The vegetation associations are well understood on Koolan Island. The numerous survey efforts have resulted in thorough mapping of species and communities. As such a broad selection of species have been identified as keystone species in rehabilitation and have been selectively targeted for seed collection. Seed collections has been ongoing for some time and stores are continuously being updated, however, the volumes of seed required for rehabilitation currently exceed available stores. In an effort to reduce the shortfall several potential seed collection options are being assessed, including labour hire of additional Traditional Owners, palletised seed and commercial options.

Rehabilitation, to date, has shown promising results and meeting completion criteria for vegetation metrics. Rehabilitated revegetation has been one of the most researched topics relating to the closure of Koolan Island and result indicate that with a suitable growth media vegetation has a strong recovery rate.

Weeds, in particular *P. foetida*, are one of the main concerns of impact to rehabilitated vegetation. The vine aggressively grows over vegetation and smothers competition, leading to reduced resources for native vegetation to establish and thrive. *P. foetida* is a legacy issue that was present on the Island prior to the commencement of the modern KIO operations. There have been efforts to eradicate Passiflora vine, however, these are in its infancy and require substantial advancement (which is beyond the control of KIO) to reach maturity. Weed monitoring and eradication actions will continue, however, given the ambient weed load of Koolan Island complete eradication is implausible.

11 VERTEBRATE FAUNA

A total of 93 species of vertebrate fauna were recorded within Koolan Island. These species comprised 6 mammal, 60 bird, 25 reptile and 2 amphibian species. A desktop literature review was also conducted and yielded 169 vertebrate fauna species. These species comprised 18 mammals, 116 birds, 1 amphibian and 35 reptiles.

Several fauna species of conservation significance have been recorded on Koolan Island, such as the Red Goshawk (*Erythrotriorchis radiatus*), Ghost Bat (*Macroderma gigas*), Saltwater Crocodile (*Crocodylus porosus*), Northern Quoll (*Dasyurus hallucatus*), White-bellied Sea-Eagle (*Haliaeetus leucogaster*) and the Eastern Reef Egret (*Egretta sacra*) (Ecologia, 2012). Of these species three mammal species of conservation significance listed by the International Union for Conservation of Nature and Natural Resources were recorded including the Northern Quoll (*D. hallucatus*) (Endangered), the Red Goshawk (*E. radiatus*) (near Threatened), and the Ghost Bat (*M. gigas*) (Vulnerable).

The Orange Leaf-nosed Bat (*Rhinonicteris aurantia*) is listed as vulnerable under the EPBC Act. This species was caught on Koolan Island in 1965 in the Japanese sea tunnels which have since been destroyed. Further survey work by McKenzie and Fontanini et al. (McKenzie, N. L., Fontanini, L., Lindus, N. V. and Williams, M. R., 1995) and Ecologia (Ecologia, 2005) failed to record this species and it is unlikely this species is still found on the Island. The Gouldian Finch (*Erythrura gouldiae*) is listed as endangered under the EPBC Act. The range of this species has declined significantly in recent years and previous records on Koolan Island are from a single observation in 1978 (McKenzie, N. L., Fontanini, L., Lindus, N. V. and Williams, M. R., 1995). Therefore, it is unlikely that this species is still found on the Island.

The project area encompassed habitats and vegetation associations which are widespread throughout the region. Some of the species listed in the CALM Priority are considered regionally significant because of limited knowledge about their distribution and / or poor representation within existing conservation reserves.

11.1 Northern Quoll

The Northern Quoll is a nocturnal, carnivorous marsupial and the smallest of Australia's four quoll species.

11.1.1 Regional context

The Northern Quoll previously occurred across northern Australia but now exists in distinct populations in the Pilbara, Kimberley, Northern Territory and Queensland. Although there has been widespread historical gradual decline in Northern Quoll populations, Cane Toads are now considered the greatest threat. Immediately following colonisation of an area by Cane Toads the Northern Quoll population rapidly declines due to poisoning from consuming Cane Toads (Commonwealth of Australia, 2016). The rapid decline has been sequential from Queensland, across Northern Territory and west towards the Kimberley. This decline has resulted in the virtual extirpation of the species from former main strongholds in the Northern Territory. In 2014, it was projected that a similar near-extirpation would occur over the next ten years in the largest remaining major stronghold, the north Kimberley.

Cane Toads were recorded for the first time in Derby during the 2022/23 wet season. There is also now evidence that Cane Toads have occupied mainland areas adjacent to Koolan Island.

Northern Quolls are known to exist on 13 Kimberley islands and will be particularly important to the survival of the species (Department of Sustainability, Environment, Water, Population and Communities (DSEWPac), 2011)

Critical habitat in the Northern Quoll Recovery Plan is defined as habitat where Northern Quolls are least exposed to threats or least likely to be in the future i.e. rocky areas and offshore islands (Hill and Ward 2010). The Northern Quoll referral guideline further defines critical habitat as that which provides shelter for breeding, refuge from fire / or predation and potential poisoning from Cane Toads; including offshore islands where the Northern Quoll is known to exist (Commonwealth of Australia, 2016).

Although offshore islands provide potential refuge for Northern Quoll, they are still vulnerable to Cane Toad invasion through anthropogenic sources (hitch-hiking on boats or aircraft), 'rafting' on floating debris or being washed on to islands in freshwater plumes from mainland rivers (NESP Threatened Species Recovery Hub, 2021). The Northern Quoll populations on these islands are likely to be highly susceptible to both Cane Toads and predators such as feral cats as they have been living in a predator-free environment.

11.1.2 Koolan Island population

There is an abundant population of Northern Quolls on Koolan Island with no evidence of recent or long-term population declines (Thomas, 2020). The population has persisted on the Island alongside iron ore mining for over 50 years (1934 – 1940; 1965 - 1993; 2006 - present). A review of population monitoring since 2006 showed that the population was relatively stable during the study period of 2006-2018, except for a decline in 2010-2011 following a cyclone (Thomas, 2020). Since 2018, the population has been above the weighted mean of 460 individuals (**Figure 41**).

The population estimate for Northern Quolls on Koolan Island in 2022 was over 700 individuals. The latest capture rates and counts in 2023 has the population much larger than any abundance ever recorded previously at more than over 1,000 animals (**Figure 41**). (Mount Gibson Iron, 2023) (Appendix C10).

The Northern Quolls on Koolan Island appear to forage in both rehabilitated and undisturbed habitats but seem to rely on undisturbed areas for denning (Thomas, 2020). Northern Quoll diet on Koolan Island includes invertebrates, skinks and major fruiting plants including the fruit of the stinking passionflower weed. Invertebrates were the most consumed food type by far (Thomas, 2020).

Koolan Island is currently Cane Toad free and quarantine management combined with surveillance and targeted eradication of any Cane Toads found by KIO is expected such that no Cane Toads become established on the island because of site operational activities.

11.1.3 Threats

Cane toads are currently considered the main threat to Northern Quoll populations in parts of their range within (Hill & Ward, 2010).

Inappropriate fire regimes, habitat degradation and competition or predation by feral cats are also considered threats to the species.

Weeds can disadvantage quolls through inhibiting ground movements or increasing fire intensity; however, the widespread established weed, stinking passionflower (*Passiflora foetida*), is also used as a supplementary food source by Koolan Island Northern Quolls (Thomas, 2020).

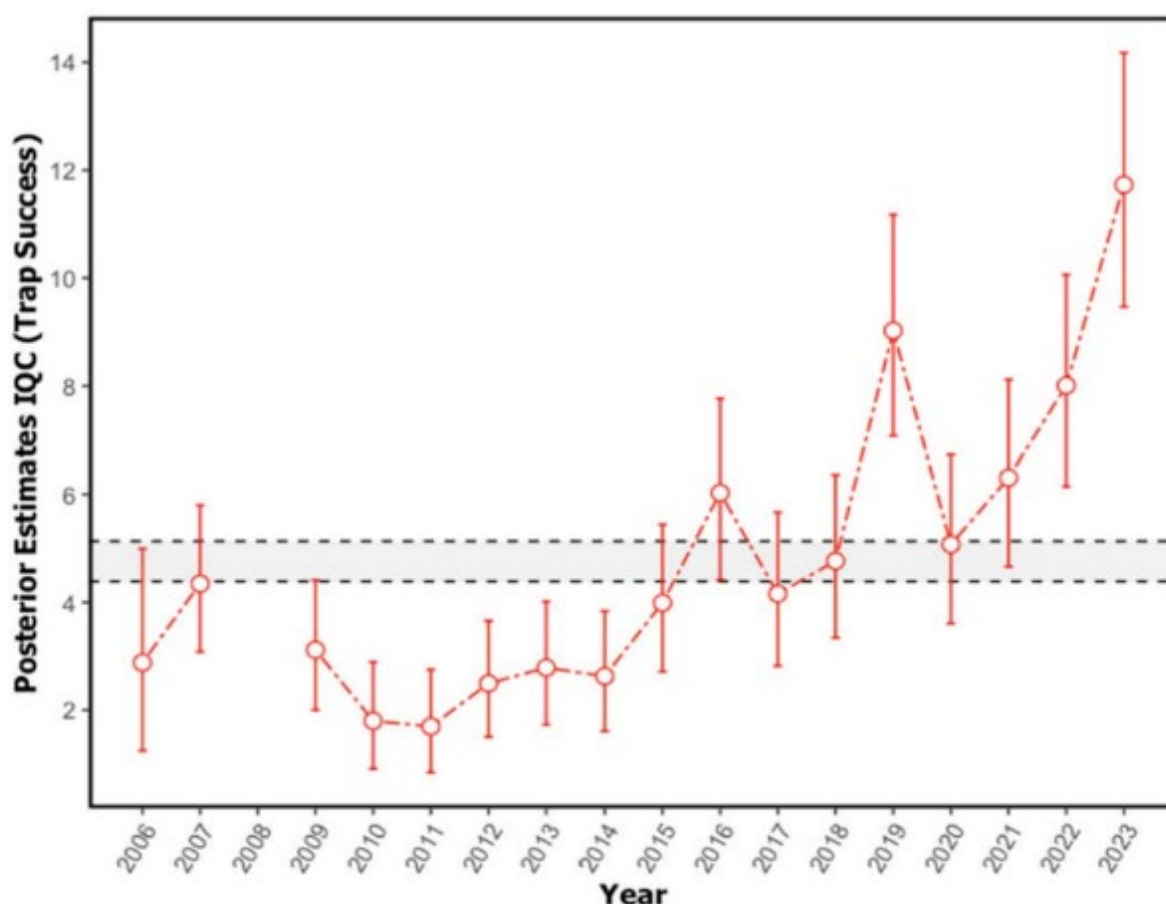


Figure 41: Annual estimates of Northern Quolls on Koolan Island 2006 to 2023

11.2 Considerations for Mine Closure Planning

The broad closure planning principles require that rehabilitation be representative of pre-mining landscape. By adhering to this guiding principle, it is likely that rehabilitated land will once again host local fauna species. KIO intends to reinstate steep rocky features with a storied vegetation composition which is considered analogous with the pre-mining vista. Upon successful revegetation it is expected that fauna will inhabit the areas.

Much of the island is habited by quolls. Monitoring to date proves that the population remains strong despite the mining operations. To improve the desirability of rehabilitated land KIO trialed the installation of artificial dens using PVC pipe as a medium to create a stable den within rocky slopes. Results were that rock overhang dens would serve better for post mining timeframes with further details are presented in Section 17.4. It is expected that upon cessation of mining the population will expand and inhabit previous mining areas. To confirm this quoll monitoring will continue post closure.

Cane Toads are known to have progressed into the Kimberley and confirmed sighting have been made in Derby. KIO are undertaking surveillance, testing, and trapping in Derby to prevent toad migration to Koolan Island. Likewise, proactive surveillance is being undertaken on Koolan Island to detect any cane toad presence as soon as possible.

12 SHORT RANGE ENDEMIC FAUNA

Short-range endemic (SRE) fauna species that are known to occur on Koolan Island include land snails, earthworms, and the blind snake *Anilius yampiensis*. Two species of land snails (*Kimboraga koolanensis* and *Amplirhagada astute*) and the blind snake (*A. yampiensis*) are protected under Western Australian wildlife legislation. Other fauna groups such as spiders and schizomid species may occur as short-range endemics on the Island; however, the presence of these species is not documented.

The main potential risk to SRE fauna species on Koolan Island from mining activities is disturbance of natural habitat. There may be a perceived risk of mining activities influencing the local populations of the specific SRE taxa. However, there is a lack of knowledge on the extent of endemism among invertebrates on Koolan Island. This risk, however, is relatively low due to the fact that mining activities by KIO occur largely in previously disturbed areas (45 % of development area was occupied by BHP before 1993) or in large patches of adjacent land not known to support short-range endemics. Short-range endemics on Koolan Island are likely to occur in habitats such as caves, vine thickets and rainforest patches. Also, routine snail monitoring which has occurred since the inception of operations in 2007 has identified the presence of SRE species outside proposed disturbance areas.

In 2013 KIO sought advice from the EPA regarding the continuance of biannual snail monitoring as required by Schedule 2 of MS 715 and the Significant Fauna Species Management Plan. KIO determined that the requirements of MS715 had been met and biannual snail monitoring was no longer necessary. This was confirmed and approved by the EPA with the revision and approval of the revised Significant Fauna Species Management Plan in 2014. Surveys for SRE species mentioned within the Significant Fauna Species Management Plan will continue as part of any pre-clearance surveys for proposed disturbance areas.

12.1 Considerations For Mine Closure Planning

There are no specific considerations for mine closure planning for SRE in relation to mine closure planning. Note, certain SRE monitoring (eg. land snails) prior to ground disturbance is undertaken on Koolan Island (Ecologia, 2012). Re-establishment of vegetative cover over surface substrates will aid the recovery of SRE taxa and communities over time.

13 SUBTERRANEAN (STYGO)FAUNA

Stygofauna are communities of stygobites – animals that live in and are wholly dependent on subterranean or “stygol” aquatic habitats. They are micro- and meiotic invertebrates rarely more than 5 mm long and are mostly crustaceans. The stygofaunal assemblages may also include gastropod molluscs, water mites, tubellarians, and several other groups.

Sampling was undertaken sporadically starting in 2006 and yearly since 2020 as shown in **Table 18**.

Round	1	2	3	4	5	6	7	8	9	10
Year	2006	2007	2008	2010	2012	2013	2020	2021	2022	2023
Bore										
IO1					X	X	X	X	X	X
K1	X	X	X	X	X	X	X	X	X	X
K2	X	X	X	X	X	X	X	X	X	X
K3			X		X	X	X	X	X	X
K4	X	X	X						X	
K5										
K7	X	X								
K8	X	X	X	X	X	X			X	X
K9	X	X	X	X	X	X		X	X	X
K10	X	X	X							
K11	X	X	X	X		X				
K12				X	X					
K13				X	X	X				
K15				X	X	X				
K16				X						
V01					X	X	X	X	X	X
V02					X	X				
Total	8	8	8	9	11	11	5	6	8	7

Table 18 Stygofauna sampling since 2006 (X indicates sampled bore)

Since sampling began there have been a total of 13 species of stygofauna recorded at Koolan Island (Bennelongia Environmental Consultants, 2023) (Appendix C11). The species found per monitoring round is shown in **Table 19**.

Higher Classification	Lowest Identification	Number of bores species collected in each monitoring round										
		Pre	R1 2006	R2 2007	R3 2008	R4 2010	R5 2012	R6 2013	R7 2020	R8 2021	R9 2022	R10 2023
Nematoda	Nematoda spp.						3	1		1	1	
Arthropoda												
Crustacea												
Ostracoda	Ostracoda sp. unident.	1					1				1	
Maxillopoda												
Cyclopoida												
Cyclopidae	Dussarticyclops 2222 'BCY080'									1		
	Mesocyclops sp.	1										
	Microcyclops varicans						2	1				
	Pesceicyclops 'BCY079'									1		
	*Pesceicyclops sp.									2		
	*Thermocyclops sp.						1					
	*Cyclopidae sp.								1			
Harpacticoida												
Canthocamptidae	Australocamptus 'BHA295'								2			
Parastenocarididae	Parastenocaris sp. B19						2	2	1	2	2	1
	*Parastenocaris sp.							1		1		1
	*Harpacticoida sp.								1			
Malacostraca												
Syncarida	Atopobathynella sp. B02	1	1	2	2	2	4	4	1	3	3	1
	Atopobathynella 'BSY218'									1		1
	Atopobathynella 'BSY219'									1	2	
	Atopobathynella 'BSY232'									1		1
	Atopobathynella 'BSY248'											1
	*Atopobathynella sp.						4	4	1	3	2	2
Isopoda												
Phreatoicidae	Crenisopus sp.	1								1		

Table 19: Stygofauna species collected at Koolan Island during monitoring

Groundwater on Koolan Island is highly variable and can range between 12 meters below ground level and 140 meters below ground level. It is expected that deeper groundwater will reduce the overall number of stygofauna due to the reduced energy inputs from the surface. However, stygofauna is routinely collected from depths greater than 47m below the surface indicating good connectivity within the groundwater and the surface (Bennelongia Environmental Consultants, 2023).

Sampling to date indicates that the number of species and the levels of detection are similar to pre-mining. This indicates that there is unlikely an impact on stygofauna populations during mining operations.

13.1 Considerations for Mine Closure Planning

The landforms left post mining will be internally draining with the cover system designed to support vegetation but not specifically to create a store and release scenario. Therefore, it is expected that rainfall will infiltrate the landforms at a similar rate to what would naturally occur at Koolan Island. The infiltrating rain will maintain aquifer quality and maintain stygofauna populations.

Given that dewatering is not showing an impact on stygofauna it is expected that once dewatering ceases any residual impact will also cease. The rebounding of groundwater levels will occur overtime and will replenish stygofauna habitat which is dry due to dewatering.

It is considered that the cessation of mining is unlikely to impact stygofauna.

14 MARINE ENVIRONMENT

The EPA approval pathway for the Koolan Island iron project in 2005 was set at the level of 'Assessment of Referral Information' (ARI). The ARI process had a number of guiding principles that proponents had to consider in the preparation of an ARI, and they were;

- Precautionary Principle;
- Principle of the Conservation of Biological Diversity and Ecological Integrity;
- Principle of Intergenerational Equity.

Prescriptive detail in the application of these principles was laid out in the approving Ministerial Statement 715 (MS715) giving guidance on the structure and content of the various Management Plans, and in particular the Koolan Island Marine Management Plan (Condition 7).

The general purpose of the Plan was to:

- maintain the ecological integrity and biodiversity of the marine environment;
- avoid impacts that arise from the implementation of the proposal on the coral pool community at Mangrove Inlet; and
- manage project activities to ensure that impacts on marine habitats, communities and biota outside the project footprint are avoided.

The most distinguishing oceanographic feature in the region is the semi-diurnal macro tide, with a tidal range of ~10 m recorded at Koolan Island (Semeniuk, 2011). This macro-tide can expose large tidal flats across many of the Kimberley coast inlets, including on the eastern shore of Koolan Island. Flood tides across these flats commonly create turbid waters within the mainland inlets and, to a lesser extent, island inlets.

Macro-tides, together with wind waves, prevailing swells and cyclones are the most influential factors in sedimentary processes along the Kimberley coast. However, their level of influence varies seasonally and geographically (Semeniuk, 2011).

The narrow stretch of sea between the south side of Koolan Island and the adjacent mainland to the south, is known as 'The Canal'. Apart from cyclonic events, the island and particularly the Canal are generally not subject to ground swell wave processes due to its latitude and protected nature of the coastline.

The marine environment typically features mud/sand tidal flats with fringing mangrove communities in more protected embayment's, coral reefs fringing more exposed and steeper hard rock shorelines and, sparse benthic filter-feeder communities in deeper areas below ~25 m.

Three levels of Ecological Protection have been applied to the waters surrounding Koolan Island. A high level of Ecological Protection has been applied to all waters surrounding Koolan Island, apart from the area of Moderate Protection which applies to the southern shoreline waters between Jap Bay and Mangrove Inlet. The lower protection level applies because of historic disturbance along this part of the shoreline, specifically waste and sediment dumping at Jap Bay and Mangrove Inlet and infrastructure and rock disturbance at Arbitration Cove.

Within the Moderate Zone a low level of protection applies to the waters known as the *mixing zone*, which extends 150 metres east and west of the dewatering discharge diffuser, and 100 metres out from the shoreline.

Although Koolan Island and its surrounding waters are within the Kimberley Port of Yampi Sound, it is outside the three protected areas making up the proposed Buccaneer Archipelago Marine Park. Two of the protected areas, the Lalang gaddam Marine Park and Mayala Marine Park share marine boundaries with the Port of Yampi Sound.

Baseline marine surveys conducted in 2005 to support the ERD and describe the then current condition of Koolan Island's marine environment, helped set the basis for the Marine Management Plan, including a relatively prescriptive monitoring regime and turbidity trigger levels for the commencement of the marine monitoring program. The ERD also noted that past mining had considerable impact on nearshore environments, including a rock waste dump coming down to the waterline in Jap Bay and waste rock and marine sediment down to the waterline on the northern slope of Mangrove Inlet.

The MMP's monitoring framework described the timing location and monitoring methods for each Key Environmental Factor (KEF). It also set out the detail for management and mitigation actions should an operational impact be detected.

To date 47 marine monitoring surveys and reports required by the Plan, have provided one of the most robust and repeated time series data sets for the West Kimberley marine environment generally, and specifically, coral health and distribution, and will continue to inform the ongoing monitoring and management through to and beyond mine closure.

14.1 Marine Management Plan

Condition 7 of MS 715 sets out the following Key Environmental Factors (KEF) that the Marine Management Plan must include to meet its objectives.

14.1.1 Benthic Communities and Habitats

- the protection of benthic communities and habitats so that biological diversity and ecological integrity are maintained.

14.1.2 Marine Environmental Quality

- to maintain the quality of water, sediment and biota so that environmental values are protected.

14.1.3 Marine Fauna

- the protection of marine fauna to maintain biological diversity and ecological integrity.

14.1.4 Introduced Marine Pests

- conduct baseline and ongoing surveys to identify the presence of marine pests that could threaten biological diversity and ecological integrity.

14.2 Benthic Habitats

The aim for this KEF is to protect benthic communities and habitats so that ecological integrity and biological diversity are maintained. A principle concern was that coral in particular, could be impacted (smothered) by sediment run-off into the marine environment from mining operations and rainfall, and as a consequence turbidity trigger levels in the early MMP's were set at precautionary levels.

In 2009, after the first five official marine monitoring surveys, MScience submitted a trigger review report to the EPA to reassess water quality trigger levels, taking into account the strength of tide-generated currents mobilising mud and sand from tidal flats and the seabed. It was clear that

natural turbidity was higher and more variable than first thought, based on baseline marine studies completed as part of the ERD (MScience, 2009).

14.2.1 Coral Pool and Mangrove Inlet

The ERD identified the coral pool in Mangrove Inlet adjacent and to the west of the wharf and laydown area construction site, as being special and worthy of protection. This was reflected in the Ministerial Statement and subsequently in the MMP. It was to be monitored prior to, during and for a period after the construction of the wharf and barge landing/laydown area. A range of measures including managing the method and timing of the wharf construction to mitigate against increasing turbidity levels, and intensive real time turbidity monitoring during the construction process.

The Mangrove Inlet Coral Pool was monitored against a reference site, also a coral pool approximately 2 km east along the southern shoreline.

Post-construction video observations taken during marine monitoring surveys (MScience, 2007) found little evident change in the benthic communities of the Coral Pool or the Wharf since last survey. Based on qualitative visual assessment, coral community structure remains the same, with the upper slope dominated by staghorn *Acropora* around the wharf and by a diverse mixed assemblage at the coral pool. These corals appear in good condition and are unbroken and unbleached in similar proportion to previous observations and records from reference sites collected this survey.

In July 2022 as part of the annual marine monitoring survey conducted by MScience, additional benthic habitat transects were conducted at the Coral Pool to determine the percentage of live coral cover compared to base line abundance. Analysis of the video footage revealed live coral cover was generally similar between the 2006 survey, (mean coverage between 36% and 27%) and 2022 (mean 34%), indicating cover was still high and that no change or modification was occurring as a result of nearby activities (MScience, 2024) (Appendix C12).

14.2.2 Main Pit Coral Survey

Iron ore mining by BHP on Koolan Island was conducted from the 1950's until 1993. With the cessation of mining and as part of the rehabilitation program, a channel was cut through joining Main Pit to the ocean and the pit was flooded. Although flushing was limited with the relatively small channel, water quality in the pit was similar to the surrounding waters.

In the 15 years between the opening of the pit to the ocean and the resealing of the pit by the construction of the new seawall in 2007, a coral community had become established along the walls of the pit.

In April 2008 post the completion of the seawall, dewatering in Main Pit commenced. Around this time MScience Pty Limited were commissioned to undertake descriptive studies of the ecology of Main Pit, aimed at ensuring appropriate information was available for subsequent rehabilitation after mining.

The first report covered fish abundance and diversity linking assemblages with habitat type and depth (MScience, 2008).

In June 2008 a further study was conducted on the diversity and abundance of coral in Main Pit. At the time the water level in the pit was approximately 2 metres below mean sea level. In addition to providing information to aid designing future pit closure options, data presented in the report was relevant to the rate and pattern of coral community recovery that could be expected from recruitment following a major impact in this nearshore Kimberley Region.

The coral survey showed that recruitment was significantly diverse with 98 scleractinian species from 13 families recorded. Although not surveyed, many other reef inhabiting invertebrates were observed. Of note were many individuals of the giant clam species, several species of encrusting oysters and other bivalves, decapod crustaceans, sponges and octopi.

The estimated abundance of corals in Main Pit, was 10% coverage, however due to the logistical limitations of the survey, the report states that both the abundance and species estimates are conservative.

Coral recruitment and growth in Main Pit occurred on both the northern (footwall) and the southern (hanging wall). The surface on the majority of the foot wall was shotcrete, applied for wall stability during mining operations. The hanging wall was naturally occurring rock formation, predominantly Elgee Siltstone. Both the shotcrete and the siltstone present relatively smooth surfaces for coral larvae recruitment.

Drawing on observations during the coral survey, the report offered the following guidance for future rehabilitation of the Main Pit post mine closure:

- Recruitment could be enhanced by preparing more coral settlement surfaces and more topographically complex surfaces, to provide shelter and protection from strong currents;
- Infrastructure to provide more settlement surfaces would be of most benefit if installed at the depth range of between 0 and 20 metres below mean sea level for optimal exposure to sunlight;
- Enhancing the potential for larvae to enter the pit by enlarging the future connecting channel.

14.2.2.1 Coral at Arbitration Cove

In relation to Arbitration Cove, the ERD stated: "At Arbitration Cove, the steel pylons from the original ship loading jetty have been cut off but still protrude above the seafloor. In addition, some steel pipes and cables litter the seafloor. Rock spoil and dark sand (possibly iron ore fines residue) cover much of the inner part of Arbitration Cove."

From the commencement of the MMP five habitat sites on the eastern side of the seawall (Arbitration Cove) sites, have been routinely monitored, by MScience. In 2018, monitoring indicated there had been a loss of coral near the eastern side of the seawall and thought to be the result of the seawall's reinstatement (**Figure 42**).

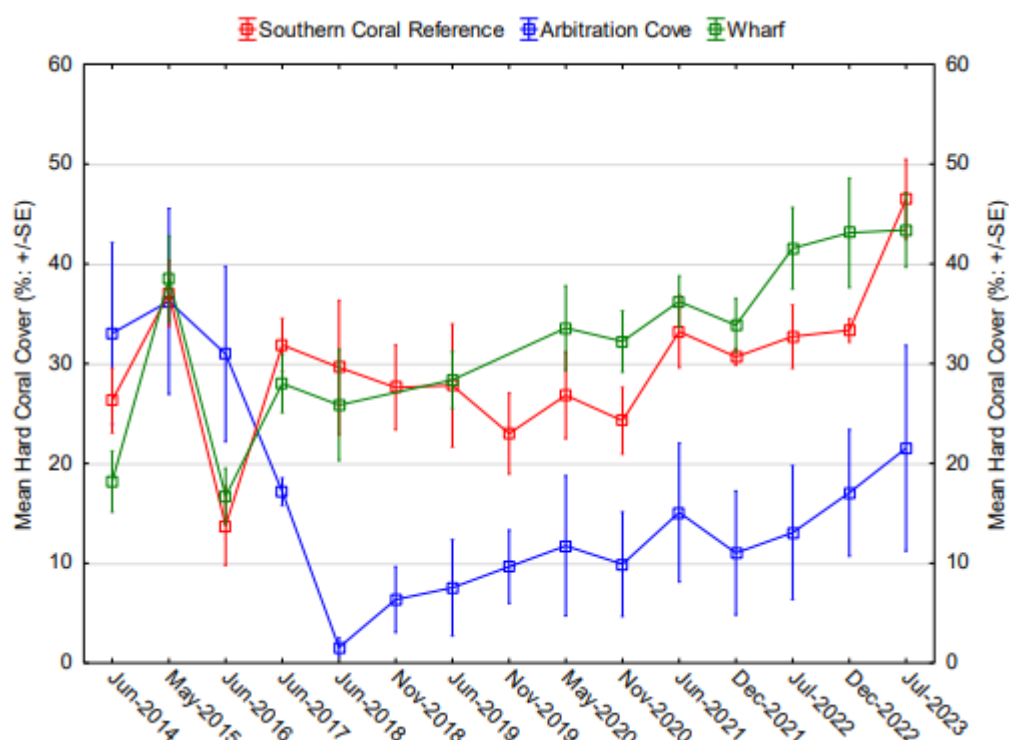


Figure 42: Mean cover of live hard corals in southern coastline – Wharf (test; green) and Reference (control; red) sites trend at near 30% cover. Arbitration Cove reductions were evident by June 2018

This monitoring site lies within a zone of Moderate Ecological Protection, which is an area where sub-lethal ecological effects on marine environmental quality are observed and permitted. In response to the coral impact, annual monitoring was increased to biannual and intensified to track benthic habitat status and gather morphological and taxonomic data for future habitat management and to assist with the coral rehabilitation program (described more fully in the rehabilitation section).

14.3 Water Quality

Following the reinstatement of the collapsed seawall, and main pit capital dewatering, the program shifted to maintenance dewatering under Operating Licence L8148/2006/4 in accordance with relevant conditions that included a daily total suspended solids (TSS) limit of 20mg/L.

In 2020 as part of a revised and approved Marine Monitoring Plan (MMP; Version 21 (superseded in 2024), MGX undertook to regularly monitor physical water quality parameters at the boundary of the diffuser mixing zone. The four annual monitoring campaigns went for a minimum of twelve weeks over each wet season and producing over 100,000 individual water quality data points from five hundred monitoring days.

The program used three EXO submersible data loggers (nephelometers) measuring turbidity, temperature, salinity and oxygen, with the emphasis on turbidity (**Figure 43**). Two SDLs were placed at the east and western boundaries of the diffuser mixing zone and the third at a reference site at the western end of the Canal.



Figure 43: Remote submerged data logger (SDL) EX02 (left) and EX03 (right) water quality sondes, attached to custom weighted frames prior to deployment

Results from the 2019 SDL monitoring period indicated elevated turbidity levels at the settlement pond; however, the receiving water quality did not show any evidence of modification or exceedance due to mixing and tidal flushing. This finding was supported by the Initial Dilution Model completed in 2019 which confirmed a low TSS trigger value ($2.78 \text{ mg/L} \approx 4 \text{ NTU}$) well within the confines of the low ecological protection area (LEPA) boundary in all scenarios modelled. The weight of evidence from continuous monitoring over a four-year period indicates there has been no significant reduction of physical water quality at the boundary of the LEPA.

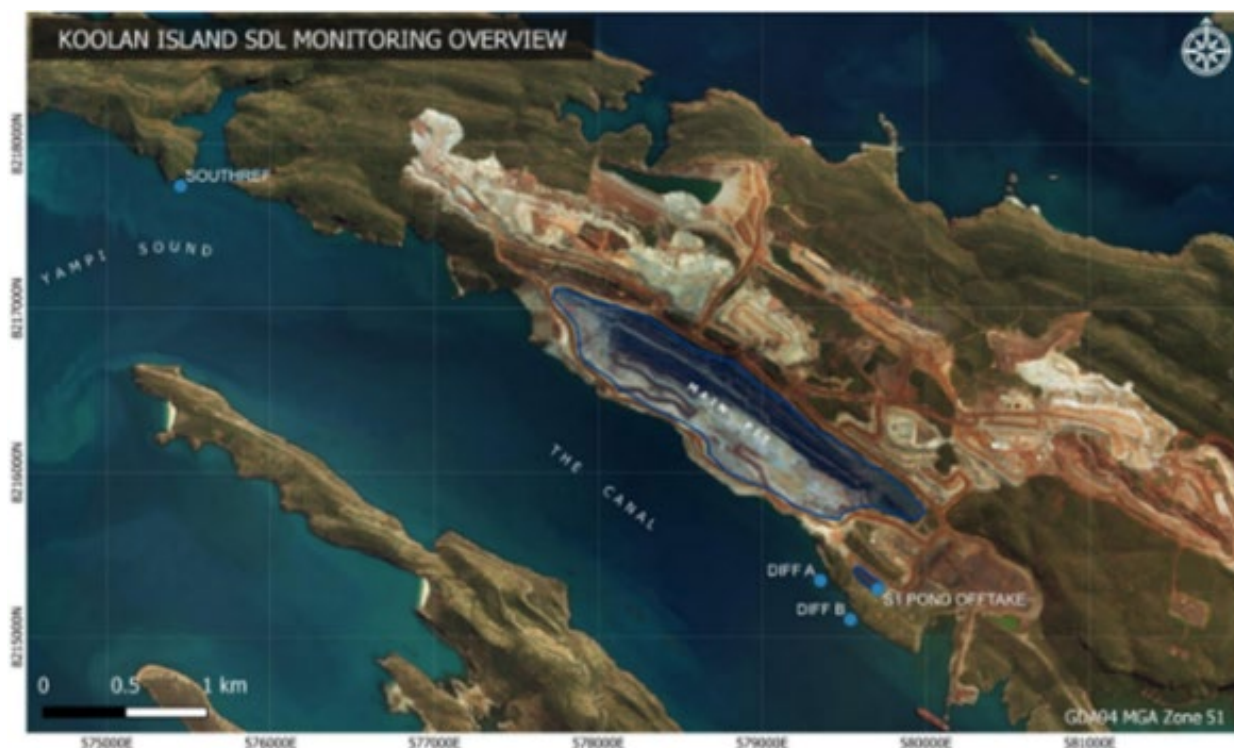


Figure 44: Layout of water monitoring locations during operational mine dewatering.

The wet season monitoring campaign concluded in 2023 (**Figure 44**), and the dewatering turbidity monitoring has reverted to the ongoing daily sample and analysis taken from the sediment pond outlet tap at W1. Because this sample is taken and analysed daily, it allows real-time management actions to be taken in the event of an elevation in TSS.

Since marine monitoring commenced at Koolan Island individual surveys have reported on minor exceedances of trigger levels for turbidity, copper levels, salinity, nitrate/nitrite and water temperature. After being reviewed against natural environmental variability of the area at the time, or in some cases equipment calibration errors, it has been concluded that none of the exceedances have resulted in a significant ecological impact. All exceedances were reported annually and no DWER response has required an action.

14.4 Sediment Quality

The Triennial Sediment Sampling surveys have been conducted since the first baseline survey conducted by MScience in 2005. Sediment samples are taken at one test site on the north side of the island and two on the south side, along with one reference site also on the south side. A chemical analysis for a range of metals and organics is conducted and reported on by a NATA accredited laboratory (MScience, 2005).

None of the resultant analyses have indicated elevated levels due to operational mining impacts. However, the May 2021 survey reported aluminium was elevated at Arbitration Cove and postulated to be the result of an increasing proportion of fine particles in sediments at this site since 2012. The Outcome Based Provisions (OBP) for iron and antimony were also elevated at Mullet Bay and thought to be linked to the same, yet unidentified, factor that has affected this site, and, to a lesser extent, the Wharf site since 2018 (MScience, 2021).

Further investigation is likely to be conducted if the 2021 results are repeated in 2024 triennial sediment survey.

14.5 Marine Pests

Triennial Invasive Marine Species (IMS) surveys have been conducted in conjunction with annual marine monitoring since 2009. IMS collectors, (PVC settlement plate and turf collectors) are set at locations near the Wharf and Arbitration Cove and collected after a minimum three-month period. As yet no IMS listed by the Department of Primary Industries and Regional Development (DPIRD), have been detected.

14.6 Marine Fauna

Marine fauna includes all animals that live in or depend on the oceans for all or part of their lifecycle. All marine animals play a role in maintaining ecological functions and processes that ensure the integrity and health of the marine ecosystem. The various versions of the MMP have identified actions to protect marine fauna from potential mining impacts, helping maintain local biodiversity and ecological integrity.

Whales were the only marine fauna specifically mentioned in the referral process, and the mining activities that were considered to present a risk were in-pit blasting and interaction with ore ships as they arriving and departing Koolan Island.

It has been found that the risk to megafauna from blasting in main pit is significantly reduced for two reasons, the first is that the narrowness of the pit floor constrains the size of the blast area to being relatively small by industry standards. Secondly, the pit floor is well below seabed level

helping to contain noise and vibration within solid natural rock. Although it is an uncommon occurrence for whales to enter the Canal, if a whale is observed within 500 meters of the seawall, the blast is delayed until the animal has moved out of the area.

Ore ships are required to have a licensed pilot or pilot exempt master onboard to guide them through Port waters. If megafauna come within 500 meters of a ship in the Port, movement must cease until the animal has moved out of the area or a lookout/observer is posted.

Although whales were the only fauna named by MS 715, KIO acknowledged their obligation to protect all marine fauna, by repatriating marine fauna including crocodiles, turtles, sharks, rays and fish from the inundated main pit to the adjacent ocean waters in the Canal.

Two such campaigns were conducted, the first as the water level in the pit was being lowered in 2010 post the completion of the seawall. The second being in 2019, as the water level was being lowered, post the rebuild of the seawall. On both occasions the work was done with the advice and assistance of the Traditional Owners.

14.7 Considerations for Closure

The marine environment will require continued monitoring during the closure phase of the mine; however, it is likely that impacts will reduce as the site impacts reduce as the reliance on discharge reduces and as landforms stabilize. Monitoring will initially follow the requirements of the MMP; however, this will be rationalised and monitoring will be reduced to detect only residual impacts remaining post closure.

A coral rehabilitation plan (Jacobs Group (Australia) Pty Limited, 2019) (Appendix C13) was presented to DWER in 2019, this plan included decision-making tools to understand the highest potential methods to restore coral. Two different references (**Figure 45** and **Figure 46**) were tested to understand the best method of coral rehabilitation, both references indicated that there was a high potential for natural regeneration of coral and augmented natural processes would be suitable to restore corals (Jacobs Group (Australia) Pty Limited, 2019). As such KIO will utilize the high potential to restore corals naturally and augment that by utilizing strategically placed artificial reef structures. KIO will also investigate other method of improving the outcomes to coral habitation, such as translocation.

A survey of the coral growth on the was undertaken in January 2024. The coral survey was undertaken by KIO environmental officers accompanied by coral specialists from Hydrobiology. The report indicates that there is some growth on the artificially-engineered substrate frames (ASFs) deployed by KIO in 2020 (Hydrobiology, 2024) (Appendix C14) (more details in Section 17.5.5). This indicates that coral will grow on ASF and that the crude structures made on site will support coral propagation. This has been advanced and further study and potential to use bespoke artificial reef habitat is now being considered enhancing the naturally occurring coral habitat.

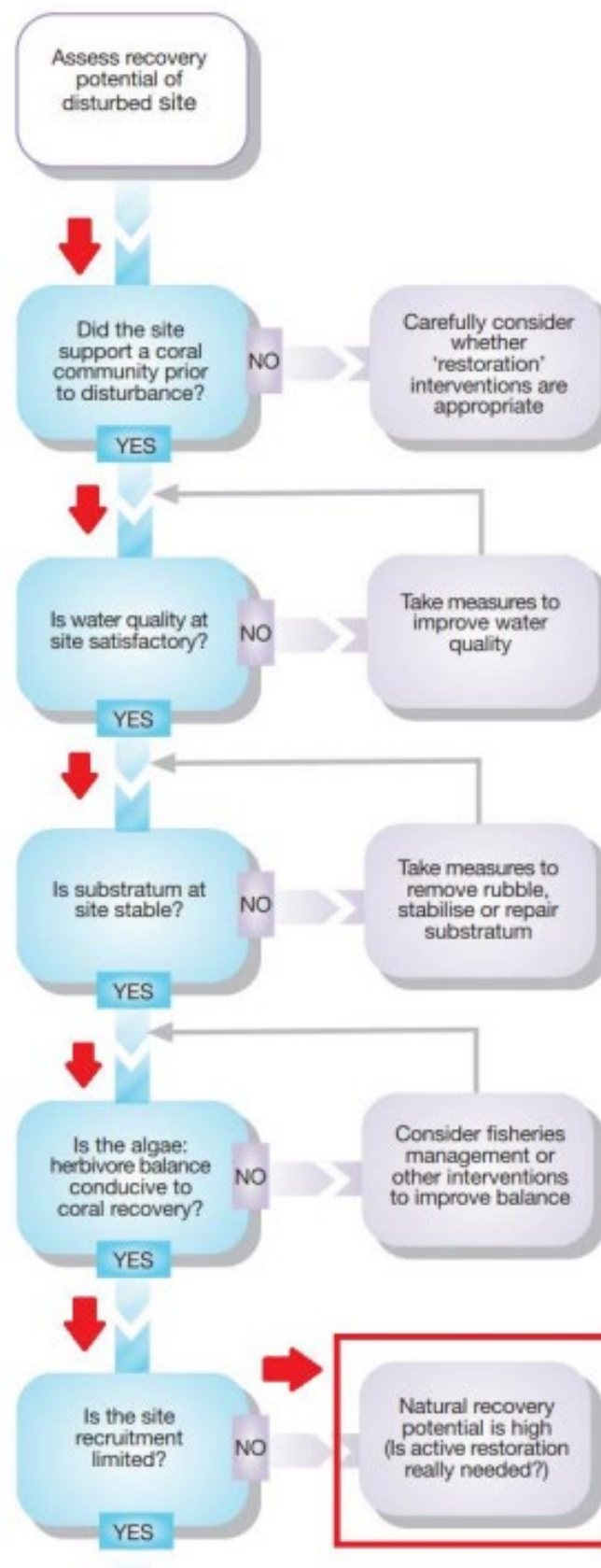


Figure 45: Rehabilitation decision tree with proposed pathway relevant to the current conditions at Arbitration Cove highlighted (Edwards, 2007; Jacobs Group (Australia) Pty Limited, 2019)

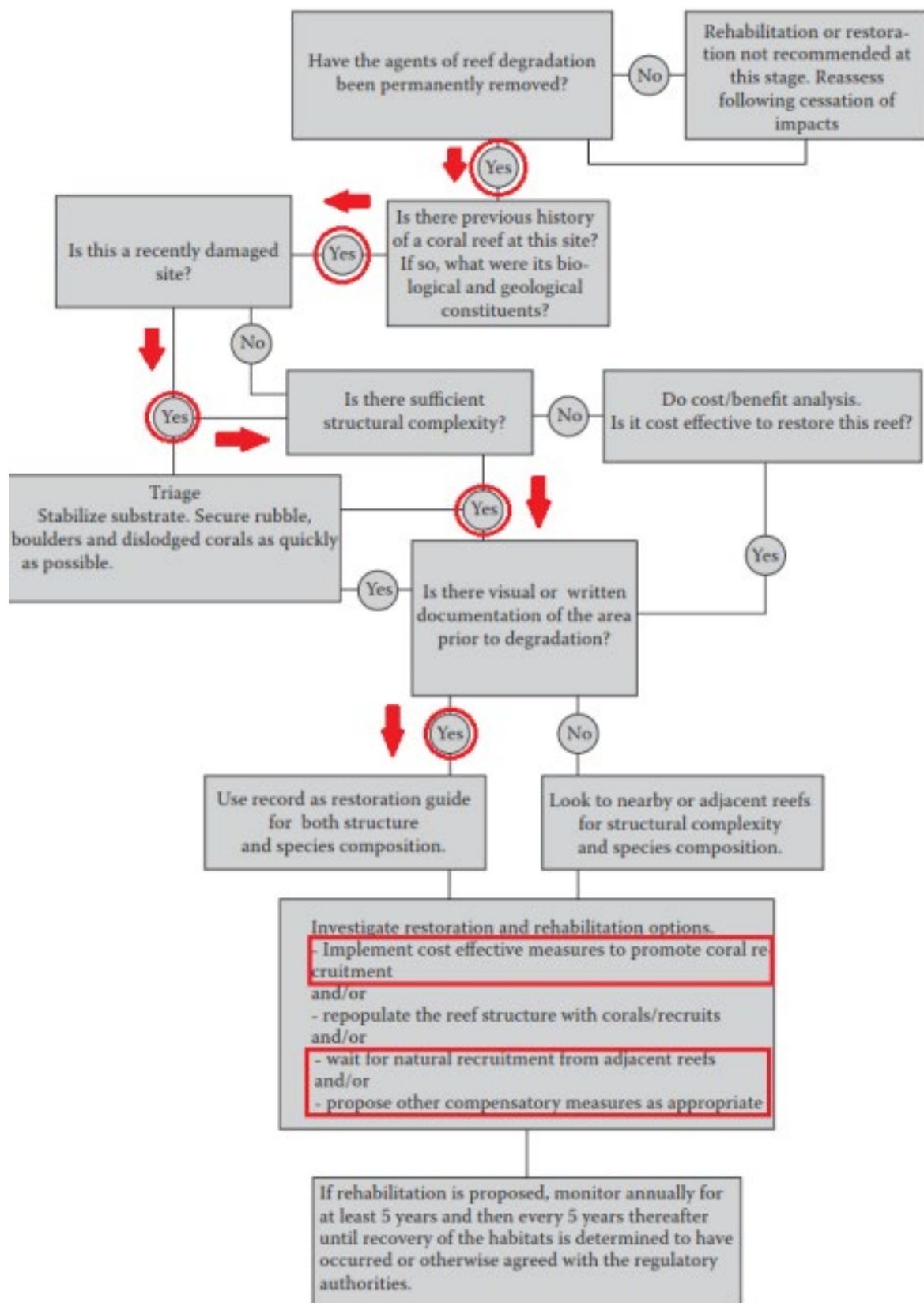


Figure 46: Rehabilitation strategy decision 'tree' framework (Precht, 2006; Jacobs Group (Australia) Pty Limited, 2019).

15 HERITAGE

15.1 Summary

The *Aboriginal Heritage Act 1972* protects Aboriginal sites in Western Australia whether or not they are known to the Department of Indigenous Affairs / Aboriginal Cultural Material Committee.

Since the recommencement of exploration and mining activities on the island and the negotiation of the Aztec Resources / Dambimangari Agreement, a number of work program clearance heritage surveys have been conducted; first through the Kimberley Land Council (KLC) and more recently by DAC.

In addition to a desktop survey of the Aboriginal site register which lists six registered sites on Koolan Island, a detailed archaeological and ethnographical survey was first conducted in November 2004 (Archae-aus, 2005). Ten Areas were surveyed on the Island. The survey located one previously recorded site and one previously unrecorded aboriginal archaeological site (Site Number K04-01 Goats Head Bluff) outside of the known registered sites. No isolated artefacts were recorded during this survey (Archae-aus, 2005). During a meeting held with the Dambimangari Native Title Determinant group by Kimberley Land Council, the traditional owners stated they wish for this site (Goats Head Bluff) to be protected from any potential impact caused by mining activities. As part of the coexistence deed developed with the Dambimangari people and KIO, and since 2006, access to areas of cultural significance is prohibited through exclusion zones and information regarding exact site locations is kept confidential.

In recent years, MGX invited Dambimangari native title holders to arrange and conduct a cultural heritage survey on tenements. Advice was kindly provided by Mintupela Pty Ltd as commissioned by DAC in April 2021. The detailed report was received by MGX in October 2021 and it informs and confirms KIO approach to operations at the mine.

It is clear to MGX that Goolanoo is a culturally significant place as follows. Koolan Island (Goolanoo), from goolanoongarima, which means 'sleeping or camping place'. The entire Island is believed to be the female Woongudd Snake which created many distinctive land and seascape features of the region. In Goolanoo, specific parts of Woongudd's anatomy and bodily extrusions are said to exist. In 1966 Howard Coate recorded an account of the female Woongudd Snake in Oomeday country. His informant, Sam Woolagoodja, Yorna's father, told the story in Oomeeda language. He described how Koolan Island and Dugong Bay were created by the crawling movements of Woongudd (**Figure 47**). There are two other material manifestations of Woongudd on the island. One is her noogoo, or faeces, which passed from her body as she moved creating various bays and natural features. Noogoo can be seen in various forms in other parts of Dambeemangaddee Country such as black basalt, white quartz and bands of coloured rock (Dambimangari Aboriginal Corporation, 2021).

Further evidence of the cultural importance of Goolanoo is shown by the presence of Wandjina and other Lalai being images in a rock shelter at the island's western end (DPLH Site ID K1773). That shelter also contains human remains. The known heritage records made at the Island are held in the Department's (DPLH) Aboriginal Heritage Information System (AHIS) database are shown as follows in relation to the mining tenements (**Figure 48** and **Figure 49**).



Figure 47 Woongudd head and eyes looking northwards out to the sea

Site	Location	Interest and values (as stated in DPLH AHIS database)	KIO tenement
IDs 13385, 13386, 13387 573382mE 8218658mN MGA Zone 51	West Point, far West End of Koolan Is	Artefacts / Scatter, Midden / Scatter, Rockshelter, Arch Deposit, Camp	E04/1266
ID 13384 Spatial Record Restricted	Land adjoining Southern shoreline around Mud Bay / Kean Cove, west of Jap Bay	Artefacts / Scatter, Midden / Scatter, Mythological, Painting, Skeletal Material / Burial, Arch Deposit	M04/417 L04/101 E04/1266
ID 12162 583437mE 8215311mN MGA Zone 51	Land adjoining Barramundi Bay	Artefacts / Scatter, Mythological, Painting, Rockshelter, Camp	L04/29 E04/1266
ID 13392 Spatial Record Restricted	Land at Catspaw Point on peninsular from Front Beach in Murungung Bay	Rockshelter, Skeletal Material / Burial, Other: NE(REJ)	E04/1266

Figure 48: Records from the AHIS

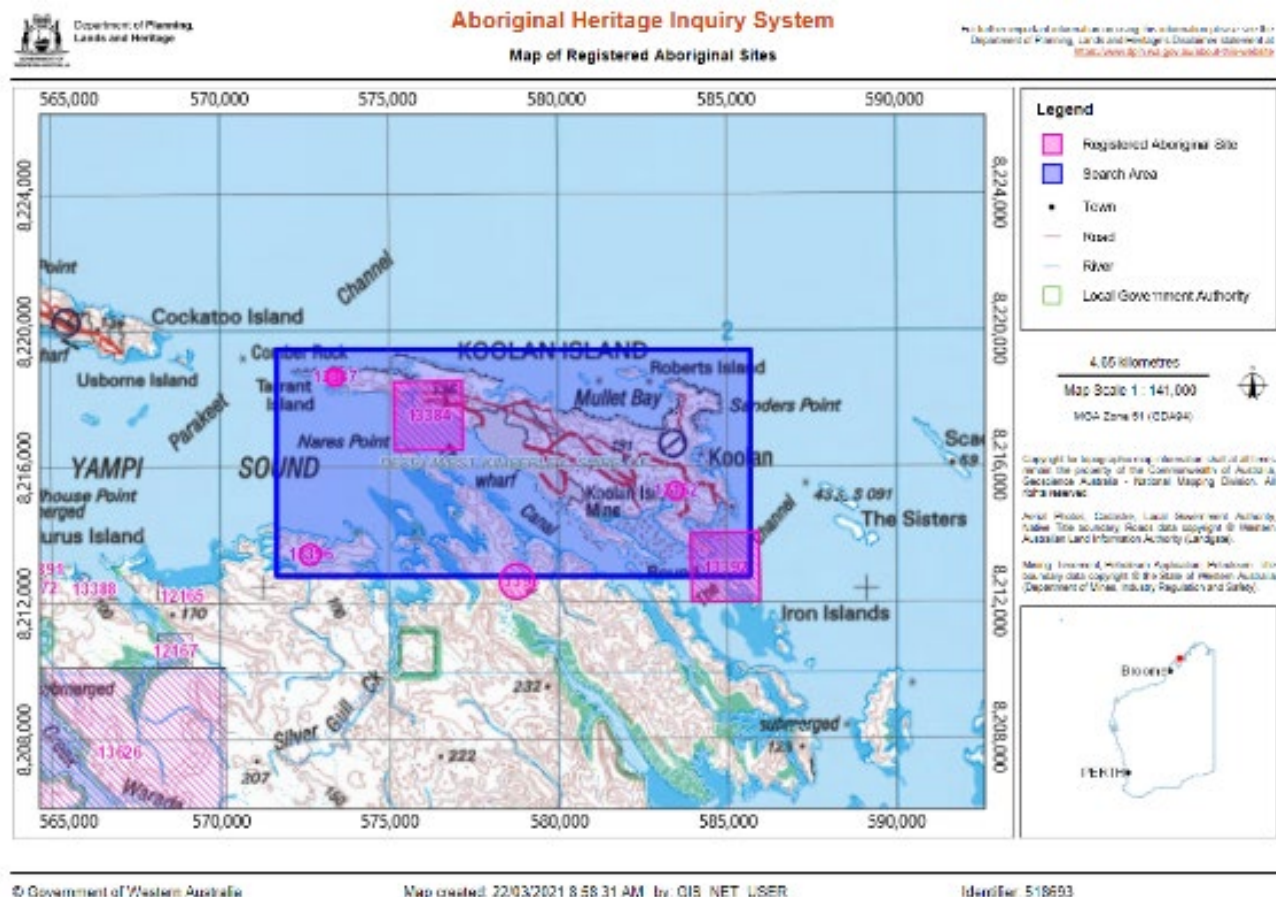


Figure 49: AHIS record of specific heritage sites.

15.2 Considerations for Mine Closure Planning

Heritage of cultural significance is currently protected through environmental awareness inductions for KIO staff to advise the use of exclusion zones, and avoidance from any mining related activities. MGX uses bollards, chains and signage on tracks that lead towards registered sites. MGX does not foresee any need for any approval under WA's cultural heritage legislation on Koolan tenements. Subsequently, the culturally significant sites will be maintained until and beyond mine closure and that topic will be the subject of ongoing consultation with DAC and native title holders. The retention of signage and barriers post-mining will be decided by DAC.

There is no need for contemplation of a Cultural Heritage Management Plan nor any heritage legislation approval for disturbance to the registered heritage sites on Koolan Island tenements. This is because KIO's activities are outside and beyond the mapped footprint and KIO is not approved to disturb or co-occur with any feature of any registered sites. The presence and operation of KIO's mine on Dambimangari country is recognised and treated under the Co-existence Deed as executed and implemented between signatories.

16 CONTAMINATION

MGX has a Contamination Management Plan (CMP) as required by MS 715. The CMP Revision 5 was updated in 2019 Contamination at Koolan Island will be managed in accordance with the CMP (Mount Gibson Iron, 2019).

In the context of closure and relinquishment, contamination at Koolan Island falls into two categories:

- **Legacy contamination:** Contamination caused by mining operations (Dampier Iron/BHP) prior to the approved Project commencing. Legacy contamination may occur:
 - within the disturbance footprint approved by MS 715; or
 - outside the disturbance footprint approved by MS 715.
- **Contemporary contamination:** Contamination that occurred during the Project.

Areas of potential concern (AOPC) for current operations are shown in **Figure 50**. Depending on how these areas are developed, mined or rehabilitated, the balance will need to be addressed prior to or before full closure.

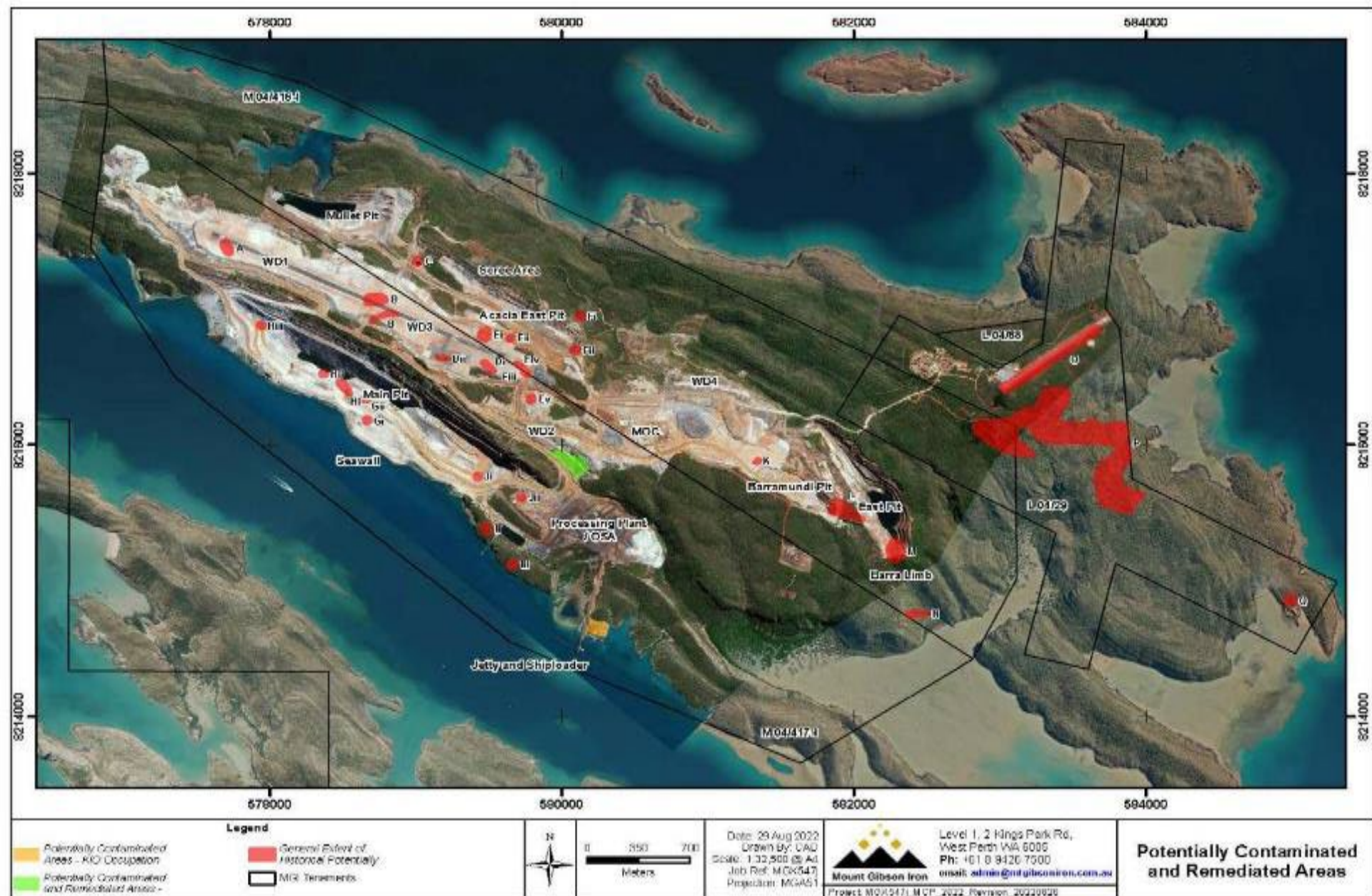


Figure 50: Potentially Contaminated and Remediated Areas

16.1 Legacy Contamination

The following potential contamination sources relate to former mining operations before MGX development and mining activities:

- Domestic landfill disposal;
- Industrial landfill disposal;
- Workshop activities;
- Fuel and waste oil distribution and storage;
- Buried machinery; and
- Former township support systems and infrastructure.

Hydrocarbons and asbestos comprise the majority of legacy contamination at Koolan Island.

Previously identified legacy hydrocarbon contamination within the MS 715 disturbance footprint for which KIO is responsible includes:

- *two salvage industrial pits* located just south of the former BHP support area, and anecdotally understood to include discarded motor vehicles and general inert industrial waste;
- *former BHP mechanical workshop*: Abandoned UST;
- *former BHP loadout wharf*: An estimated 10t of fuel leaked from the wharf side petroleum above ground storage tanks in 1988. The contaminated material was believed to be excavated between January and June of 2007. High tidal movements and warm sea temperatures typical of the area are believed to have significantly processed materials between the time of the spill and current KIO operations;
- *quarry petroleum hydrocarbon storage*: formerly located at the western end of Main Pit;
- *Barramundi Industrial Landfill*: Minor contamination in near surface wastes; and
- *airstrip*: Associated with historic cover of the original airstrip with an oil and water mix to condition the surface.

Legacy material containing ACM has been found at the following areas within the MS 715 footprint:

- Former main fuel storage;
- Former power house;
- Former stores;
- Former administration buildings;
- Former Barramundi industrial tip; and
- Former East Pit Industrial tip.

Potential legacy hydrocarbon effects outside of MS 715 footprint likely also exist at the historical township, former boat club, East Pit domestic landfill, and 'Roche' area. Legacy material with ACM has also been found at the historical township.

16.2 Contemporary Potential Contamination Sources from MGX companies

Upon reviewing the potentially contaminating land uses (Department of Water and Environment Regulation, 2021) the following infrastructure fall into one or more category. It is worth noting that these infrastructures are not known or suspected contaminated sites but rather simply aligned with a potentially contaminating land use.

- Airports, airstrips, aviation facilities (Airstrips).

- Automotive repair, engine works and spray painting (Mechanical workshops).
- Cement/concrete/lime manufacturing or batching (Concrete batch plant).
- Electrical substations/transformers.
- Electricity generation/power stations.
- Explosives production/bulk storage pyrotechnics (Magazine and Explosive Batching Facility).
- Firefighting and training (use of foams) (Emergency Response Training Grounds, areas where fire has been fought with foams).
- Landfill sites and waste disposal sites.
- Mineral processing and extractive industries (ROM Pad and Crushing and Screening Plant sites).
- Port/wharf/dock activities.
- Sewage/wastewater treatment plant (wastewater treatment plants and spray fields).

16.2.1 Known Contemporary Contamination Events resulting from Aztec / KIO

In March 2011, a diesel spill at the barge landing resulted in the spillage of approximately 20,000 L of diesel. Much of this was largely contained to the barge landing itself. The incident was investigated and remediated for potential hydrocarbon contamination. Total recoverable hydrocarbons (TRH) were recorded at the barge landing due to the spill of diesel and approximately 5,000 m³ of material was removed to the onsite bioremediation facility for treatment. Marine monitoring of the surrounding waters at the barge landing occurred for several months following the incident and hydrocarbon contaminated water was not recorded; strong shoreline currents and large tides were deemed to have reduced residual risk. TRH and ethylene glycols were found at the former mobile workshop, which has since been buried in-situ by advancement of a WRL. Remediation in accordance with the DER (2014) contaminated sites guidelines was undertaken and the site was deemed remediated by DWER, with no further investigations or remediation necessary.

16.3 Assessment of Current Conditions

Many areas on tenements have been significantly modified since the Project commenced. Some AOPCs identified by site assessments at Project commencement may still exist, while others are not likely to present any residual risks to human or ecological health as a result of the site changes undertaken during operation of the mine and various management measures implemented.

Multiple AOPCs such as the former tyre dump, support buildings and landfills are now located under various WRLs, indicating these areas are now completely buried. The BHP wharf (a former spill area) is now located under KIO's seawall, which is > 33 m in height. Other areas have been subject to significant excavation due to mining activities. Specifically, the quarry hydrocarbon storage area material was sent for bioremediation and no longer remains at the location. Differences between surface elevations at the end of BHP operations and the proposed surface elevations at closure of KIO operations, illustrating areas where AOPCs have already been either excavated or buried, are shown in **Figure 51**. This accounts for a number of legacy areas.

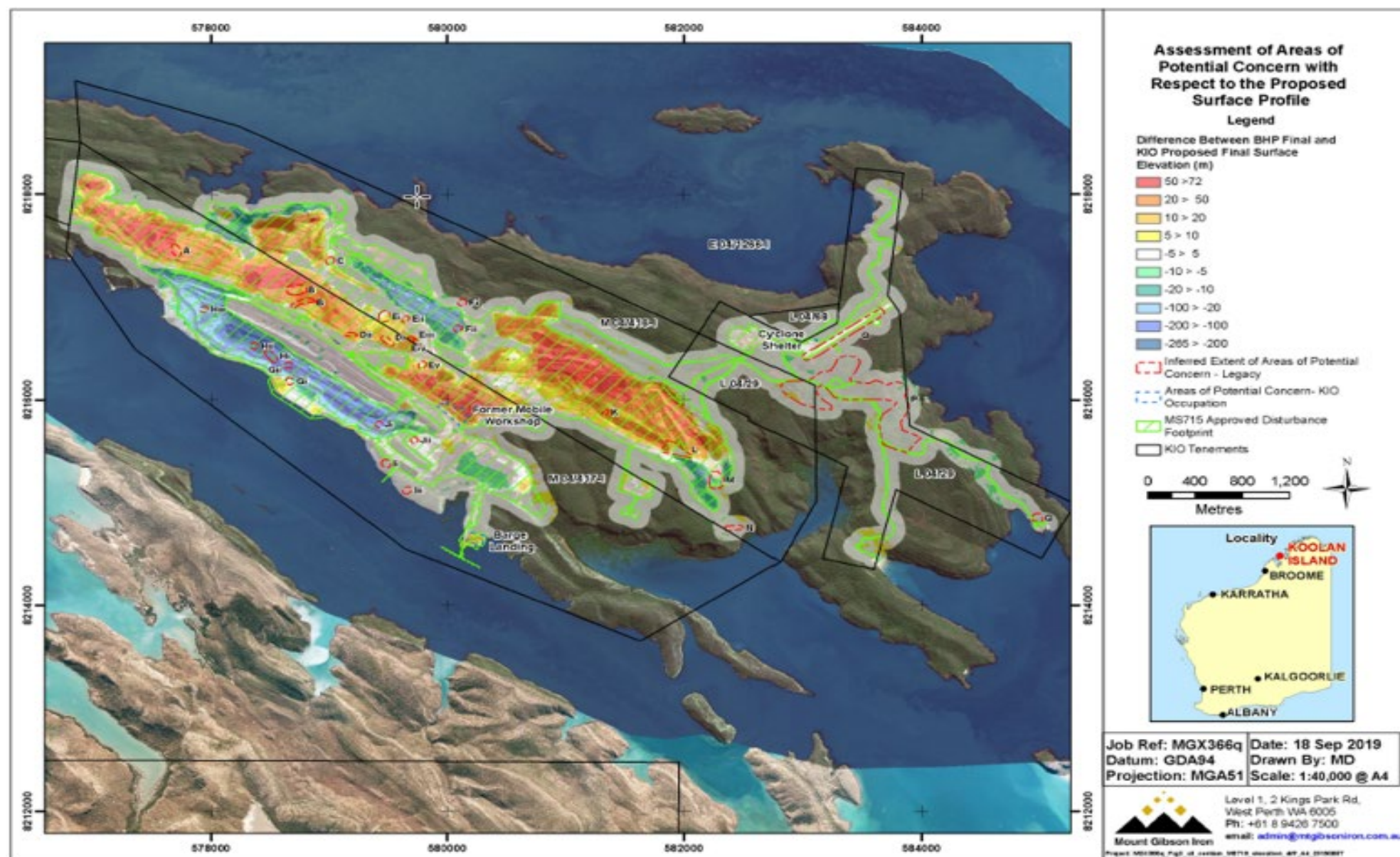


Figure 51: BHP Final Surface Elevation and Proposed KIO Closure Surface Elevation Differentials

16.4 Considerations for Mine Closure Planning

As part of the closure planning process sites are progressively being investigated, where possible, as they are identified. To ensure compliance with legal obligations all sites will be reported as per the requirements of the *Contaminated Sites Act* 2003. This reporting process will include the identification of future land uses and ensuring the land is left consistent with the objectives of this MCP.

KIO intends to inform DEMIRS of the broad status of contaminated sites on Koolan Island via the MCP, however, the formality of the reporting process will occur under the jurisdiction of DWER, and the *Contaminated sites Act* 2003.

KIO is undertaking a risk-based triage process to develop an action plan to undertake progressive investigation and remediation of contaminated sites. This process will be a gated process that will undertake broad sitewide assessment of the entire Island, focussing in on areas that require further investigation as discrete packages of work. The initial scope of works will look to refine the legacy sites.

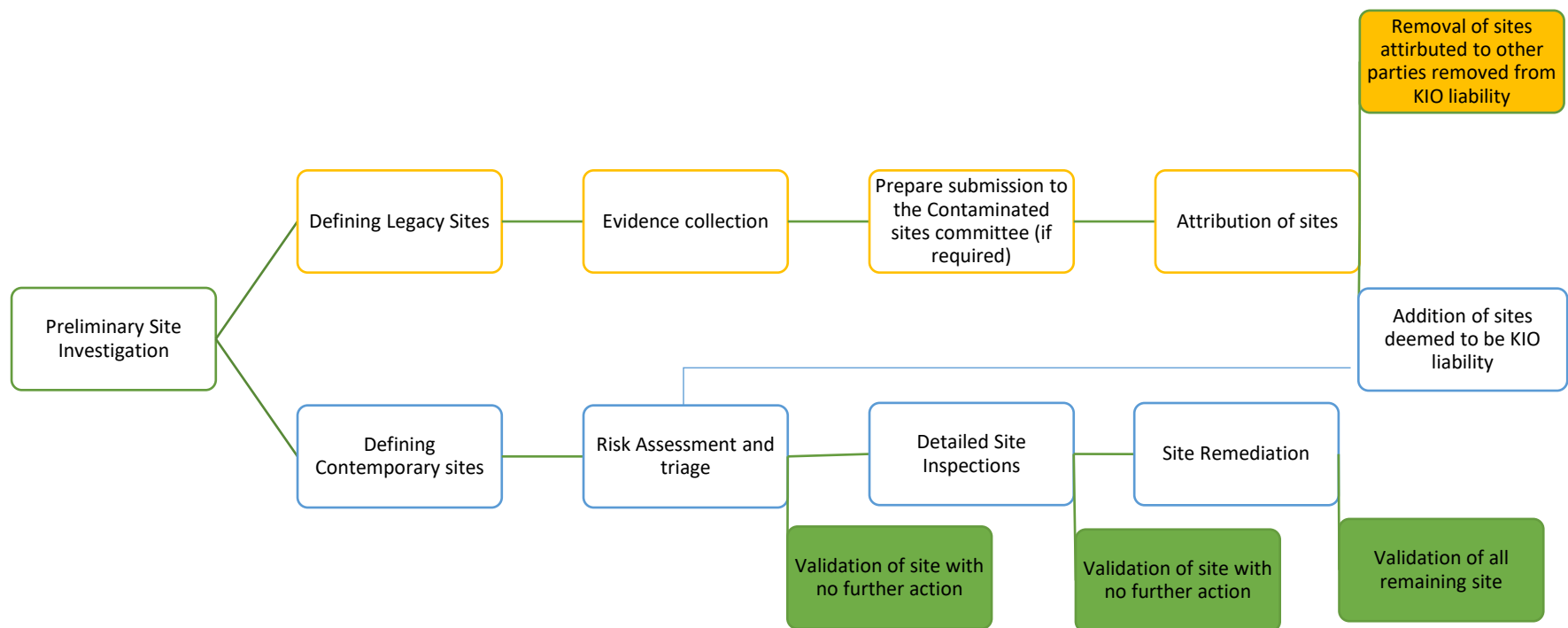


Figure 52 Contaminated sites assessment procedural flowchart.

17 ANALYSIS OF CLOSURE DATA

17.1 Closure of the Seawall and Main Pit

17.1.1 Main Pit Infill by Re-flooding

In November 2014, a Main Pit Seawall section collapsed resulting in inundation of the Main Pit by seawater. The seawall was rebuilt in 2017-2018 and entrained waters returned by pumping into the sea by early 2019. Upon closure, it is intended to construct a decommissioning cut (DC) through a natural section of the shoreline to convey tidal waters to inundate Main Pit in a manner which is safe and non-polluting. The seawall crossing the former Arbitration Cove will otherwise remain in-situ. This allows for the seawall to remain operable into perpetuity and therefore does not sterilize any remnant resource within Main Pit.

17.1.2 Stability and Structural Integrity of Seawall

It is likely that the seawall designed and built for safe mining conditions would also equally suit both that short term operational need and long-term post closure state. This is especially the case when a factor of safety must be met for protection of human safety and working environments. Having presented a feasible design in its design report (Coffey, 2017), KIO also commits to a final closure design and post-closure conditions for the seawall.

Once the Main Pit is tidally inundated, the balance of the seawall mass could remain in place. It is anticipated that the geotechnical stability of the seawall, after equilibration with coastal waters on the landward side above the hanging wall, would not compromise the structure. In the very distant future post-closure, should the embedded seepage barrier corrode and water infiltrates to flux through the seawall during large tides, it is anticipated that the competent quartzite material within the seawall embankment would allow for water movement by seepage without undue wall integrity effects because of the free surface flows of tidal waters through the excavated channel. The competent material and consolidated nature of the rock armour and fill would also retain *in situ*. That is, the seawall design of the exterior armour face is built to suit closure.

The seaward slope of the seawall will have been adequate during mining operations and have been periodically maintained following peak storm/wave/cyclone events. However, when considering “perpetuity” conditions, long term natural tidal forces and coastal processes may lead to flattening of the seawall embankment and, in readiness, a closure solution for long term integrity of the seawall may require manual lowering of the seawall profile and/or placing armour against the seawards slope, at closure. Wave-erosion studies will be sought, in conjunction with finalization of the pit lake channel (CD) design, to assess erosion rates under long term tidal forces and cyclonic events. If required, material would be progressively placed using conventional earthworks equipment above the tide level.

As a concept for the post-closure seawall, the following overview shows a cross section of how to adapt the progenitor life-of-mine seawall (Coffey, 2017) into the post-closure seawall (**Figure 53**). Rock facia on the seawall could be regraded pitwards to flatten the angle along contours such as C-T or C1-T, each terminating at the existing toe of the embankment. Note C-T once re-constructed would have a batter slope of 1:2.5 or greater, so conceptually the area is available to do the work to flatten the seaward face of the constructed seawall. Within the pit, on the inside of seawall, the batters on the buttressing would be graded down to flatten the inside of the seawall too.

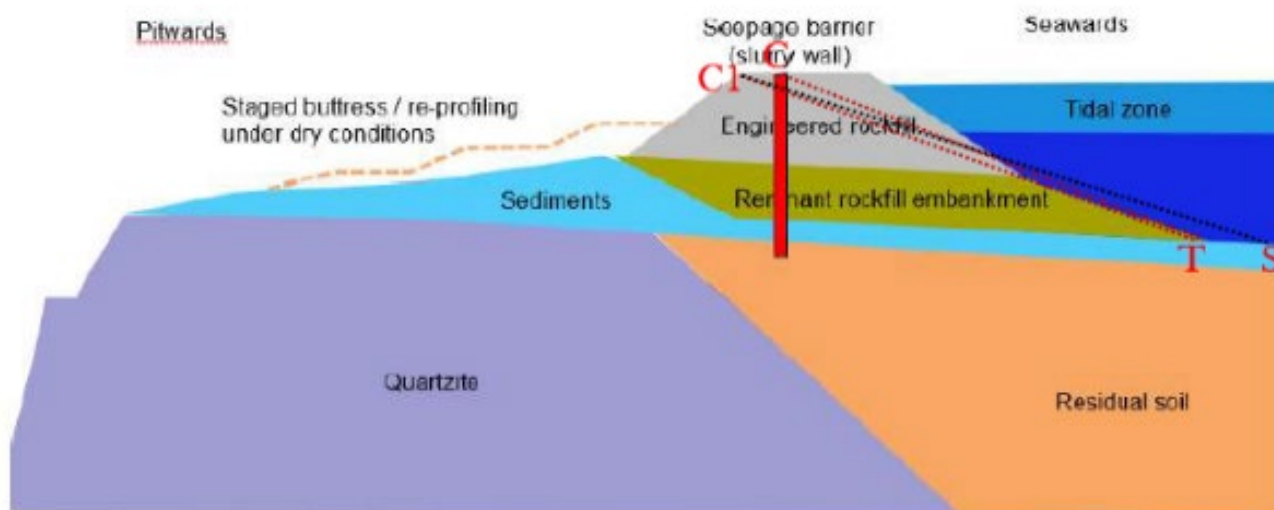


Figure 53 Schematic of Options for Reprofiled Seawall Surface Terrain

Should assessment indicate significant post-closure risk of the final seaward profile, then “flattening” as shown in **Figure 53** may be appropriate (noting that this profile may require additional EPA and DEMIRS assessment/approval). The flattening of repose on the seawall outer surface would be complemented by pit flooding through the adjacent ocean exchange trench.

Seawall Structure and Engineered Sea Trench – hierarchy of outcomes
Design work 2023-2025

- a) Check and/or re-instate armouring to seawall facia at the as-built angle – *preferred outcome*; and/or
- b) Grading the seaward facia down to a lower angle and shallower profile (reclaiming rockfill towards Pit, see sections C-T and C1-T as examples) – *preferred outcome*
- c) Grading the seaward facia down to a much lower angle and shallower profile (reclaiming rockfill towards Pit and pushing rockfill seaward – potentially requiring future EPA / DEMIRS consent; see Section C1-S)

The preference for closure of the Main Pit at completion of mining would involve creating a tidal channel through natural earth at the south-eastern side of the Main Pit adjacent to the ocean into a location outside at least 50m from the engineered seawall. This channel will be relatively narrow and at an RL such that the pit fills slowly on flood tide inundations yet renders the pit inaccessible for large vessels. It would however enable the pit void to flood and exchange daily tides and account for a marine re-connection of The Canal with the Arbitration Cove pit. It is unlikely that, without extensive improvement works, the inundated Pit Lake could be used as a “safe harbour” for marine vessels.

Further assessment for the final preferred option will be determined after on-site information is collected as the seawall structure now built is extensively monitored. Information would then enable input of “As-Constructed” conditions such as geological and geotechnical data, as-built design and ground / subsurface condition monitoring data (including from inclinometers and piezometers).

17.1.3 Scouring and Erosion

Marine monitoring undertaken since the seawall was rebuilt in 2018 has indicated localised physical water quality effects (increased turbidity) and benthic habitat (reduced coral cover) potentially associated with reconstruction of the seawall; specifically, burial beneath seawall rocks and increased sediment loads. The slope of the upper seawall section ($\gg 1:1.25$ vertical: horizontal above mean sea level) is steeper than the seawall toe ($\gg 1:2$). The lower portion of the seawall is likely to already be relatively stable, while the upper section will predictably continue to erode naturally on falling tides until a stable profile is reached - the stable slope would likely be $\leq 1:3$ (Siragusa, N., 2019). This design and operate approach uses time as the modifier for the structure to reach stable equilibrium.

If required before mine closure, instead of allowing nature to determine the stable slope, a manual re-profile of the upper section of the seawall could achieve a slope of 1:1.5 (typical slope used for breakwaters) and to armour the reprofiled slope with two layers of armour rock as schematically shown in

Figure 53. The size of the armour rock would be determined by the selected design wave criteria. KIO will consider this option if natural coastal processing does not form a suitably stable profile within closure timeframes.

17.1.4 Uncontrolled and Excessive Rock and Sediment Loss into Surrounding Environment

During operation of the seawall, seawall sediment will become entrained in surrounding seawater (and ultimately deposited to the seabed) as localised turbidity and seawall rock deposited on to the adjacent seabed in the short term as the upper seawall re-processes until a stable profile is reached.

In the medium term, once a stable seawall profile has developed, rock deposited from the seawall will form a new seabed surface and the rate of seawall erosion will reduce a level similar to that of surrounding, natural substrates. As the rate of seawall erosion equilibrates with the local natural rate, so too will sedimentation rates, which are functions of coastal processes. The return to natural conditions will allow benthic species to establish on the new sea floor. This condition is approved by Statement 715 and will continue to be monitored in accordance with the MMP. No foreseeable long-term changes in seawall condition are forecast after operations cease and a trench enables tidal fluxing of Main Pit Lake.

17.1.5 Main Pit 'Lake' Water Quality Environmental Value

At closure, Main Pit will be re-inundated by seawater moving through a tidal conveyance trench (referred to as 'DC', decommissioning cut) which would be constructed through natural (i.e. not engineered) section of coastline adjacent to the seawall. Due to the limitations of flow through the DC, hydraulic connectivity between the Main Pit 'lake' and the ocean will be restricted relative to that of Arbitration Cove (prior to KIO mining of Main Pit and construction of the seawall). This could potentially result in physiochemical conditions within the lake such that the lake is unable to support a taxonomic suite representative of the local marine environment.

In 2015-16, DHI built a fully calibrated hydrodynamic model (MIKE21) which was used to simulate the transport of sediment away from the seawall during its reconstruction. Diurnal tidal movements are known with high accuracy. The same calibrated model has been used to simulate seawater flux into a reflooded Main Pit through the trench made through the elevated coastal margin. The trench was modelled to be made through native rock and not through the engineered seawall for reasons

explained elsewhere. Preliminarily, a number of dimensions were assigned to trench options in terms of widths and bed elevations, mindful of two countering factors: the larger the trench the more ocean exchange water but the greater the opportunity for vessel navigation in the post closure period; smaller the trench, the less excavations and engineering to be made.

Pit lake and ocean water's physiochemical parameters are proportional to the efficiency and completeness of mixing of the two bodies. Various DC configurations were hydrodynamically modelled (DHI Water and Environment, 2019) to determine flow and mixing patterns with the ocean:

- -1.5 m AHD invert, 10 m wide base 1H:2V side slopes;
- West of the engineered seawall, normal to the seawall;
- East of the engineered seawall (at the ramp), normal to the seawall;
- Two channels: East of the engineered seawall (at the ramp) and west of the engineered seawall, both normal to the seawall;
- West of the engineered seawall, rotated 6° from normal to the seawall; and
- Two channels: East of the engineered seawall (at the ramp), normal to the seawall, and west of the engineered seawall, rotated 6° from normal to the seawall.
- Two channels: -1.5 m AHD invert, 10 m wide base 1H:2V side slopes, east of the engineered seawall (at the ramp), normal to the seawall, and +1 m AHD invert, 10 m wide base 1H:2V side slopes west of the engineered seawall, rotated 6° from normal to the seawall.

An interesting aspect of the surface model simulations was tidal flushing via either or both modelled east and west DCs. When just one DC was applied in isolation the eastern one worked far better, while the western one resulted in a relatively poorly mixed section of water at the eastern side of the pit even after 14 days. An explanation for that is that the eastern DC generates a jet of tidal water which crosses the pit and induces mixing in both directions when it collides with the foot wall, while the western one tends to generate a self-perpetuating counter-clockwise gyre resulting, in the latter case, in less efficient water exchange, both in terms of the distribution of the incoming clean water, and because more of the clean water is drawn out again on the following tide. The total volume of water conveyed through the canals over the simulations (east canal in isolation vs. west canal in isolation) are identical but the east option mixes and flushes better. A DC trench to the east of the seawall is the optimal choice.

There was a significant difference in the tidal range in the pit for the one DC versus two DCs. For one canal the spring range is around 3.5 m (identical whether east or west location) while for both active is about 5.0 m. Mean sea level in the pit lake is also a bit lower when both canals are active, and when one DC is active the mean sea level in the pit lake is always higher than mean sea level. Tidal levels over the modelling period in and outside Main Pit are shown in **Figure 54**. Modelled water mixing of the lake and ocean was most rapid with using two DCs with -1.5 m AHD inverts, with at least 99% of (a 20 m deep upper layer) lake water exchanged with the ocean after only 14 days (DHI, 2019). A single DC east of the engineered seawall (at the ramp) with the same design proved nearly as effective at mixing, with at least 95% of lake water exchanged with the ocean after 14 days (DHI Water and Environment, 2019).

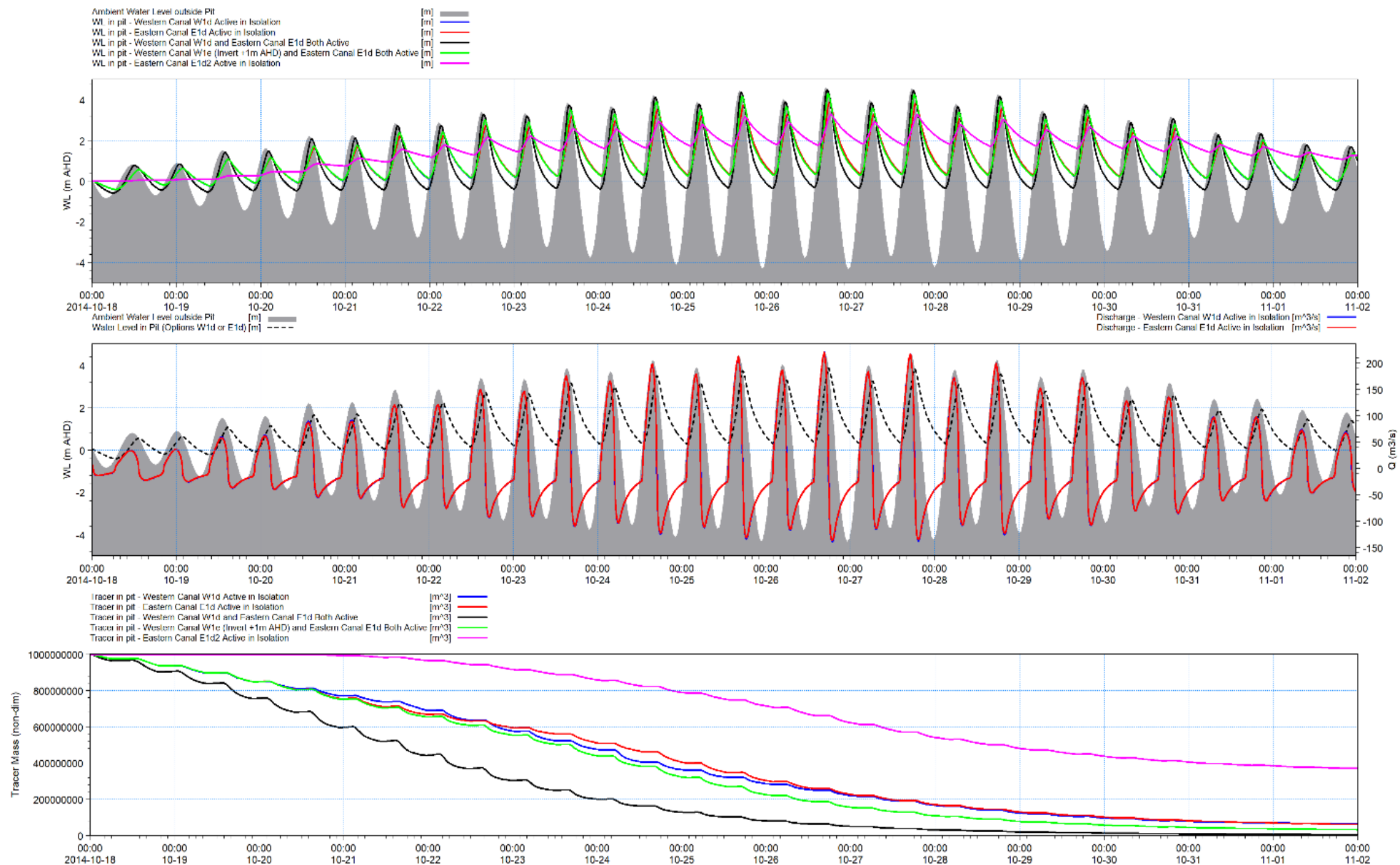


Figure 54 Tidal Levels in and outside of Re-flooded Main Pit

The single DC is KIO's preferred option as:

- potential environmental impacts of construction (i.e. blasting and subsequent sediment and rock deposition to the marine environment) will be lower, and
- spring tidal range for one cut (≈ 3.5 m) is significantly lower than for two cuts (≈ 5.0 m) (DHI Water and Environment, 2019), reducing scouring and erosion of pit walls.
- pit lake mixing using one DC sufficient if the pit is to be left in an unmanaged "natural" state. Construction of a second cut would be more beneficial if future pit lake use includes aquaculture or other intensive activities that would introduce a significant nutrient load and need flushing currents (DHI Water and Environment, 2019)

Current speeds over the shallows just offshore of seawall east DC are only approximated at this stage, and a finer model would be required to describe the transition out of the Pit lake into the sea. The existing model suggests that the peak localized currents exiting DC into the sea are high in a very localised area and highest upon an extreme runout spring tide (**Figure 55**). This would occur during late spring ebb when levels in The Canal have fallen well below the invert level of the DC bed but the levels in the Pit Lake remain perched several meters higher. When this happens, the flow exits in a hurry, and flows onto an exposed slope on the seaward side of the seawall. Further small-scale modelling will be done to determine the size and extent of the current flux field (from typical and extreme runout tides), and this will inform where (down to ten of metres) the DC would be installed to avoid established benthic habitat near the seawall.

A snapshot of a localised velocity field simulation around a single decommissioning cut is provided in **Figure 55** (DHI Water and Environment, 2019). It is estimated that within one to two months, the seawall east DC option would provide ocean quality water at the surface, noting:

- the surface layer of the pit lake is set to extend down to -20m AHD (the photic zone for light dependent benthos);
- entrance and exit losses for DC have been included; and
- roughness of the DC has been set high ($n=0.075$), based upon what appears to be a very rough boulder-strewn ultimate condition of the rock lining the DC trench.

The next tranche of modelling work to be completed by July 2023 will progress the following items:

- Examine the joint effect of tide and wind mixing of surface water by exchanges (i.e., oxygen) into deeper pit lake water layer(s). This will consider the risk and effects of seasonal vertical turnover of waters after hot summertime vertical stratification hypothetically causes a warmer, salty sea layer at the surface (a hyperlimnion);
- Provide a design of the trapezoidal DC trench to be stable post closure and to constrain vessel navigation; and
- Iterate the model should external stakeholders' express interest in aquaculture within the closed flooded pit lake.

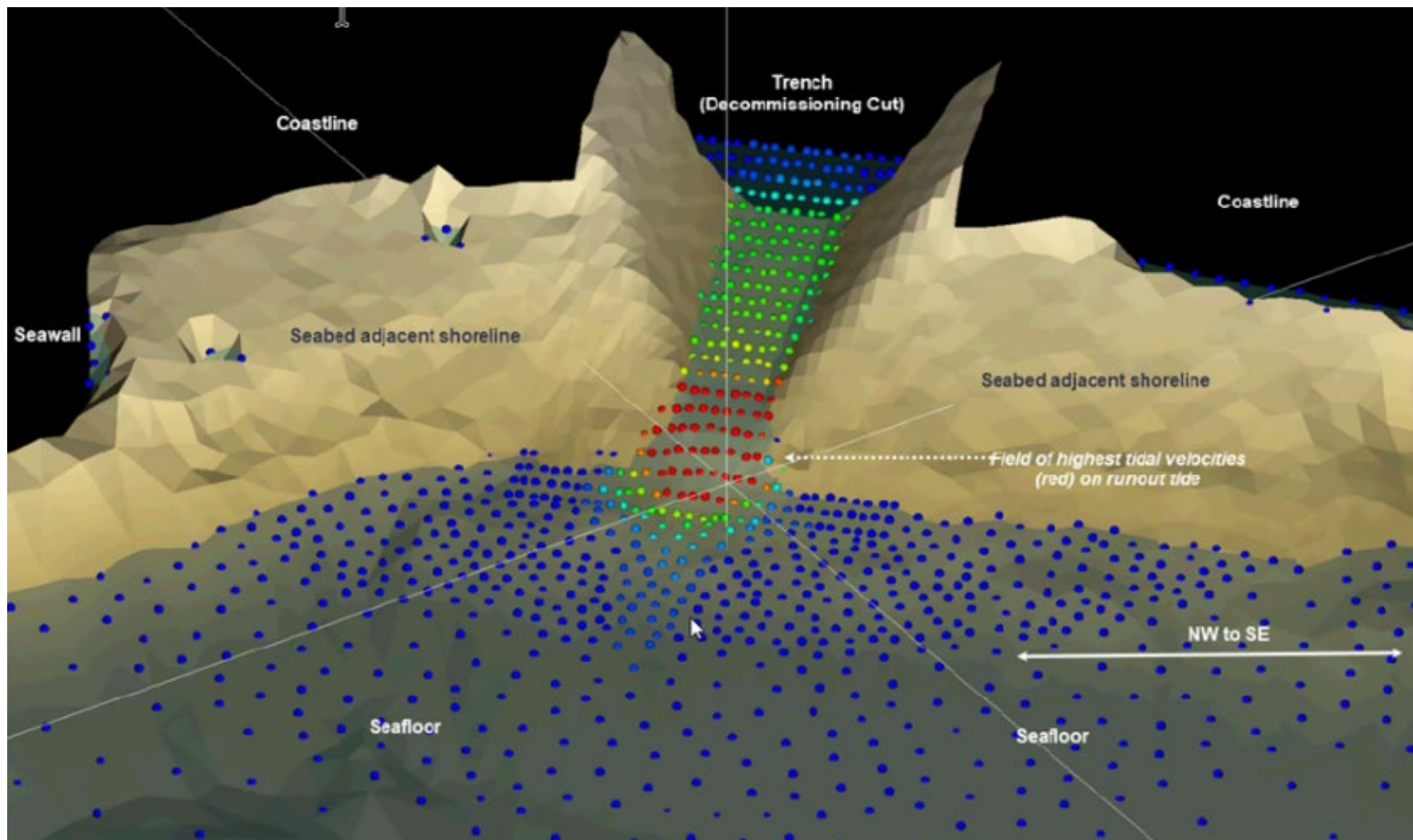


Figure 55: Snapshot of Time Series localised velocity field simulation around Modelled Decommissioning Cut (for tidal conveyances between sea and the flooded Main Pit)

17.2 Closure Designs for WD1

Several iterations for the closure landform at WD1 have been conceptualised. A summary of the pros and cons of different scenarios is outlined in **Table 20** (Soilwater Consultants, 2014b). The table looks at different factors that will influence the closure scenario of WD1, however, it should be noted that the airstrip is not considered due to the age of the information.

Table 20: Considerations of different closure designs of WD1

Design Form	Social	Economic	Environmental
As-built with selective material placement	Retains sections of low visual amenity	Low economic cost	Maximises area with highest growth potential
20° batter slope	- Reduces bare batter slope area - Likely to create large sections of sparsely vegetated landform	High economic cost	Maximises area with low growth potential
30° batter slope	Retains sections of low visual amenity	Lower economic cost	- Retains area of high growth potential - Maximises surface water flow resistance

Currently KIO is preparing for a blanket “base case” of battering all WRLs outer slopes to 20°. This is the most conservative approach from a stability perspective, however, requires the most earthmoving of previously mined waste rock materials and requires the most additional footprint and therefore clearing previously undisturbed areas. The upside of 20° batters is trials undertaken to date indicate that a blend of siltstone and quartzite create a stable surface that also provides a suitable environment for revegetation (more information is presented in Section 21.4).

There are two broad ways for a slope to be regraded to 20°; firstly, it can be over dumped until the slope face is 20°; secondly, the crest can be mined backwards to create 20° batters. The former requires a large amount of material and can significantly expand the toe of a WRL which is exponentially larger as the WRL increase in height. The second option may not require additional footprint but will mobilise large amount of waste that will need to be relocated; there is also some element of the unknown when mining into a WRL and that the waste quality may degrade as mining continues, this can cause landform instability. KIO has previously estimated the extent of potential rehabilitated land, assuming a maximum 20-30° angle projection from the existing waste dump crests (as denoted by the magenta hatched area shown in **Figure 56** particularly to the west end of WD1).

This construction approach would, in many areas, require that the WD1:

- Extend a significant downstream distance into areas of natural vegetation and, waste dumps generally.
- Require significant earthworks to be undertaken. This work is not necessarily required to bring about safe and stable closed landforms.

Coffey had recommended to KIO it considers maintaining the toe of the existing waste dumps at / near their current (pre-closure) position and, as a potential option for sections, to flatten the slopes 'inwards' by adjusting the WRL crests. This method would serve to:

- Reduce environmental disturbance, by reducing the extents of clearing and general disturbance works in downstream vegetated areas;
- Reduce the overall height and crest width of the waste dumps; and
- Reduce the earthworks volume associated with the closure earthworks.

To facilitate a modified "mined back" landform, the upper section of the waste dump would need to be cut and then the outer waste dump areas would be reshaped down. Earthworks would be balanced, so that minimal new waste rock is required to be imported to the areas. This is likely difficult and potentially unstable ground conditions for any new work. Should it be possible, the additional footprint area for pushing out to 20 degrees would no longer need to be used, as earthworks could be carried out over the existing disturbance footprint. A new ultimate crest would be formed, which would need to include surface water management.

Geophysical modelling has shown that short flights of 30° batters interrupted by berms is another viable option based on material types present on Koolan Island. The most recent proposed footprint for WD1, based on this design, is shown in **Figure 57**. However, based on the works completed the batters would require armouring with quartzite, which will minimise the ability to revegetate the slopes, the berms will be very gently sloping and could be capped with a growth medium that would allow selective areas of the WRL to be revegetated (Soilwater Consultants, 2014c). This is conceptually presented in **Figure 58**. If this design is selected trials would need to be advanced to understand if a blend of siltstone and quartzite would create a stable landform capable of supporting vegetation.

The land forming options presented considered prior to the construction of the new WD1 airstrip. KIO has engaged geotechnical consultants to undertake further testing and develop a closure design which meets the closure requirements of maintaining an airstrip but also meeting the closure obligations of the Project.

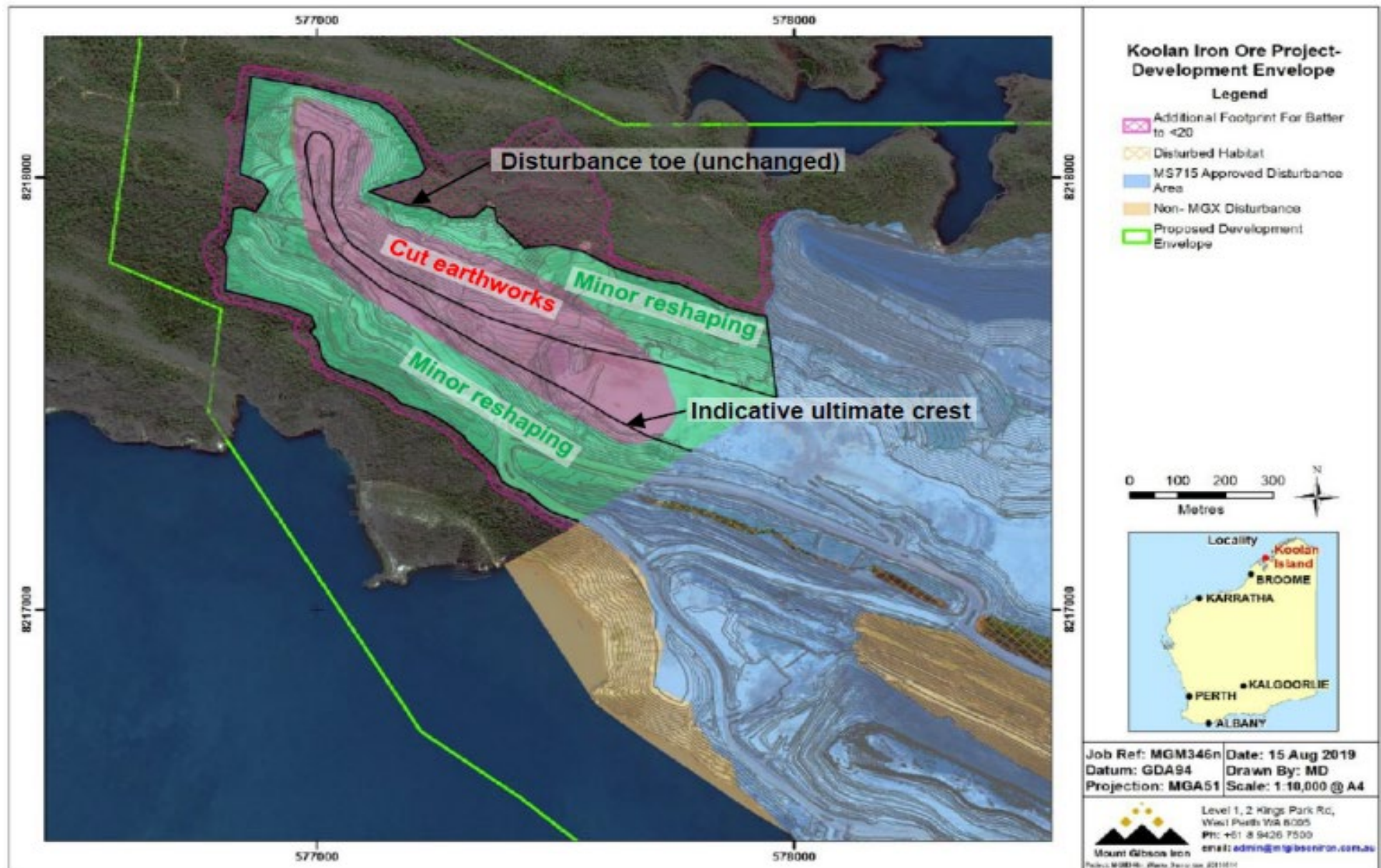


Figure 56 Preliminary estimation of final outer batter and WRL design at west end of WD1

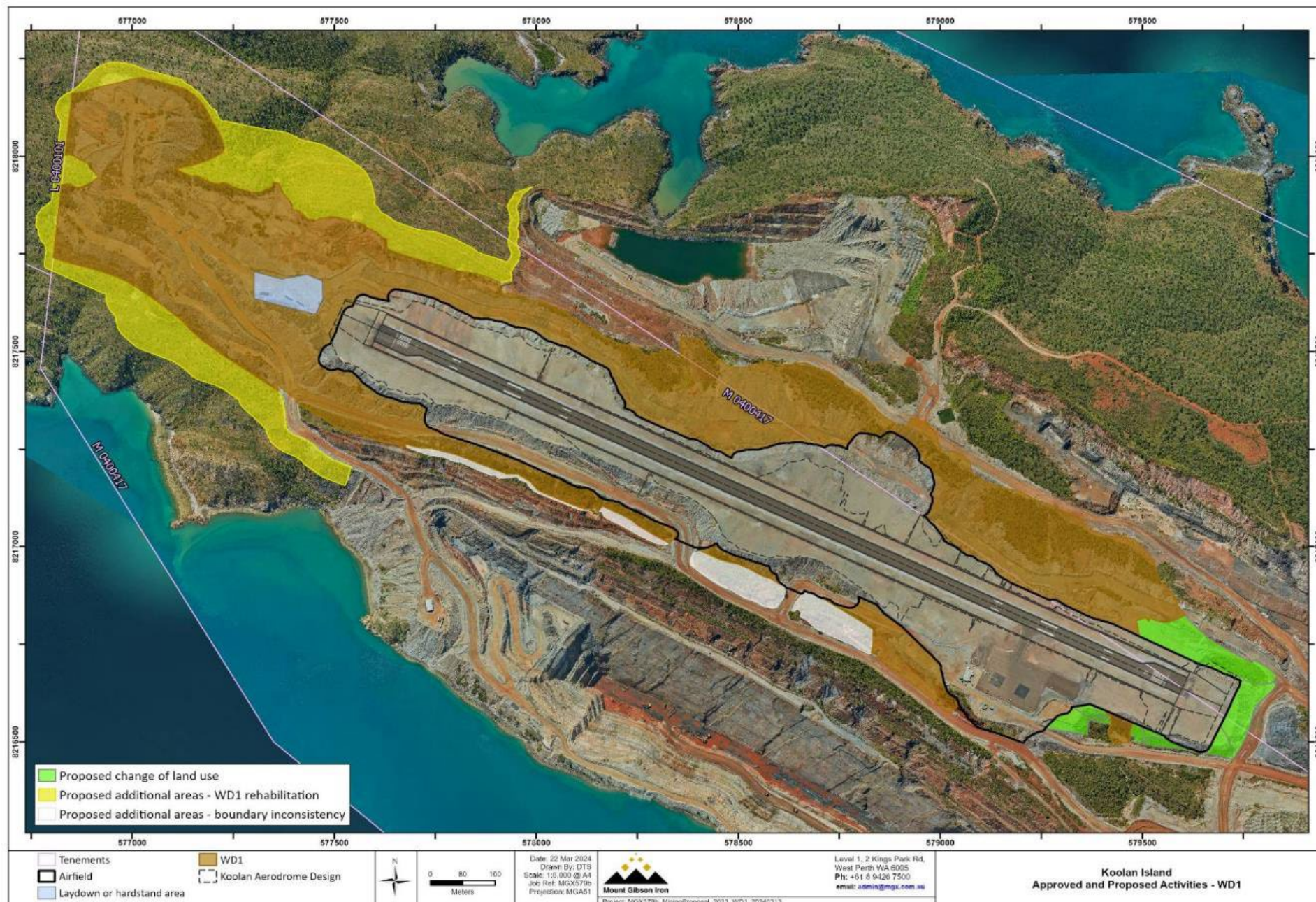


Figure 57 WD1 approved and proposed footprint

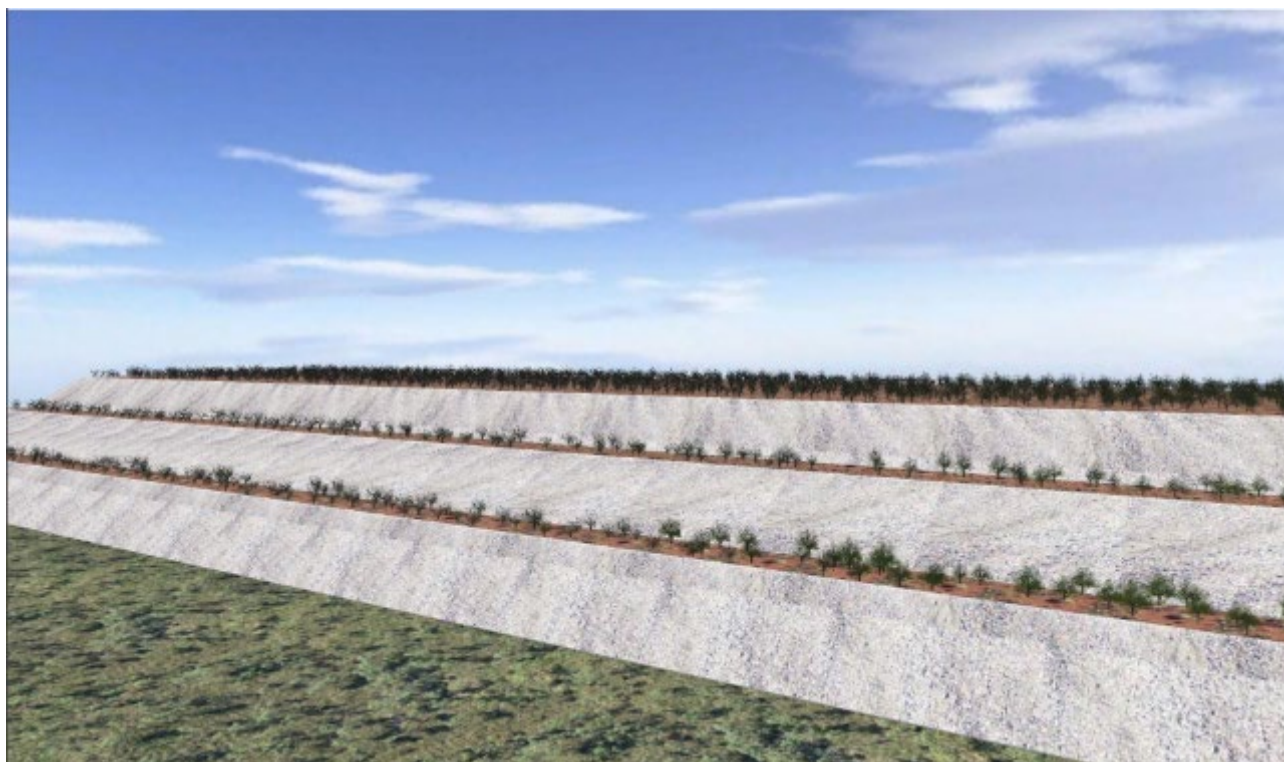


Figure 58 Conceptual view of a WRL with 30° batters and 10 metre wide vegetated berms.

17.3 Closure of Open Pits

17.3.1 Stability and Structural Integrity of Pit Crests

Mine pits have been, and will continue to be, designed in accordance with the Department of Minerals and Energy (Department of Minerals and Energy, 1999) with sufficient Factor of Safety and Probability of Failure margins.

17.3.2 Slumping and Collapse of Pit Walls

Mining of Acacia East pit has suspended. Risk associated with pit wall slumping and collapse is avoided by limiting access to the pit by use of a rock bund.

With the necessary geotechnical studies undertaken, a factor of safety is built into the designs, and geotechnical control systems (i.e. anchoring, mesh and shotcrete) of the Main Pit walls. Operationally, wall slumping and collapse is known to occur. Small-scale fretting, and erosion during the wet season are managed operationally. Geotechnical inspections of the pit walls are conducted regularly, with formal reports developed weekly and all evidence of pit wall movement and potential and actual failure recorded.

Main Pit will be seawater inundated at closure. As the ground water level rises following this inundation, the geotechnical stability of the saturated pit walls, and the overlying capillary fringe may be affected. The effects of rising groundwater, and fluctuating sea water levels (once groundwater conditions have 'stabilised') on the stability of the pit walls will be assessed by geotechnical analysis prior to closure design finalisation to assess long term effects. After Main Pit is inundated post-closure, foot wall stability may be compromised over the longer term by tidal rise and fall. Ultimately the geotechnical control systems will fail, likely resulting in slumping and / or collapse of sections of the foot wall. In acknowledgement of long-term safety risk associated with

foot wall instability to potential pit 'lake' users, KIO proposes to constrain access to the 'lake' to control vessels beneath sections at risk of rock fall. A potential and suggested management measure previously discussed with DEMIRS is for a 'No Go Zone' marked by buoys and / or dolphins at the time of closure (post-flooding).

17.3.3 Use of Abandonment Bunds

Abandonment bunds may be needed to constrain access to the steep top sections of:

- Main Pit,
- Acacia East,
- Mullet pit (shortfilled),
- East pit (shortfilled), and
- Mangrove Pit.

Given the topographic nature of Koolan many of the mining areas are only easily accessible from one direction. KIO have started the engagement with DEMIRS (Appendix B) and KIO has raised the topographic constraints as part of the abandonment bund strategy. The Safety Bund Walls around Abandoned Open Pit Mines Guidelines (Department of Industry and Resources, 1997) specifically states that the "*design of safety bunds required to minimise the potential risk to public safety of inadvertent access to abandoned open pits*". The fact that Koolan Island is an island and the very difficult topography surrounding mining areas KIO expect that this strategy prevents inadvertent access and meets the purpose of the guidelines. To ensure compliance with the intent of the guidelines a simple three-point checklist has been used to when using natural topography is used in place of an abandonment bund:

- The slope is steep enough to prevent inadvertent access ($<30^{\circ}$ in hostile terrain or $<37^{\circ}$ in accessible terrain).
- The topographic feature is outside of the zone of pit instability plus 10m.
- The topographic feature is a minimum of 5m high and 2m wide.

A slope analysis of Koolan Island was undertaken, this data is used to determine which slopes meet the above criteria and can be used in lieu of placing abandonment bunds.

An overview of the placement of Abandonment bunds is shown in **Figure 59** and a site wide slope assessment is **Figure 60**, specific closure bund designs and placement for each pit is outlined in section 21.

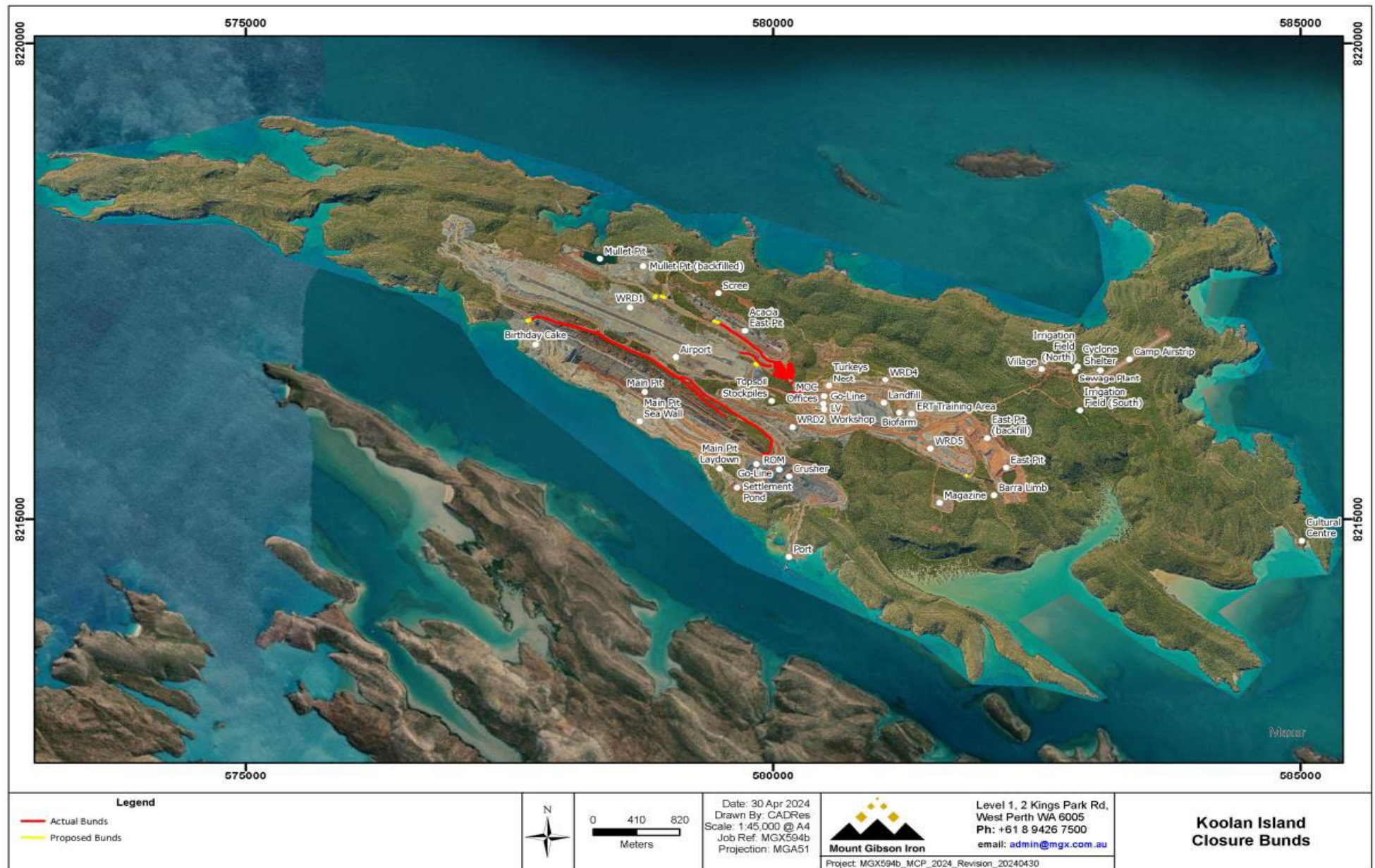


Figure 59: Conceptual Location of Abandonment Bunds



Figure 60: Slope assessment. Red highlighting indicates a slope of 37° or greater.

17.3.3.1 Main Pit

Main Pit, once inundated with water, will be accessible via water from the southern shoreline. The water will reduce the pit depth from the south to a variable depth which will be tidally influenced. The southern side will effectively not have a zone of pit instability due to water buttressing and therefore will not have an abandonment bund.

The northern side of the Main Pit, atop its footwall, will have a significant drop to the inundated pit and therefore will require abandonment bunding to constrain access towards the pit void from that bearing. The internal roads connecting the northern crest and the southern crest of main pit will also need to be severed to comply with abandonment bund requirements.

The ZOI has been projected in **Figure 61** and the corresponding placement of the abandonment bund is shown in **Figure 62**.

17.3.3.2 Acacia East Pit, Mullet Pit and Scree Mining Areas

Mullet Pit and Acacia Pit (along with the rehabilitated scree mining area) create the northern mining precinct. Therefore, the closure of all three areas are interlinked. At closure, a void will remain at both Acacia and Mullet Pit; Scree is already land formed and rehabilitated and does not meet the requirements to be considered a permanent void.

The northern shoreline of Koolan Island is highly rugged with very steep slopes or cliffs protecting mining areas being accessed from the sea. The slope angle analysis in **Figure 60** highlights the steep topography. There are no safe landings for vessels on the northern shoreline and the small beaches are flanked by cliffs which make traversing them extremely difficult. It is considered that the likelihood of inadvertent access to any mining areas from the Northern shore is very unlikely. Therefore, it is considered that this natural topography meets the intent of the Safety Bund Walls around Abandoned Open Pit Mines Guidelines (Department of Industry and Resources, 1997).

The overall angle (toe to crest) of Mullet Pit hanging wall slopes is 35 to 40°. Both weathered and unweathered conditions were anticipated during mining and due cognisance was taken in the slope design process (Geotechnical Consulting P/L, 2007). Slopes were designed to a factor of safety of 1.2. Recent inspection of the pit hanging wall slopes where dominant bedding dips favourably at between 45 to 65° into the wall suggests that the slopes remain in a stable condition.

A conservative abandonment bund was projected should the pit remain at pre-backfilling conditions, representing the most conservative location of an abandonment bund, as shown in **Figure 63**. Upon the completion of backfilling of Mullet pit a final assessment of the abandonment bund location will be required noting that the location presented in **Figure 63** is adequate for all closure scenarios.

There is the intent is to build abandonment bunds to the south of Mullet and Acacia pits to prevent inadvertent access to the voids. Additionally, there is only a single-entry road to access the northern mining precinct. A secondary bund will be built to restrict access to the haul road which would provide additional layer of safety for closure of the northern mining precinct.

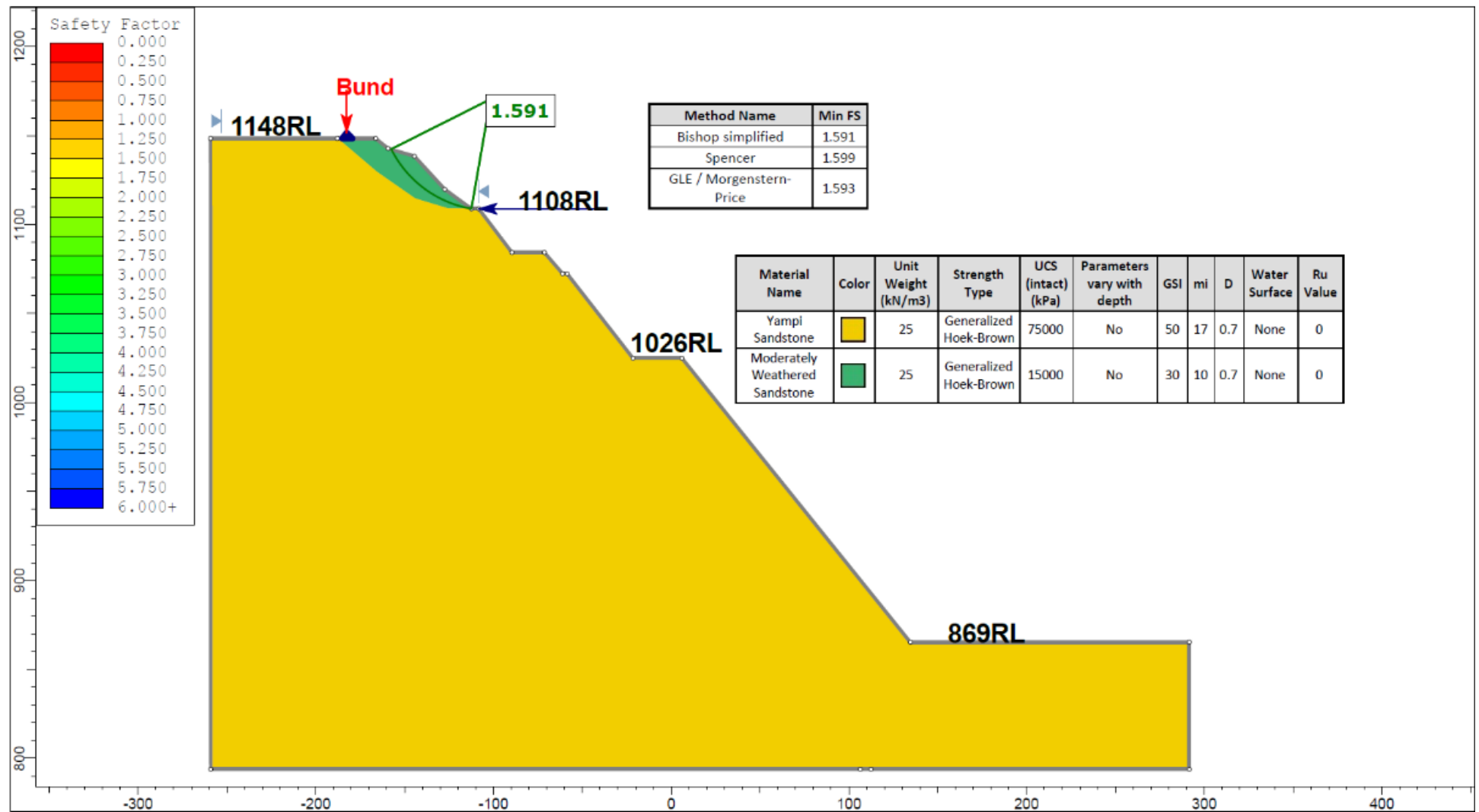


Figure 61 zone of pit instability – Main Pit

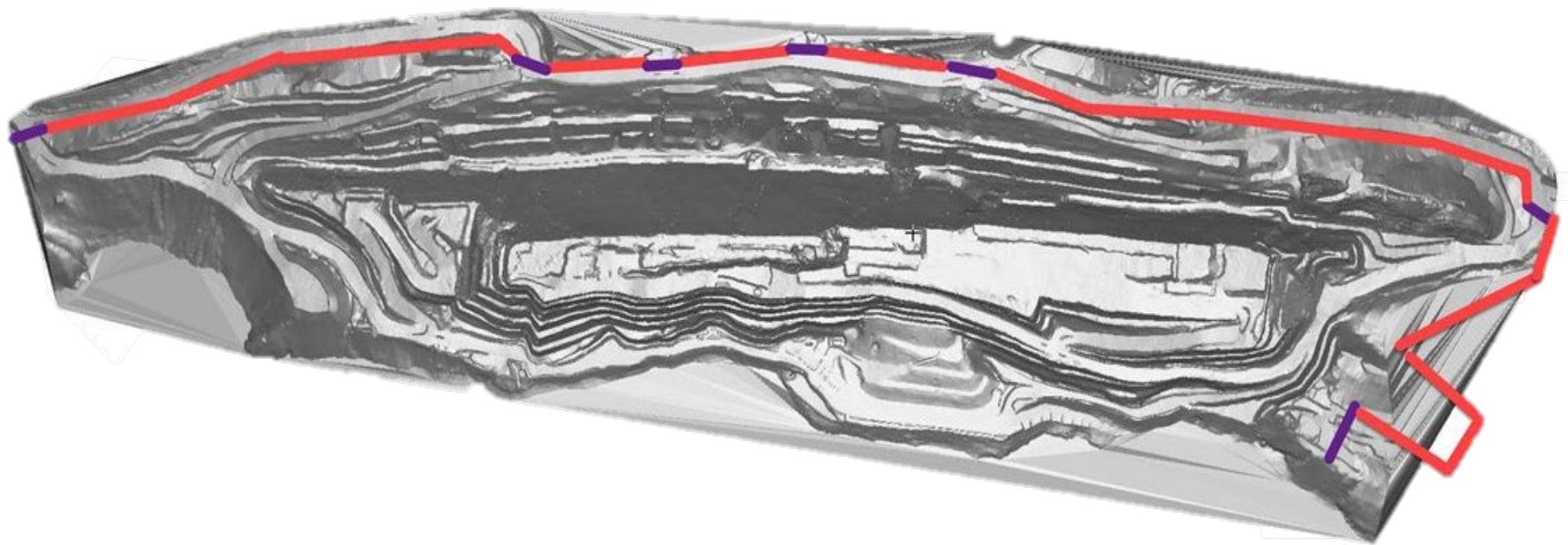


Figure 62 Main Pit Abandonment Bund Location (Red indicates bund parallel to a road, purple indicates road crossing is required).

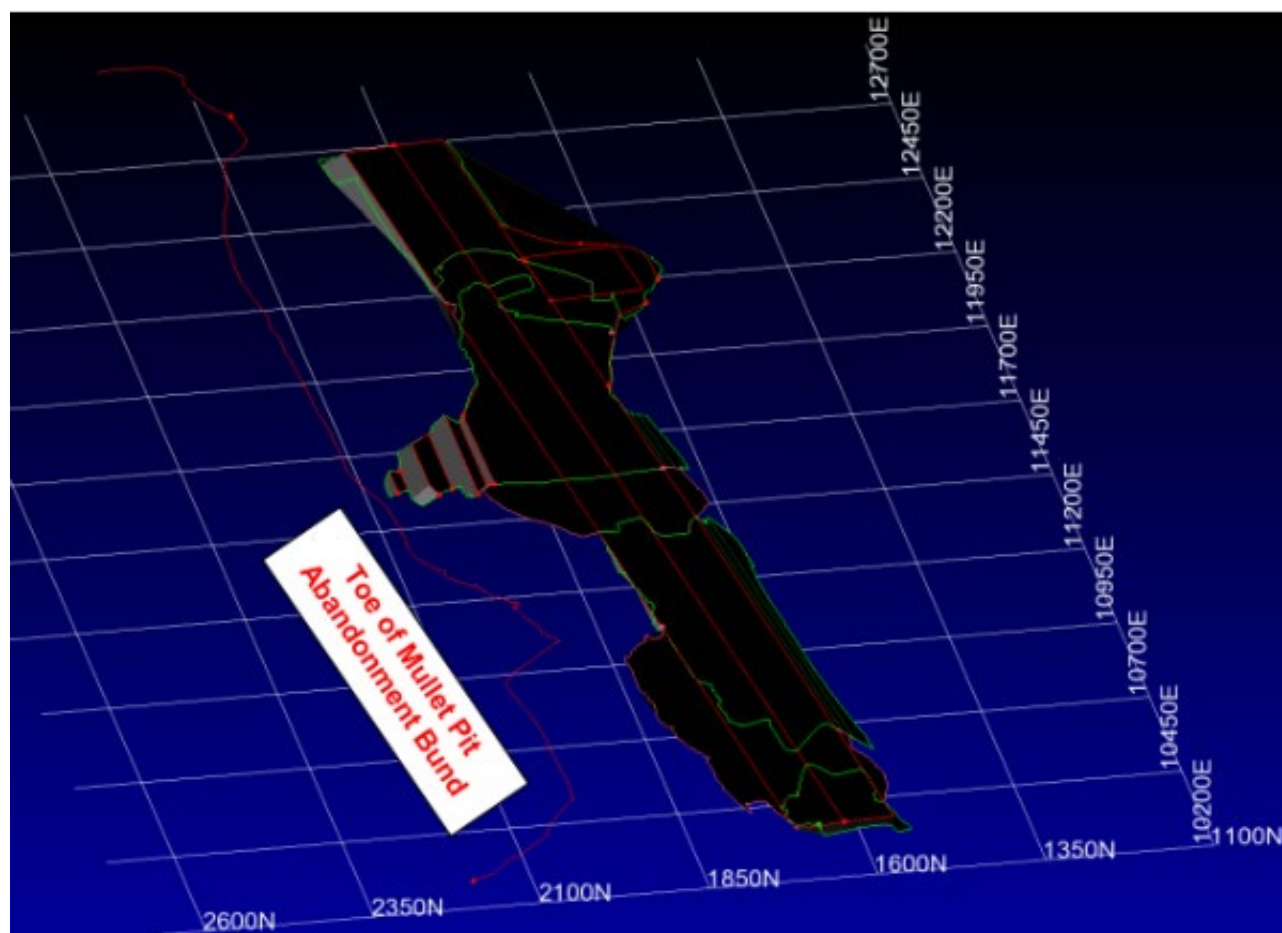


Figure 63 Preliminary location of the Mullet and Acacia pit abandonment bund.

17.3.3.3 East Pit

The remnant East pit will be partially filled with waste rock with a surface terrain at RL 1100m, some 50 metres lower than the surface constructed over Barramundi pit.

The potential zone(s) of instability was created around the crest of East Pit by projecting the backfilled surface at 250 creating an intersecting string with the natural surface. The location of the abandonment bund for East Pit is shown in **Figure 64**. The zone of instability on remnant steep walls drapes predominantly to the south and east of the backfilled pit. The ZOI is undergoing geotechnical review and final placement of abandonment bunds will be forecast once the review is complete.

There is currently limited access to these areas from the coastline. As can be seen in **Figure 65** the slopes from the coast are long and heavily vegetated. These unimpacted areas considered very hostile for the purposes of access to the island. Any constructed access will require additional clearing and significant work to establish safe access for heavy equipment. Similarly, the steep natural terrain (**Figure 66**) on those faces heavily constrains any form of overland entry to the former footwalls of East Pit. It is considered that the natural topography to the south and east of East Pit natural deter inadvertent access



Figure 64 – preliminary placement of abandonment bund for East Pit.



Figure 65 Barramundi Bay looking landward towards East pit

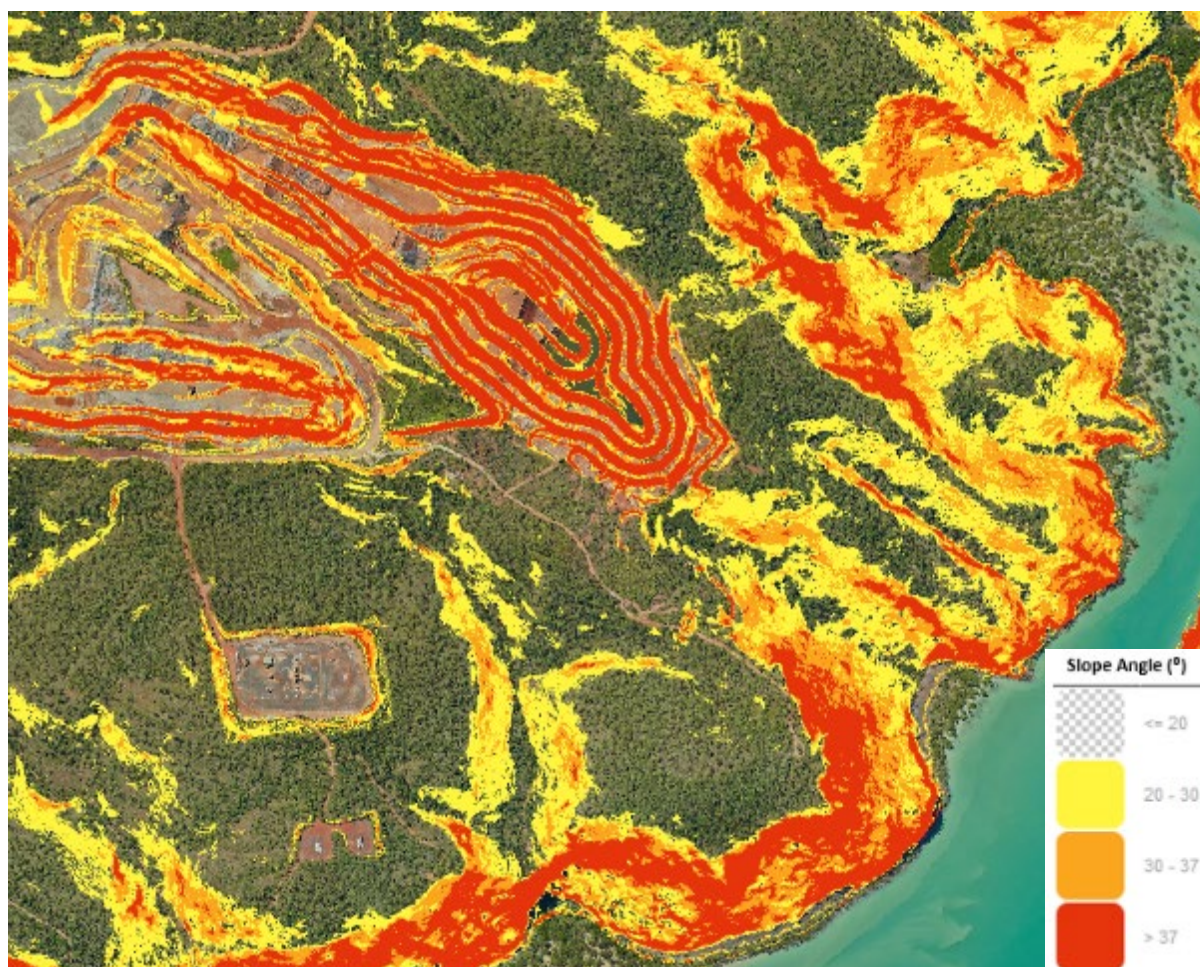


Figure 66 Slope assessment at and around mined East Pit (note East pit internal slopes will differ upon closure with partial backfill)

17.3.3.4 Mangrove Pit

Mangrove pit is a resource that is yet to be mined. The pit has been planned; however, geometry may change to facilitate optimisation. Based on the current pit design the floor of the pit will cease at approximately 15m below the ROM/Stockpile area. This will result in a remnant void at closure. Until a final pit design has been executed and the zone of pit instability has been defined by geotechnical engineers a conceptual abandonment bund location is provided on **Figure 67**.

This bund has been located to tie into existing topographic features while still meeting DEMIRS' requirements. A final abandonment bund location will be completed once a final pit shell is established.

17.4 Northern Quoll Artificial Denning

To understand how to ensure Northern Quolls will reinhabit rehabilitated landforms KIO trialled the installation of artificial dens into a trial rehabilitation slope on WD4. The project area encompassed habitats and vegetation associations which are widespread throughout the region. Some of the species listed in the CALM Priority are considered regionally significant because of limited knowledge about their distribution and / or poor representation within existing conservation reserves.



Figure 67 Conceptual location of the Mangrove deposit planned pit abandonment bund.

KIO had formed a partnership with Murdoch University to undertake a PhD program for studies related to the Northern Quoll. This project provided key outcomes for mine closure in relation to habitat use, artificial den creation, cane toad aversion techniques, and population estimates which take into consideration the advantages and / or disadvantages of human occupation at Koolan Island.

Rehabilitated revegetated land is thought to serve as foraging habitat for fauna, including quolls. However, additional small scale civil works would be needed for any re-creation of quoll dens on otherwise homogenous waste rock landform surfaces. It is thought that this will tie with their ranging and foraging habits, with opportunities for local breeding and denning (**Figure 68**). Trial work has examined the effects of temperature and humidity inside and outside polypipe (PN14) artificial dens. Long term stability of the PN14 dens must be considered and current views are that rock overhang dens would serve better for post mining timeframes.



Figure 68 Installing 2m lengths of PN14 pipe (LHS); Quoll footprints at 'den' entrance (RHS). Quoll inspecting (below).

17.5 Progressive Rehabilitation, Trials and Benchmarking

17.5.1 Overview of Rehabilitation

The majority of cleared land has been active for mining purposes and due to limited access and the footprint of active mining, rehabilitation of MGX past mining has been applied to areas known as WD4 Bay 4, Barra Limb, WD4 and Scree (**Figure 69**). KIO first established rehabilitation trials in 2009 with stage 1 of Barra Limb rehabilitation, followed by the WD4 Bay 4 rehabilitation trial in 2010, and the expansion of Barra Limb rehabilitation to include stage 2 in 2011. The different rehabilitation trial areas received similar treatments, with slopes battered down to approximately 20°, covered with approximately 100 – 400 mm of topsoil, and ripped on contour. In addition to these rehabilitated areas of MGX disturbance, some areas historically disturbed by BHP were rehabilitated prior to MGX activities, generally by moonscaping then seeding. Revegetation has also occurred on a smaller trial scale at the WD1 surface treatment trials (**Figure 69**)

A brief summary of the background and methodology applied for the rehabilitation of these areas is provided below:

Comprehensive photographic herbarium was compiled by KIO staff, with baseline data collected on numbers and species of plants growing in 10 different analogue habitats across the Island. Seedling databases were developed for the purpose of identifying plant species early in rehabilitation monitoring.

Data from the analogue quadrats was used to guide seed mix for the rehabilitation areas with Barra Limb Stage 2 and WD4 direct seeded. Barra Limb Stage 1 rehabilitation was not direct seeded, with all subsequent plant growth either from the residual seed bank within the topsoil or transported seed from other areas carried by wind or fauna.

Monitoring has been carried out within quadrats (approximately 10m x 10m) set up within the five rehabilitation areas (including the WD1 cover trial), with plant species and numbers recorded along with general observations and photo monitoring. LFA has been utilised to monitor revegetation since 2012.

Seed collection is biased towards those which have adapted to thin soil cover and low water requirements. The selected species mix is based on those which been observed to establish and grow in rehabilitated areas, areas subjected to re-establishment of vegetation (i.e. subjected to naturally occurring bushfires) and the species selected for traits analysis. A database of seed weights has been developed for the purpose of designing seed mix volumes. Seed is stored in self-contained, temperature controlled facilities on site. Based on site investigations the optimum conditions for seed storage are low light, low oxygen, temperature of 15°C and 15% humidity. The facility on the Island stores seed at 23°C and humidity is controlled by air conditioners which maintain the facility at this temperature. Vacuum packaging is also used and seed viability testing has been undertaken by external providers previously.

In 2019 the scope of the rehabilitation monitoring was expanded from previous years. The LFA was repeated on the sites that have been previously monitored, new sites were added, including older rehabilitation areas, rehabilitation trials and analogue sites, increasing the total number of transects from 8 to 16. Erosion monitoring and vegetation structure measures were also expanded to all sites. Photo monitoring, floristic diversity and vegetation structure monitoring occurs and expanded to all LFA sites in order to generate EFA information. A methodology for assessing the habitat for terrestrial vertebrates was also developed and applied.

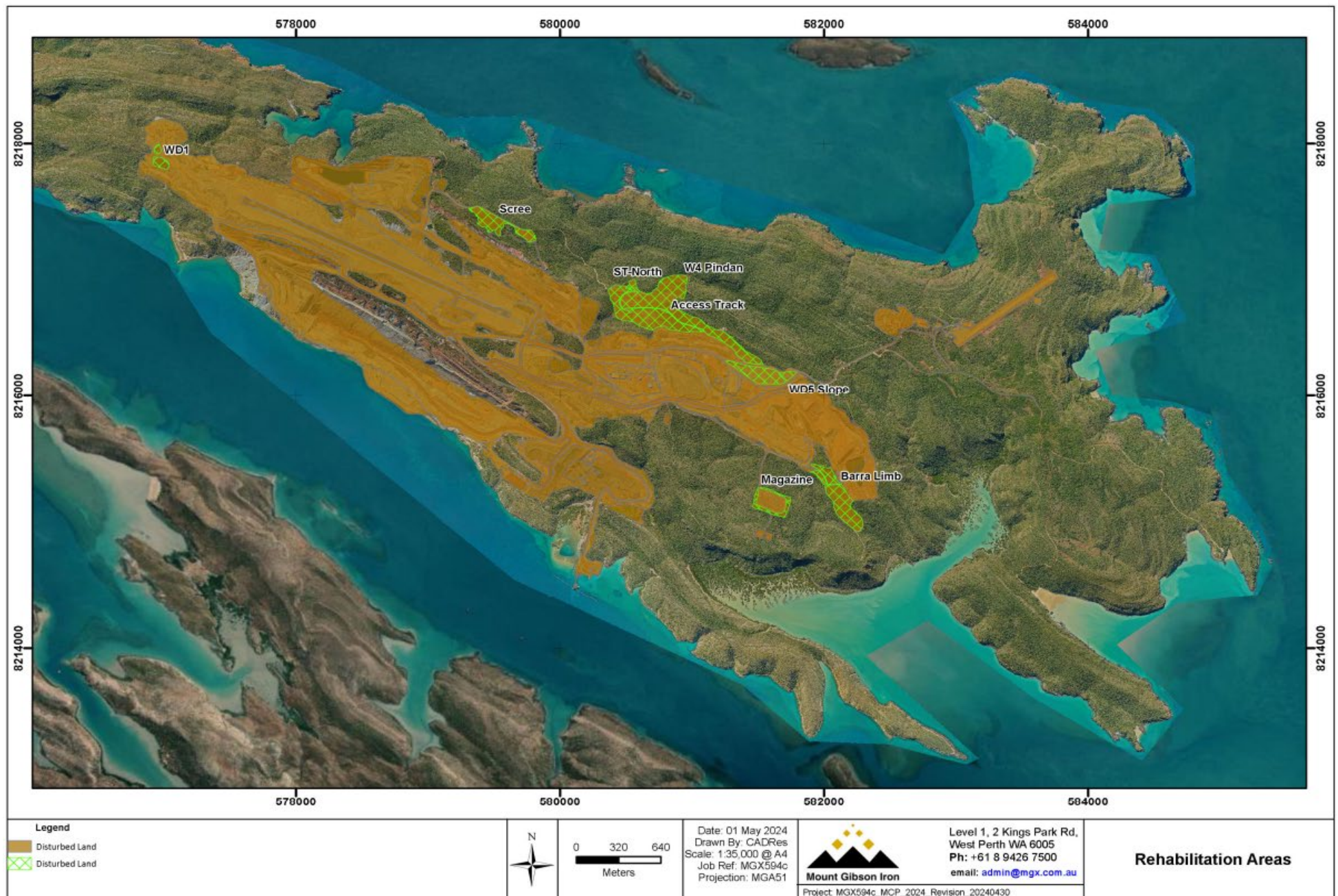


Figure 69 Rehabilitation Areas

At a glance, the vegetation metrics associated with rehabilitation are positive with all rehabilitated sites meeting the vegetation criteria targets. Landform stability requires further assessment as current reporting indicated that none of the sites are meeting requirements. This may be because there was a change of methodology between 2020 and 2022 reporting periods; these different methods are not directly comparable and therefore the most recent stability data is limited to two monitoring events which is not enough to define a trend. The data requires further scrutiny to understand the longer-term stability trends. The summarised LFA results from the Landscape Function Analysis 2023 study (AECOM, 2023) (Appendix C15) are provided in **Table 21** through **Table 26** with detailed analysis of rehabilitation below.

Table 21 Landscape Organisation Summary

Landform	Transect	Result	(%) of Analogue Site	Criteria Met
Bay 4	B4-T1	81.0	105.4%	Yes
	B4-T2	40.0	52.0%	
Waste Dump 4	WD-T1	46.0	59.8%	Yes
	WD-T2	43.0	55.9%	
Rehabilitation Trials	T-1	19.0	24.7%	No
	T-2	79.0	102.8%	Yes
	T-3	92.0	119.7%	Yes
	T-4	46.0	59.8%	Yes
	T-5	43.0	55.9%	Yes
Barra Limb	BL-T2	42.0	54.6%	Yes
	BL-T3	61.0	79.4%	

Table 22 Stability Index Summary

Landform	Transect	Result	(%) of Analogue Site	Criteria Met
Bay 4	B4-T1	61.7	71.8%	Yes
	B4-T2	54.6	63.6%	
Waste Dump 4	WD-T1	55.4	64.5%	Yes
	WD-T2	64.8	75.5%	
Rehabilitation Trials	T-1	67.0	78.0%	Yes
	T-2	76.8	89.4%	Yes
	T-3	74.4	86.7%	Yes
	T-4	61.9	72.1%	Yes
	T-5	47.4	55.2%	Yes
Barra Limb	BL-T2	47.6	55.5%	Yes
	BL-T3	51.7	60.2%	

Table 23 Vegetation Structure – Plants per Ha - Summary

Landform	Transect	Result	(%) of Analogue Site	Criteria Met
Bay 4	B4-T1	22672.7	99.1%	Yes
	B4-T2	18323.7	80.1%	
Waste Dump 4	WD-T1	11951.3	52.2%	Yes
	WD-T2	36709.7	160.5%	
Rehabilitation Trials	T-1	10075.3	44.0%	Yes
	T-2	10784.9	47.1%	Yes
	T-3	50827.3	222.2%	Yes
	T-4	65307.2	285.5%	Yes
	T-5	24150.2	105.6%	Yes
Barra Limb	BL-T2	11366.8	49.7%	Yes
	BL-T3	43567.3	190.4%	

Table 24 Vegetation Structure - Canopy Volume - Summary

Landform	Transect	Result (m³)	(%) of Analogue Site	Criteria Met
Bay 4	B4-T1	147402.7	2939.2%	Yes
	B4-T2	51142.5	1019.8%	
Waste Dump 4	WD-T1	12556.2	250.4%	Yes
	WD-T2	41030.0	818.1%	
Rehabilitation Trials	T-1	2831.2	56.5%	Yes
	T-2	102268.4	2039.2%	Yes
	T-3	301450.8	6010.8%	Yes
	T-4	302751.6	6036.8%	Yes
	T-5	3764.4	75.1%	Yes
Barra Limb	BL-T2	26692.9	532.2%	Yes
	BL-T3	38573.2	769.1%	

Table 25 Number of erosion features (rills and gullies)

Landform	Transect	Rills (≤ 0.3 m)			Gullies (> 0.3 m)			Criteria Met
		2020	2022	2023	2020	2022	2023	
Bay 4	B4-T1	5	5		3	4	-	No
	B4-T2	7	5	3	1	3	5	
Waste Dump 4	WD-T1	32	16	25	32	16	10	No
	WD-T2	10	9	7	9	9	10	
Rehabilitation Trials	T-1	6	12	10	1	1	0	No
	T-2	28	1	2	0	0	1	No
	T-3	3	6	2	0	2	9	No
	T-4	15	10	8	0	3	5	No
	T-5	3	4	4	0	1	3	No
Barra Limb	BL-T2	6	1	0	0	3	1	No
	BL-T3	5	3	3	0	0	1	

Table 26 Average cross-sectional area of rills and gullies

Landform	Transect	Average cross-sectional area (m ²) of erosion features			Criteria Met
		2020	2022	2023	
Bay 4	B4-T1	0.64	0.86	-	No
	B4-T2	0.13	0.46	0.30	
Waste Dump 4	WD-T1	0.09	0.52	0.30	No
	WD-T2	0.89	1.03	1.61	
Rehabilitation Trials	T-1	0.08	0.16	0.22	No
	T-2	0.01	0.06	0.23	No
	T-3	0.00	0.59	0.28	No
	T-4	0.01	0.37	0.27	No
	T-5	0.01	0.78	0.31	No
Barra Limb	BL-T2	0.01	0.36	0.06	No
	BL-T3	0.01	0.15	0.29	

17.5.2 eMapper's Rehabilitation Analysis

eMapper Pty Ltd did satellite image analysis of the rehabilitated areas to generate rates of recovery of vegetation. Analysis was undertaken using high spatial resolution satellite imagery for five selected years (2000, 2004, 2015, 2018 and 2019) and for a time-series of Landsat imagery from 1993 (eMapper, 2019). Vegetation cover was analysed within assigned 20 m quadrats and compared within the identified target rehabilitation areas. The analysis indicated good recovery in all of the assigned Koolan Island areas analysed, and that recovery was either on par, or exceeding rates observed in the historic BHP rehabilitation. An indicative area was examined; it was named BHP Moonscaping area.

Floristic Diversity

Three analogue areas selected for EFA are in the same locations as representative Open Woodland slopes for the target seed mix used in rehabilitation of Bay 4 and Barra Limb Stage 2. The 10 x 10 m quadrats recorded between 15 and 21 (average 18.3) native species. No weed species were recorded. By structural class there was an average of 0.3 climbers, 3.3 groundcover species, 5.7 shrub species, 4.3 tall shrub species and 4.7 tree species.

Vegetation Structure

Analogue vegetation structure is summarised in **Table 27**.

Table 27 Key Analogue Vegetation Characteristics

	Groundcover	Shrubs	Tall Shrubs	Trees	Total
Number of plants per hectare	11,070	10,358	865	584	22,877
Canopy Volume (m ³) per hectare	1,599	268	958	2,189	5,105

17.5.3 Surface Cover Trials at WD1

A rehabilitation trial to test the rehabilitation success and response over time of different cover materials and surface treatments was initiated by KIO in November 2013. The trial was established to provide data on what material type and volume (depth of return):

- will remain stable on proposed landform slope angles; and
- provide sufficient growth resources for vegetation establishment and growth.

Surface treatment trials were established in two areas, as shown in **Figure 70**, each with plots for five surface treatments as follows in **Table 28**:

- 'Slope' - Southern face of the western section of WD1, to measure the viability of surface treatments on 20° WRL batter slopes; and
- 'Top' – on top of WD1, to the northwest of the 'slope' plots.

Table 28: Plot treatment

P1	P2	P3	P4	P5
Control (no treatment)	No covering material, ripped on contour to ≈ 0.5 m	0.1 m layer of topsoil, ripped on contour to ≈ 0.5 m	0.5 m layer of siltstone, ripped on contour to ≈ 0.5 m	0.5 m layer of Weathered sandstone and sediments sourced from Acacia East backfill material, ripped on contour to ≈ 0.5 m
735 m ²	853 m ²	725 m ²	728 m ²	553 m ²

The trials continue to be assessed to this day. They provide very valuable insight to the types of treatments /cover systems to be used sustainably, especially based on vegetative cover.

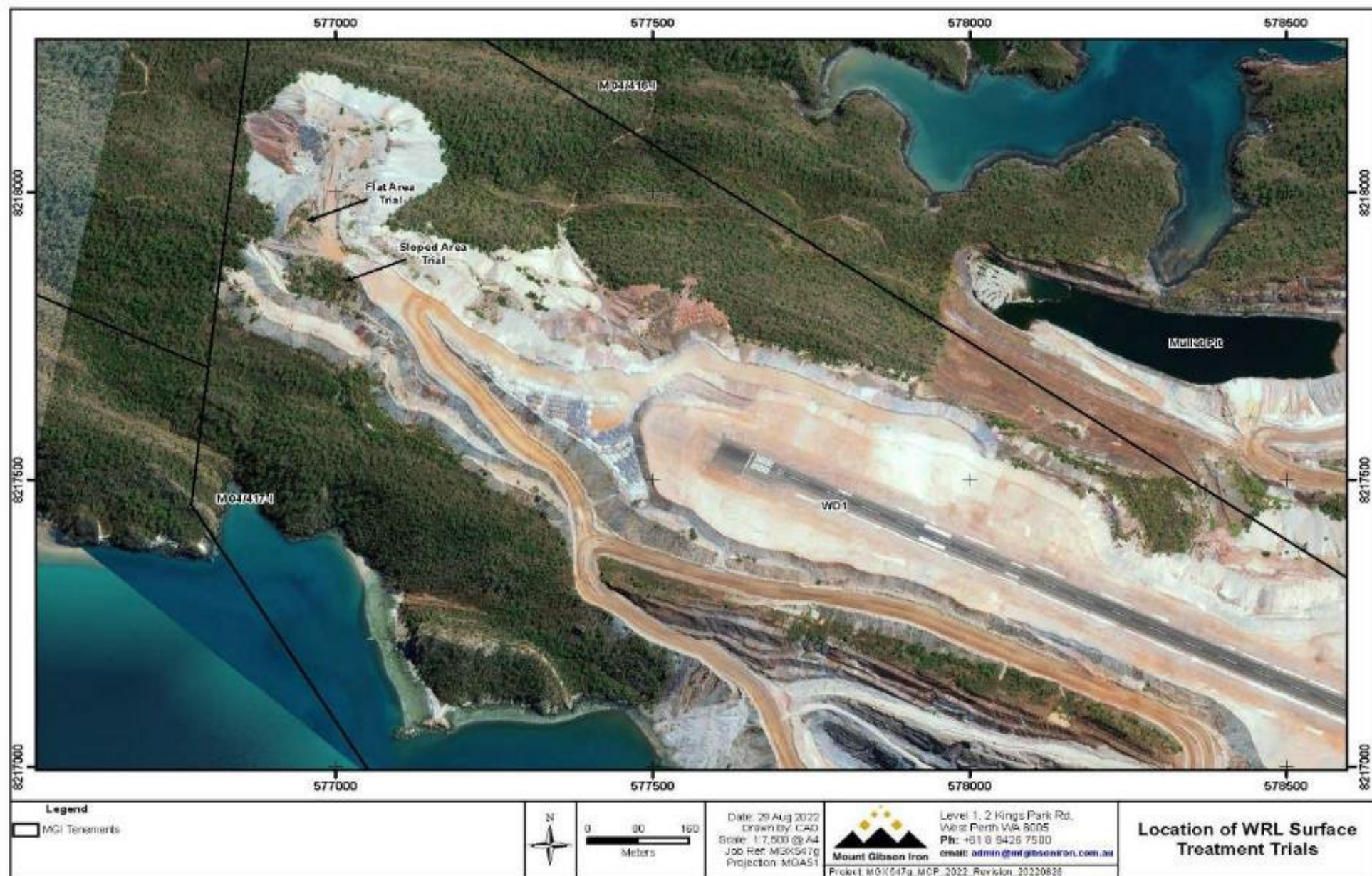


Figure 70: Surface treatment trial plot locations

Initial monitoring scans (i.e. baseline) of the plot trial area were collected directly after construction earthworks and direct seeding in December 2013. **Figure 71** shows the slope as a photo draped digital elevation model (DEM). The photo and DEM together provide an illustration of the different surface treatments applied to the separate plots. The two plots on the far left (T-1 and T-2) of the trial area did not have additional surface material placed on them and are therefore a mixture of waste rock (likely excavated from the Main Pit as they are dominated by quartzite). The DEM clearly shows the ripping which has occurred on the four plots which received surface treatments and the remaining track marks from the dozer pushing down the batter during earthworks on the control 'do nothing' plot (T-1).

Following the earthworks, direct seeding of the quadrats and slope trial plots was carried out at an approximate rate of 5 kg seed/ha utilising the following species seed mix (no seed pre-treatment was used):

- *Acacia colei*;
- *Acacia hippuroides*;
- *Acacia monticola*;
- *Acacia stigmatophylla*; and
- *Acacia tumida*.

The trials were documented photographically in 2015 and again in time. Temporal comparison shows encouraging evidence of successful revegetation across all treatments, which is supported by annual LFA surveys of other rehabilitated areas. Of particular interest and relevance are the 'flat' treatment 4 and 'sloped' treatment 5 plots as these represent the landform rehabilitation strategy proposed to be most widely used (i.e. siltstone matrix on the tops and berms, and an armouring quartzite matrix on batter slopes). The differences in floristic composition visually evident between these two treatments are analogous to the differences observed between natural topographies across the Island and indicate the development of a mosaic of habitats over time, which will likely support native fauna (e.g. the rocky quartzite slopes are likely to provide quoll nesting habitat).

While floristic diversity within the surface treatment trial plots is not yet equivalent to undisturbed analogues, the presence of *Triodia* and *Eucalyptus* species, and native grasses, indicates that successional colonisation is underway. The dominant *Acacia* species likely sprouted from the applied seed mix; *Triodia* and *Eucalyptus* seeds, however, were not applied and establishment of these species and the grasses present is potentially correlated with edge effects (the trials are within 200 m of undisturbed vegetation) and diffusion of endemic species ecological boundaries. This bodes well for overall site rehabilitation prospects, as the landforms to be rehabilitated are all within 250 m of undisturbed vegetation.

The earlier work of APM (Animal Plant Mineral, 2019) and eMapper (eMapper, 2019) considered the effectiveness of the trials in relation to FA and photogram metric analyses. Some erosion at the trials was visually evident initially in 2015. A catchment berm proved effective retention of sediment eroded from the trial plots (**Figure 72**). Encouragingly, the erosion did not significantly advance by 2019, indicating that the rate of erosion reduced over time after surface cover was laid.

The results of the assessment for each slope trial treatment are shown in **Figure 73** and described in (**Table 29**). The most effective treatment based on vegetative growth was trial plot T-3, with 0.1 m layer of topsoil, ripped on contour to approximately 0.5m. The next most effective treatment was T-2, which had no additional substrate added, only mechanical modification of ripped on contour to approximately 0.5m.

Siltstone (T-4) was found to be a more effective substrate for vegetation growth when compared with the weathered sandstone sourced from Acacia East (T-5). However, the proximity of T-5 to the sloped access road may have affected independence of this trial plot through excess dusting or erosion.

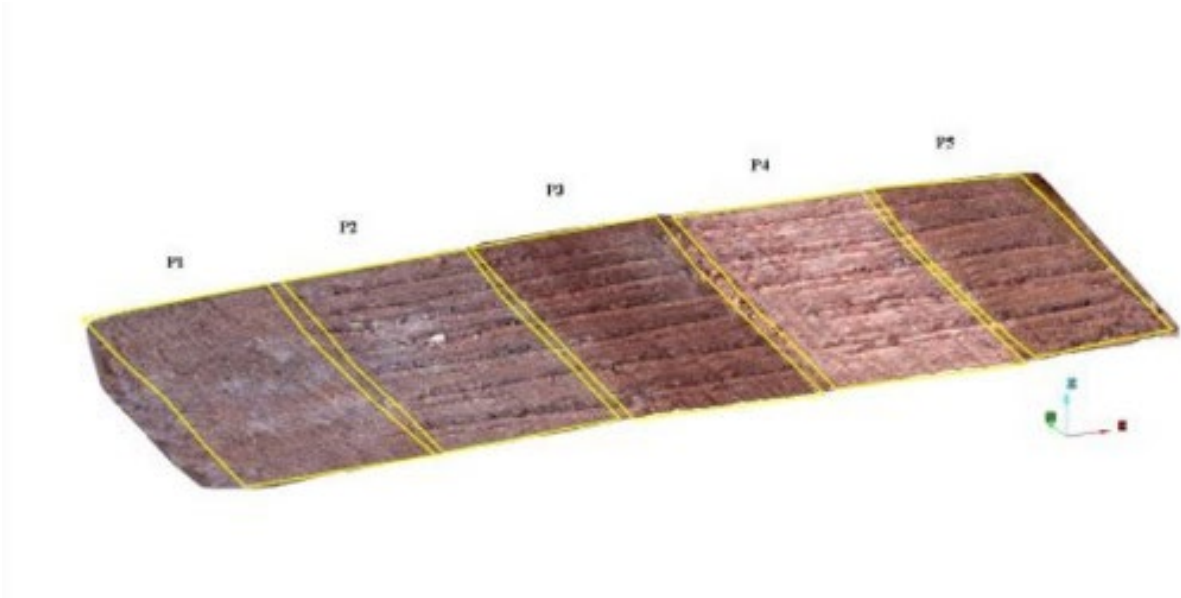


Figure 71 Ground based lidar scan of trial plot area (December 2013) shown with photo overlay



Figure 72 Accumulation of sediment on catch berm in 2015

Table 29 Results of visual assessment of soil and vegetation cover (% of plot cover) by WD1 Slope trial treatments (AECOM 2022)

	T-1	T-2	T-3	T-4	T-5
Treatment	No treatment	No cover; ripped on contour to 0.5m	0.1m Island topsoil cover; ripped on contour to 0.5m	0.5m mined siltstone cover; ripped on contour to 0.5m	0.5m weathered sandstone cover; ripped on contour to 0.5m
Date	10/07/2022	10/07/2022	26/06/2022	10/07/2022	26/06/2022
Position	Start: 576958 8217884	Start: 576984 8217878	Start: 0577000 8217863	Start: 577022 8217847	Start: 0577034 8217845
	End: 576951 8217856		End: 0576990 8217835	End: 577004 8217825	End: 0577020 8217818
Transect compass bearing	230 degrees	230 degrees	200 degrees	230 degrees	205 degrees
Position in landscape	Upper slope, below windrow	Upper slope, below windrow	Slope below windrow	Mid to upper slope	Top of slope below windrow
Lithology	Mining waste rock	Mining waste rock	Waste rocks	Waste rock, min topsoil	Mix of mining waste rock
Soils	Rocky, no topsoil	Sandy clay	Sandy clay loam	Sandy clay	Sandy clay
Slope	15-20	15-20	14-20	15-20	15-20
Aspect	SW	SW	SW	SW	SW
Vegetation type	Acacia tum over some natal	Acacia tum with passion over natal grass	Mixed Acacia tall open to open shrubland over triodia hummock with some passiflora	Acacia tum over some natal	Acacia tall open to open shrubland over Natal grass with pash vines
State of soil surface	Bare	Bare	Obscured by rocks, litter and seedlings	Plenty of litter, bare 70%	Obscured by rocks, litter and plants
Comments	Slope suffers from broad sheet erosion. banks and troughs levelled out to slope	Sloped, no banks or troughs	Dense triodia understory, more tall Acacia than T5, selling abundance low. Big stick litter and leaf litter. Natal grass common from 22m	-	Many tiny Acacia and passionfruit seedlings, some big <i>Acacia tumida</i> and <i>minnierichi</i>



Figure 73 WD1 slope trial, with bare earth differentiated from vegetation cover by visual assessment.

17.5.4 BHP Moonscaping Trial (<1994)

BHP moonscaping areas (**Figure 74**) far exceeded the mean analogue value for the number and canopy volume of groundcover plants (**Table 30**). For shrubs and tall shrubs the number of individuals is less than the mean analogue but the canopy density exceeds the mean analogue value, indicating there are fewer but larger plants in these strata. Whilst one tree species was recorded in the transect, its abundance and canopy volume is insignificant.

Table 30 Vegetation Structure in the BHP moonscaping area

	Groundcover	Shrubs	Tall Shrubs	Trees	Total
Number of plants per hectare	11,070	10358	865	584	22,877
% of Analogue	1,167	12	89	0	293
Canopy Volume (m³) per hectare	1,599	268	958	2,189	5,105
% of Analogue	251	102	176	0	288

17.5.5 Coral Rehabilitation Plan

In 2019, a Coral Rehabilitation Plan was submitted by KIO to DWER (Jacobs Group (Australia) Pty Limited, 2019). The plan described a series of actions to be taken by KIO to progress areas of rehabilitated corals along the southern shoreline of Koolan Island. The intent is to re-create artificial habitat suitable for the natural recruitment and colonisation of coral in areas disturbed by previous mining operations near the eastern side of the seawall (within 0.2ha of seabed).

A coral recruitment trial was initiated in February 2020 with the deployment of the selected treatments at two sites. This trial described by the plan was submitted to DWER in 2019. The plan described a series of actions to be taken by KIO to progress areas of rehabilitated corals along the southern shoreline of Koolan Island (**Figure 75**).

Substrates were deployed (**Figure 76**) and have been regularly examined for biofouling, coral settlement and growth throughout 2020 – 2021 and again in 2023 both far via vessel and close-by via shore (**Figure 77** and **Figure 78**). In the earlier observations since the deployment of the frames, a primary level of growth has been observed on the trial substrates and the supporting steel frames. No major differences in the level of growth were noted between the concrete mat treatment and the natural terrigenous rock. The organisms present on the test substrates included algal turf, barnacles, tunicates, tube worms and gastropods. Monitoring is to continue annually.

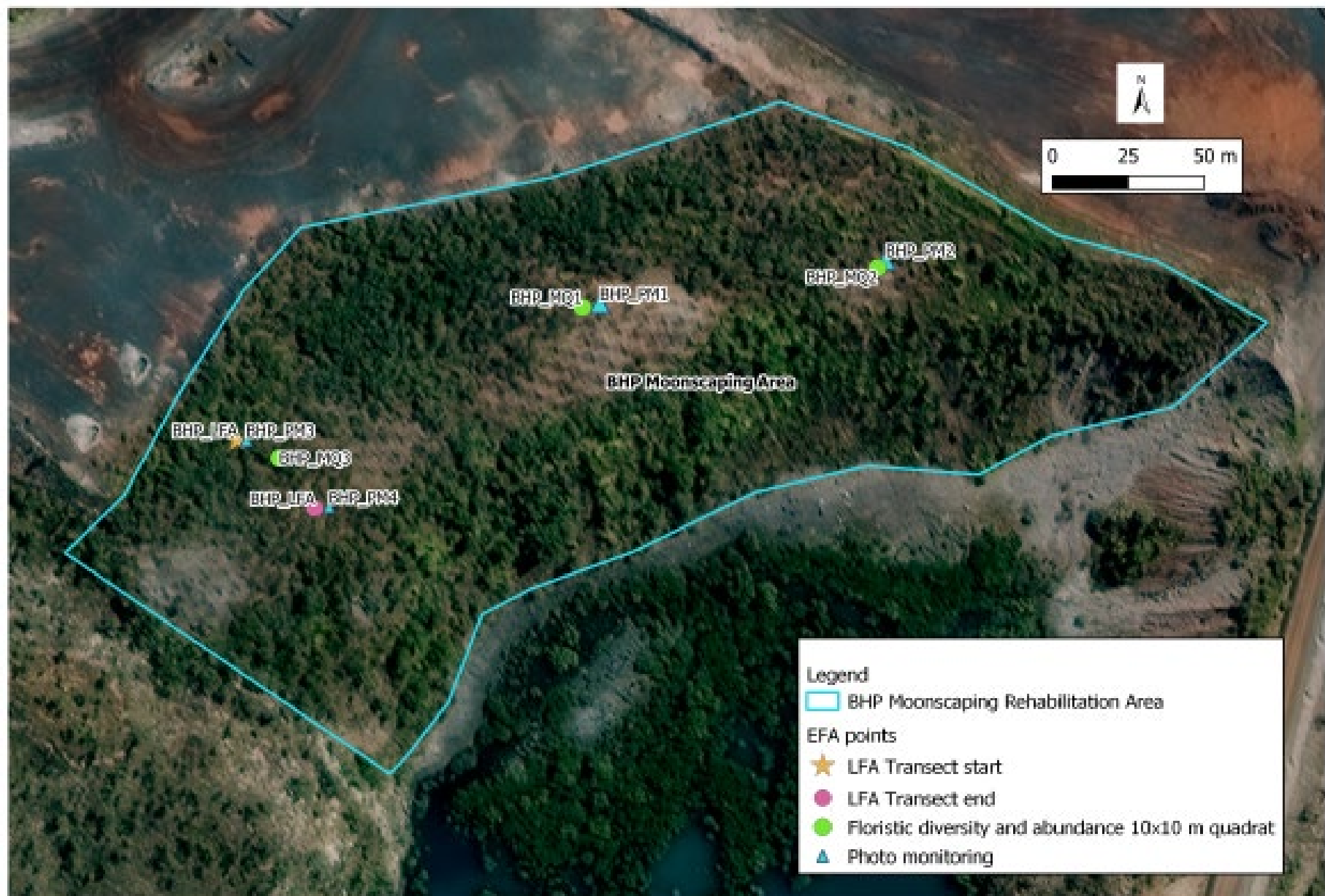


Figure 74 BHP Moonscaping Rehabilitation Area

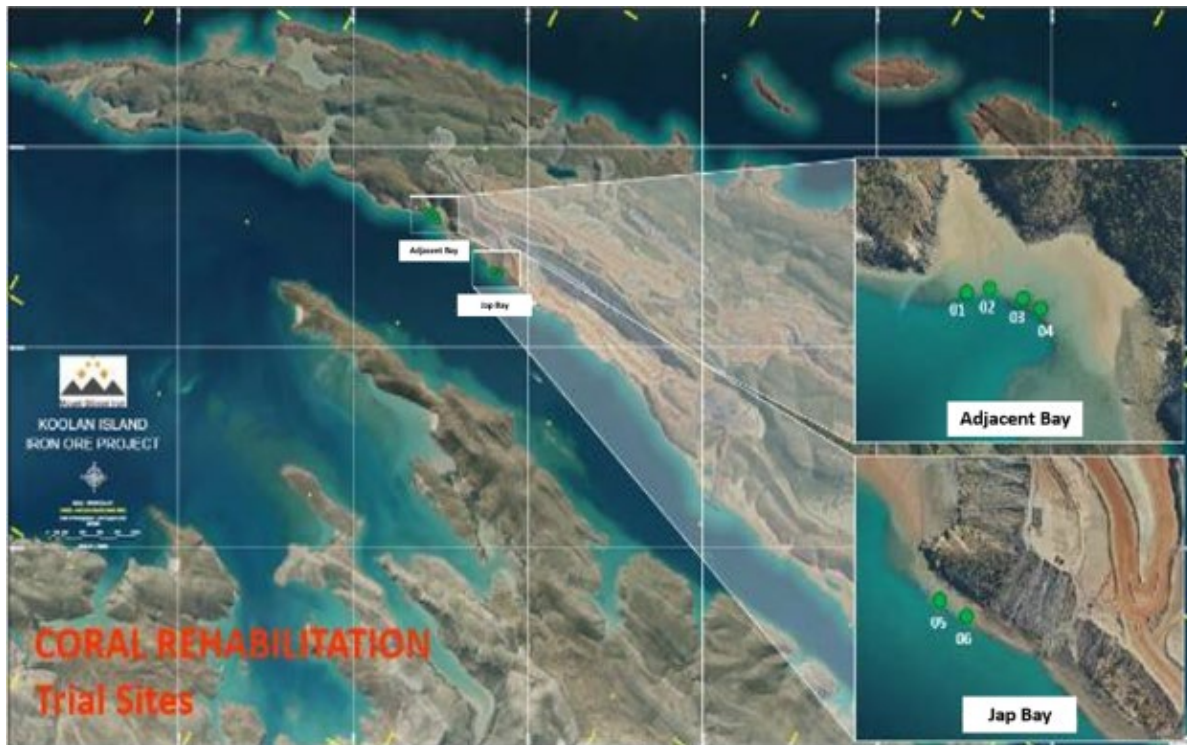


Figure 75 Location of coral rehabilitation trial sites

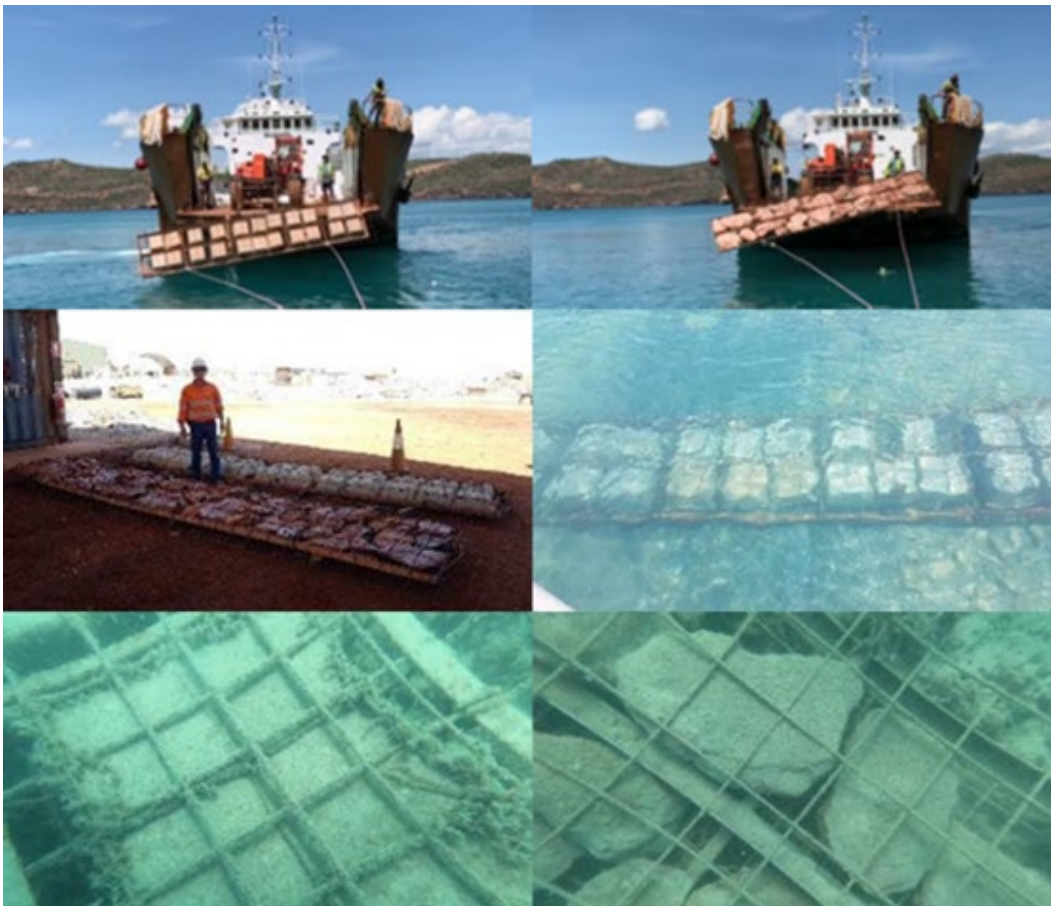


Figure 76 Deployment of concrete coral frame (top left); deployment of siltstone coral frame (top right); coral frame construction (middle left); deployed coral frames (middle right); substrate on concrete coral frame after one month (bottom left); and substrate on siltstone coral frame after one month (bottom right).



Figure 77 Exposed concrete (left) and siltstone (right) frames



Figure 78 Examples of long term coral growth on quartzite rock in Jap Bay (left) disembarcating vessel for closer on-shore checks or natural substrate and coral substrate frames (right)

Quartzite rock in Jap Bay appears to support small sporadic coral colonies when further examinations were made alongshore of surrounding natural substrate but the lack of larger more widespread colonies indicates that, while abundant, the quartzite is not suitable as a short term substrate for colonization (as predicted by Jacobs 2019).

Since deployment, there has been several coral spawning events. However, observations over the following two years showed little evidence of coral recruits on the trial substrates associated with these spawning events, although, due to microscopic size they may not have been visible. Further limited observations in 2023 indicated some coral recruitment on two frames.

In late 2023, a decision was made to conduct photographic survey of all six frames, to determine the level of recruitment success, and how any data the trial might offer could inform future considerations on the adoption of alternate rehabilitation/offset measures as described in the Coral Rehabilitation Plan (Jacobs, 2019).

The survey was conducted in January 2024 using a drop video and GoPro cameras mounted on a frame, and lowered from the Koolan work vessel to hover

17.5.6 Coral Enhancement Pilot Trial

In accordance with Ministerial Statement 715, there is a requirement to enhance the coral habitat along the southern shoreline. As such Koolan Iron Ore Pty Ltd (KIO) conducting a coral rehabilitation pilot trial.

As outlined in the preceding sections KIO undertook a study to prove the viability of an introduced substrate to attract and provide a surface for local wild-stock coral larvae to settle on. The study introduced six (6) flat structures built from inert mined waste or manufactured concrete bound with reinforcing steel bars. The study resulted in a successful proof-of-concept but demonstrated that to be a viable habitat replacement the substrate is required to be a three-dimensional structure (rather than the large flat surfaces of the initial trial) to mitigate against sedimentation in this highly turbid natural environment.

With expert support from marine environmental consultants Hydrobiology KIO has identified a preferred habitat structure. To confirm the structure provides the enhancement expected a pilot trial will be undertaken utilising 8 concrete Bombora Type 1 reef enhancement modules, as can be seen in **Figure 79**. The pilot trial is expected to last a minimum of two years with the intention to inform the final coral rehabilitation program.

The trial will target the reef flat, slope or at the toe of reef platform. The modules will be placed in an area adjacent to those known to contain natural coral habitat as research indicates that artificial reef structures placed close to natural reef enhances ecological connectivity between the two.

A pre-installation site investigation with a side-scan sonar, ROV and drop video camera would determine the final placement, configuration, depth and location of the cluster.

It is intended that the area indicated as red in **Figure 80**, will be the area investigated for deployment, and will be within the depth of high coral density (5 – 20 metres) which in general will be less than 30 metres from shore. However, two contingency areas have been determined should conditions not be suitable for safe deployment in the primary target area (Orange on **Figure 80**).

The modules will be deployed from the deck of one of the Koolan Island supply barges and lowered to the seabed and released mechanically, similar to that seen in **Figure 81**.

KIO is advancing plans to deploy the modules prior to the Autumn coral spawning event predicted in March/April. With an expected execution to occur in February 2025.

Currently KIO is seeking approval from the Western Australian Department of Transport for the Installation of Objects in Western Australian Navigable Waters to conduct the pilot trial. Should the pilot trial prove unsuccessful the installed modules will be removed. However, should final results indicate the pilot trial is successful the intention is to install a larger population of Bombora Type 1 reef enhancement modules to eventually become fully integrated with the coral and other benthic habitat. At such time an Artificial Reef Permit will be sought from the Department of Climate Change, Energy, the Environment and Water (if required) for the full scale coral enhancement project, and the modules deployed as part of the pilot trial will be included in the permit application.

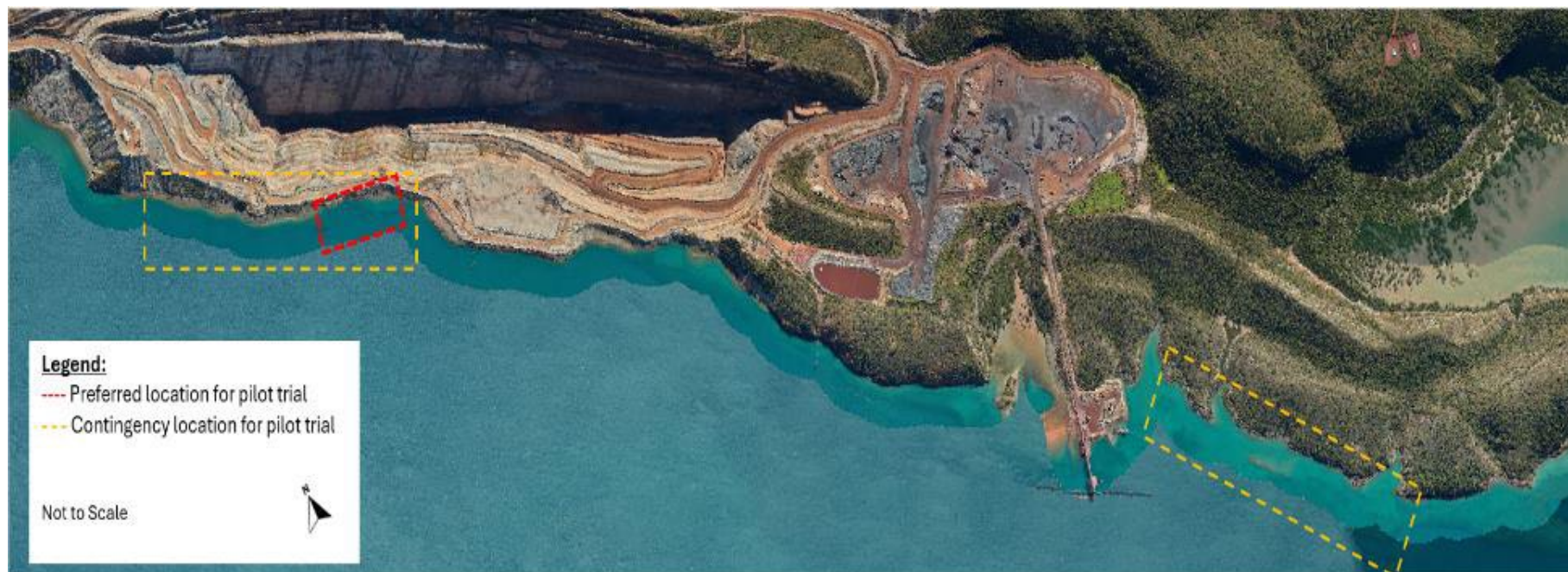


Figure 80 Primary and Contingency Locations for the Coral rehabilitation Trial



Figure 81 Example of Bombora habitat enhancement structures being installed at Ocean Reef, Perth (photo credit RecFishWest).

17.5.7 Hydromulching Trial

In October 2020, a trial was undertaken to test the efficacy and suitability of spray on hydromulch impregnated with seed as an option for revegetating waste rock dumps at steep angles. Hydromulch was applied over of 100m of waste dump slope at a linear length of 25m (0.25Ha). *Acacia*, *Eucalyptus* and *Triodia* species was used in the seed mix applied through the hydromulch (**Figure 82**). two months the hydromulch had washed off the trial slope with the onset of seasonal heavy rains.

It was hypothesised that further time may result in broadcast seeds germinating in rock crevices. Preliminary results indicate that spray on hydromulch is unlikely to be useful as an option to revegetate acute waste dump slopes on Koolan Island. However, this ultimately proved untrue as reported by KIO in the 2020 Annual Environmental report that the applied hydromulch washed off within two months due to heavy rains. Any further progress on this trial was abandoned.



Figure 82 Hydromulch emulsion of seed in organic growth medium direct sprayed on to an angle of repose.

17.6 Land under rehabilitation.

Below is a summary of the rehabilitation works undertaken to date with land under rehabilitation shown in **Figure 83**.

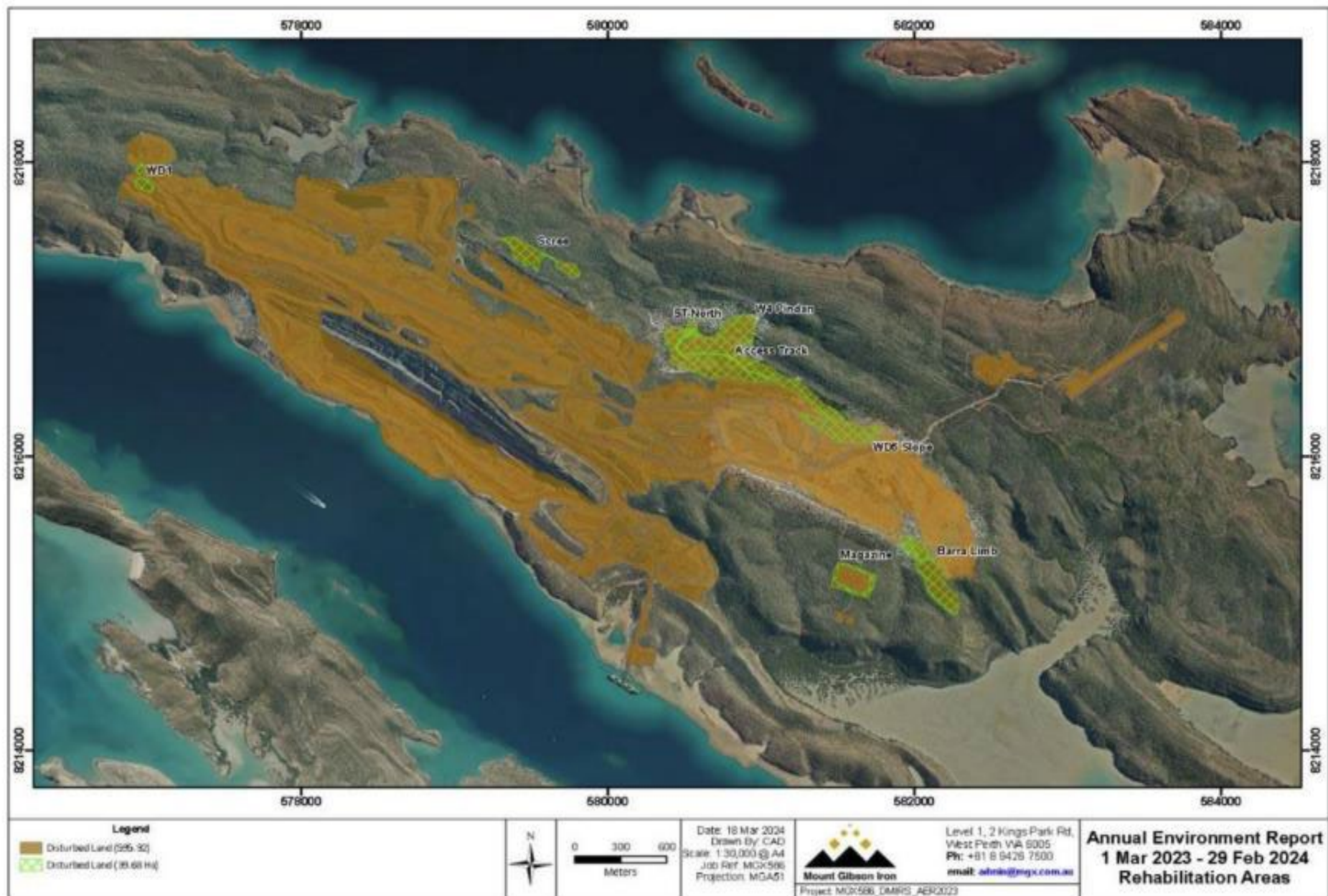


Figure 83: Land under rehabilitation as of February 2024

17.6.1 WD4 Bay 4

Rehabilitation earthworks at Bay 4 on the WD4 Spur were completed in 2011. Slopes were battered down to $\approx 20^\circ$, covered with 100 – 400 mm of topsoil and ripped on the contour. Bay 4 was direct seeded with 2.06 kg ha^{-1} of seed mix containing 31 species developed from analogue quadrats located in undisturbed Open Woodland across the Island. Soil testing by SWC (Soilwater Consultants, 2015a) indicated that the surface of the Bay 4 landform was constructed from highly weathered, variably mineralised sandstone and siltstone materials.

Monitoring commenced in mid-2011 with eight 10 x 10 m floristic diversity and abundance monitoring quadrats and photo monitoring points. One transect was installed and repeated measurements were taken in 2012, 2015, 2016, 2017, 2019 and 2020. Recently two of the historic monitoring sites were selected for continued monitoring, and a third new site was added (**Figure 84**).

Following high rainfall from a cyclone in late 2013, large amounts of vegetation growth occurred which in combination with the troughs increased the LOI to 80%. Weathering of the bank / trough system between 2015 and 2016 and death of short-lived perennial species led to a reduction in LOI in 2016. The distribution of litter on the ground is important in defining the LFA 'Patch' areas and it is likely that large litter accumulation post the cyclone-induced growth was present in 2015 but by 2016 erosion had restricted its distribution to the troughs. From inspection of the photo monitoring, it is likely that the area occupied by troughs on landscape formation was greater than 20%.

Between 2016 and 2019 LOI has steadily increased to within 15 % of the mean Analogue value. In 2019 perennial hummock grasses were frequent in the gully area and have spread a small distance up the slope to the bottom of the transect. *Passiflora foetida* vine is also in the lower gully area.

LOI of B4_T2 transect was just under 68% in 2020. This is predominantly influenced by the intact bank and trough system. Although there is perennial woody vegetation cover on the transect it is of lower density than B4_T1. A bare section occurs in the middle of the B4_S2 transect where large rocks occur at the surface and there is no soil cover. This situation is not dissimilar to the rocky outcrops that also occur at Analogues however the proportional cover is approximately double in this transect.

By 2019 the Stability Index values for the Bay 4 transects was within 30% of the Analogues. In 2020 Infiltration Index values were at approximately 60% of analogue values, and the index value has increased at B4_T1 in 2017 and in 2019 from the previous year but little change as of 2020. The increase over time is due to the increase in the LOI raising the proportional influence of the zones on the overall transect values and an increase in litter cover and decomposition. The lower than analogue value is due to a lower vegetation and litter cover, and a reduction in the soil surface roughness measure in places where the bank and trough landform has evolved to a slope without rock armouring or vegetation cover.

Nutrient Index values at Bay 4 were 40-50% of analogue values in 2020, but the time series data at B4_S1 shows increase, particularly between 2017 and 2019. The change over time is driven by the accumulation of litter and the positive effect that is having on the level of decomposition. As the litter accumulates to depth, moisture is trapped and decomposition is accelerated.

In 2019 sixteen different species were recorded at Bay 4. On average there were just under seven taxa per quadrat at the Bay 4 rehabilitation area in APM (Animal Plant Mineral, 2019). Although there have been some minor seasonal fluctuations over time, and some species turnover, the richness is relatively constant. Likewise, the structure of the rehabilitation trends towards that of the relevant analogue site.

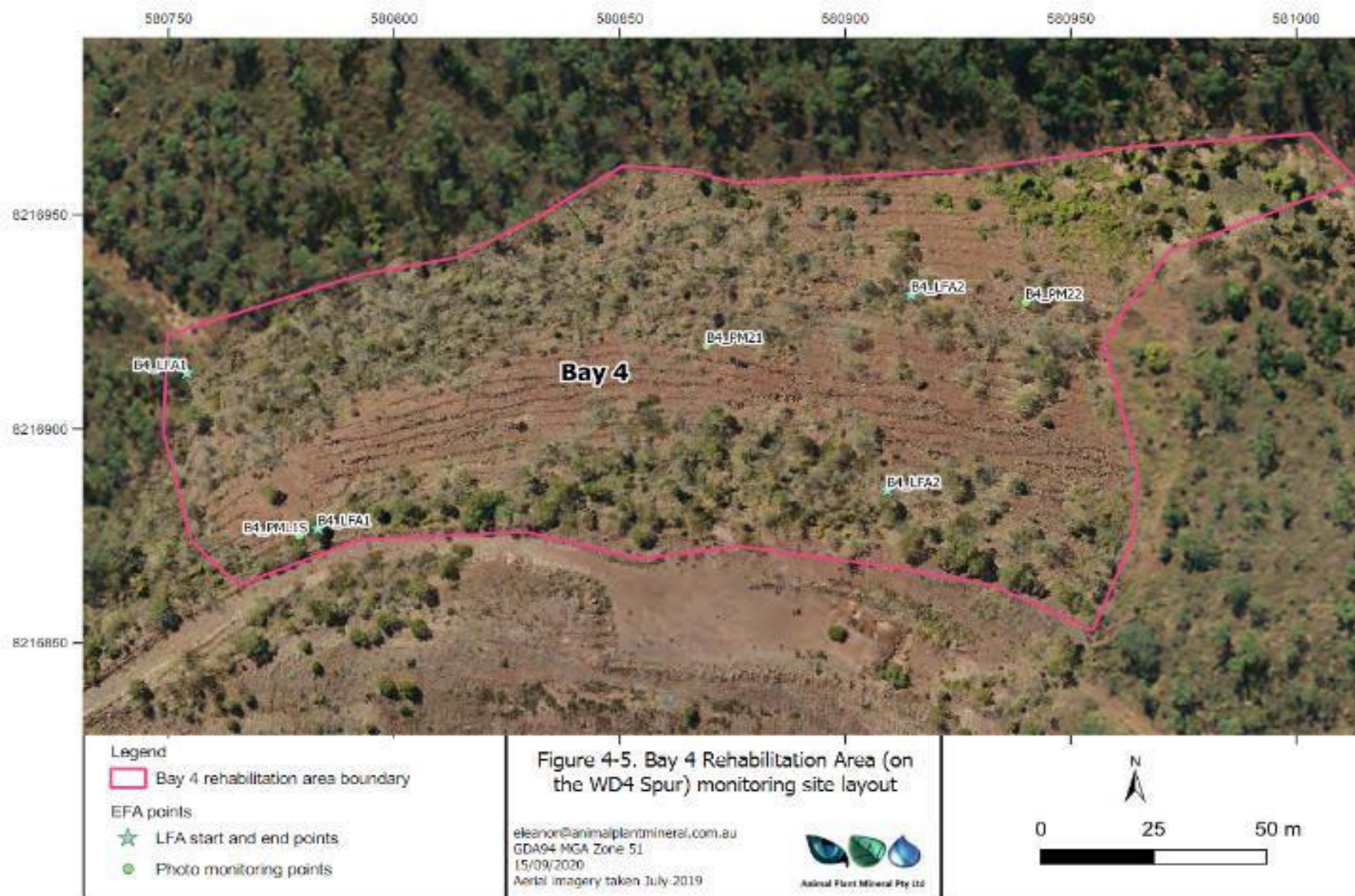


Figure 84: 2020 Bay 4 Rehabilitation Area (on the WD4 Spur) monitoring site layout

In 2019, three representative quadrats were selected. By structural class there were on average 0 climbers, 2.7 groundcover species, 1.7 shrub species, 2 tall shrub species and 0.3 tree species; on average 6.7 species per quadrat. In comparison of the seed mix applied at Bay 4 in 2011 and the species present in the monitoring quadrats in 2019, nine species were present from the seed mix and seven species are present that were not. This represents diffusion of seed across the edges into the rehabilitation. Eight of the target species defined by SWC (Soilwater Consultants, 2015a) were present.

Also examined in greater detail more recently is the work of Hydrobiology (2024a)(Appendix C16). **Figure 85** shows a hindcast of NDVI time series with a clear seasonal annual oscillation (grey; yellow lines) at areas never disturbed (Western Reference) or rehabilitated before 1993 for almost 30 years (BHP Townsite). Median NDVI of both these 'analogue' areas is circa 0.5. There is an increasing NDVI signal trend with time and the seasonality in foliage cover is evident too. By 2022 and 2023, the median NDVI at Bay 4 after approximately a decade after rehabilitation was approaching 0.4. This provides strong evidence of regrowth in native vegetation cover and applicability of the closure/rehab techniques applied. A bushfire in 2023 had a significant impact on the median NDVI which can be seen in the decrease below 0.3 in early 2024. However, this does not consider the potential future positive effect of bushfire on floral ecology.

Figure 86 shows the median linear regression predictions, projecting a trajectory for full rehabilitation. Based on this prediction, WD4 Bay 4 will reach reference levels for rehabilitation by 2029.

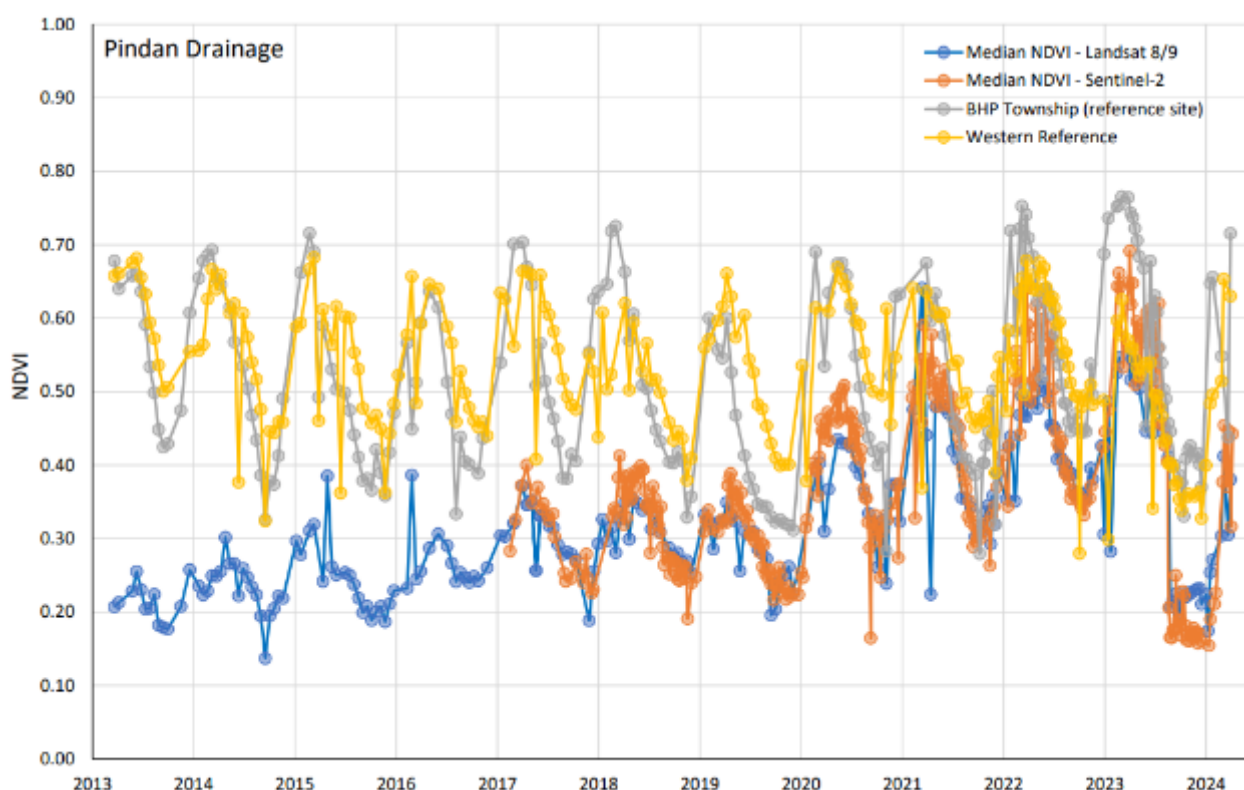


Figure 85: Median NDVI at Bay 4 (also known as Pindan Drainage area) compared to natural or fully rehabilitated land over 11 years.

	2025	2026	2027	2028	2029	2030
Pindan Drainage	0.43	0.45	0.47	0.49	0.50	0.50

Figure 86 Table displaying linear model predictions for NDVI data at Bay 4 WD4 (Pindan Drainage)

17.6.2 Barra Limb

Barra Limb Waste Dump was rehabilitated in two stages (**Figure 87**). Barra Limb Stage 1 earthworks were completed in 2009 with slopes battered down to $<20^\circ$, covered with approximately 100 – 400 Mm of topsoil and ripped on the contour. Stage 1 rehabilitation was not direct seeded. Plants growing on Stage 1 likely originate from the stored seedbank in topsoil that was respread or have diffused across the boundary with undisturbed areas. Barra Limb Stage 2 rehabilitation earthworks were completed in 2011. Slopes were battered down to $<20^\circ$, covered with approximately 100 – 400 mm of topsoil and ripped on the contour. On the steeper southern slope light moonscaping was applied to reduce the risk of erosion. Barra Limb Stage 2 was direct seeded with 7.1 kg ha^{-1} of seed mix contained 105 species developed from 10 analogue quadrats located in undisturbed Open Woodland across the Island. Soil testing by the Soil Water Group (Soilwater Consultants, 2015) indicates that Barra Limb Stage 2 surface is siltstone. The area has been monitored 10 occasions between 2012 and 2023.

Ripping on the contour at Barra Limb provided a landscape with troughs recorded in 2012 as occupying over 30% of the slope. Weathering of the bank / trough system between 2012 and 2016, led to a reduction in LOI to 2015. In 2019, LOI has rapidly increased to exceed the mean Analogue value but was lower in 2020. The bank / trough system is still in place over both of the transects, and perennial vegetation cover is high. A lack of consistent groundcover vegetation is an important factor in the litter. Groundcover vegetation such as perennial grasses and low shrubs trap litter during climatic events and prevent high wind speeds at the ground surface.

The Stability Index values for the Barra Limb transects in 2020 is within 30% of the Analogue sites. Factors with a positive influence on the Stability score are the increased LOI, good litter build up and decomposition in the patch zones, intact soil crusts and very little evidence of erosion.

Infiltration Index values for the Barra Limb transects in 2019 were within 65 -80% of the Analogue sites. In 2020, there was a reduction in the index to 50% of analogues. Factors with a positive influence on the Infiltration score that have increased between 2018 and 2019 are the increased LOI and the increased litter cover and extent of decomposition. Unchanged factors were high scores for surface roughness and the good soil texture and structure.

Nutrient Index values for the Barra Limb transects in 2019 were within 55 -80% of the Analogue sites, but these declined in 2020 to 45%. The trends in the Nutrient Index score emulate those in the other indices at Barra Limb where the consistency of the litter cover, the depth of the litter and the extent of decomposition drive the patterns. Reductions resulted because of lower LOI levels. If the litter that is present in 2019 is maintained there will be a steady increase in the Index values although loss of the litter through high winds or heavy rainfall may see the index values decline in the future.



Figure 87 Barra Limb Rehabilitation monitoring layout. Inset photo taken from BLMQ7 facing east

Eighteen species were recorded on Barra Limb. On average there are just over 7 species per quadrat in 2019. There was an initial increase in number of species from the end of 2012 to the end of 2013, followed by a decline then recovery in 2019 to the level previously reached in 2013. While Stage 2 (seeded) was richer than Stage 1 (unseeded) up until the end of 2014 (there was 2 more species present compared to the unseeded area), by 2019 the unseeded quadrats recorded greater richness.

Up to the end of 2014, ten quadrats were monitored. In 2019 four representative quadrats were selected, two from each Stage. By structural class, there were on average 0.5 climbers, 0.75 groundcover species, 1 shrub species, 3.5 tall shrub species and 1.5 tree species. Seven of the target species defined by SWC (2015b) were present at Barra Limb.

APM (Animal Plant Mineral, 2018) recorded 20 local provenance species in the 2,500 m² quadrat at Barra Limb Stage 2.

Despite records of erosion, the intact bank and trough system is containing instances of concentrated surface flow to a maximum of one to two meters, generally one or two trough intervals at most. All recorded erosion features had vegetation and/or rock armour, but many had a significant amount of litter suggesting they are active but stable.

A small number of *Melinis repens* (red natal grass) occur at Barra Limb and it is common in low densities across the disturbed areas of Koolan Island. *Passiflora foetida* is common at Barra Limb, often as small individual plants scattered throughout the rehabilitation area. There are also dense pockets where the vegetation is completely obscured by vines. A small number of Pilbara *Acacia* species are found on the Barra Limb rehabilitation area from BHP revegetation works in the 1990s.

The work of eMapper (eMapper, 2019) shows that there was strong recovery of densely vegetated areas (cover >80%) in the period from 2015 to 2018. The work also showed that the amount of sparsely vegetated area (<2%) is also approaching the baseline values before disturbance from 2000 to 2004.

Also examined in greater detail more recently is the work of Hydrobiology (2024a). **Figure 88** shows a hindcast of NDVI time series with a clear seasonal annual oscillation (grey; yellow lines) at areas never disturbed (Western Reference) or rehabilitated before 1993 for almost 30 years (BHP Townsite). Median NDVI of both these 'analogue' areas is circa 0.5. There is a clear increasing NDVI signal trend with time and the seasonality in foliage cover is evident too. By 2024, the median NDVI at Barra Limb after approximately a decade after rehabilitation was approaching 0.4. This provides strong evidence of regrowth in native vegetation cover and applicability of the closure/rehab techniques applied.

Figure 89 shows the median linear regression predictions, projecting a trajectory for full rehabilitation. Based on this prediction, Barra Limb will reach reference levels for rehabilitation by 2026.

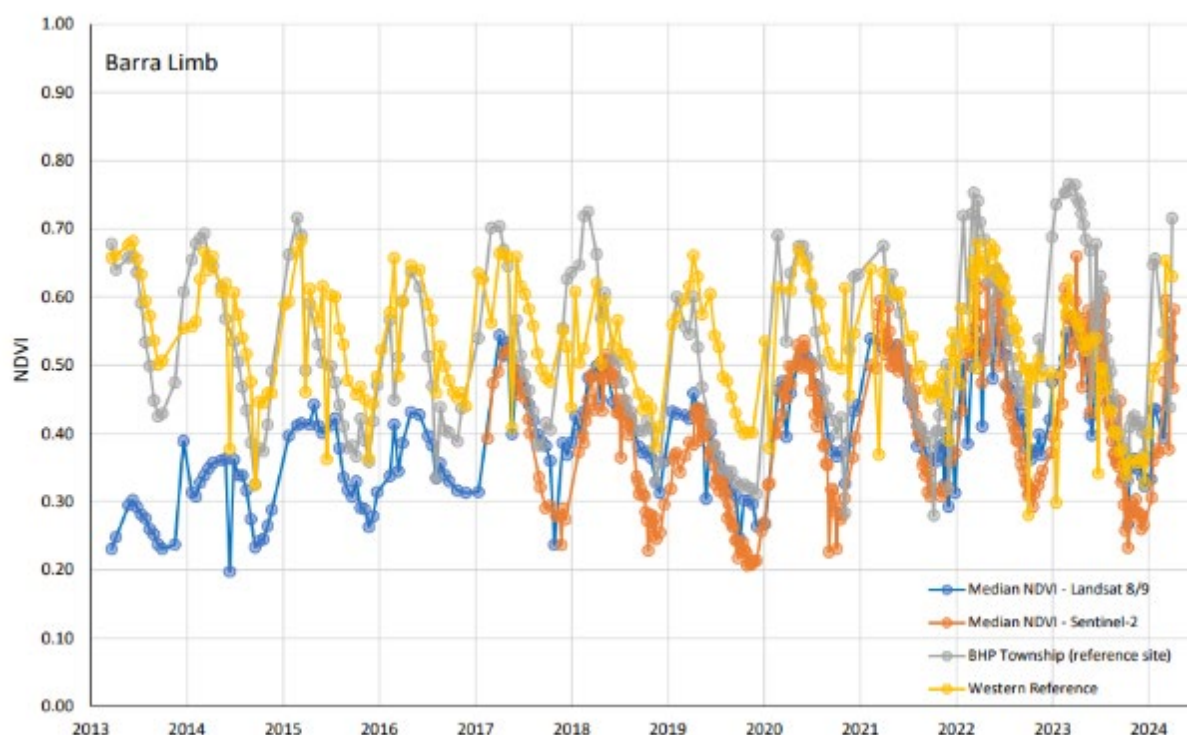


Figure 88: Median NDVI at Barra Limb compared to natural or fully rehabilitated land over 11 years

	2025	2026	2027	2028	2029	2030
Barra Limb	0.48	0.50	0.51	0.52	0.54	0.54

Figure 89: Table displaying linear model predictions for NDVI data at Barra Limb

17.6.3WD4

Rehabilitation earthworks at WD4 were completed in 2015 in areas of the WD4 landform where waste rock dumping was complete. Slopes were battered to 14-20° and berms 3 to 10 m wide were installed where possible. Topsoil was spread between 150 – 200 mm depth. Deep ripping on the contour was applied. No direct seeding was applied. Layout of the monitoring locations is displayed in **Figure 90**.

Soil testing by SWC (Soilwater Consultants, 2015a) indicated that the surface of the WD4 landform was constructed from highly weathered, variably mineralised sandstone and siltstone materials.

The WD4 transects have been monitored five times since 2016.

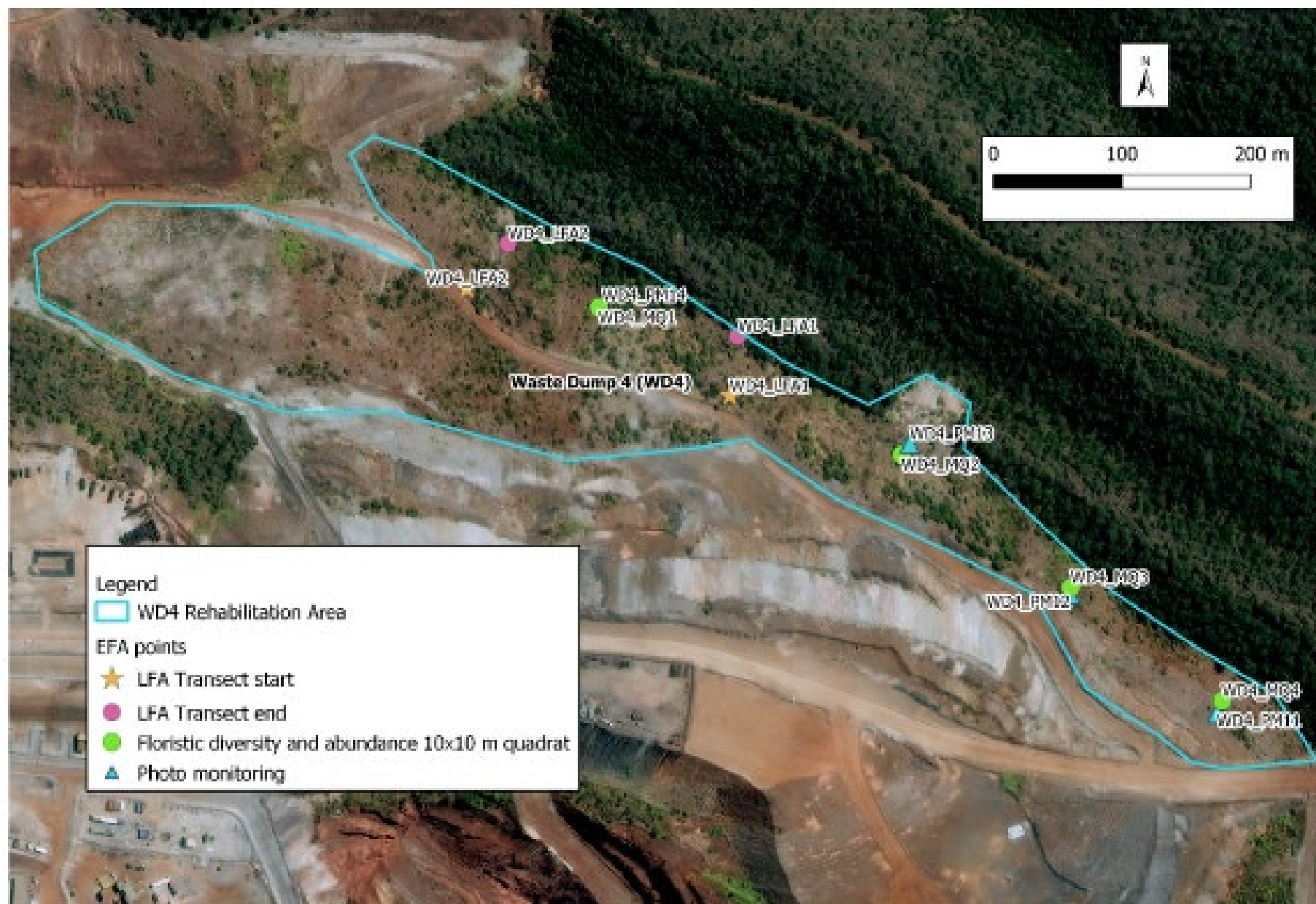


Figure 90 WD4 Rehabilitation Area monitoring site layout.

Ripping on the contour at WD4 provided a baseline landscape with troughs recorded in 2016 as occupying approximately 45% of the slope. The bank and trough system has quickly evolved to a slope in most parts of the WD4 slope by 2019, but steady increase in vegetation cover has seen the LOI steadily increase over time, without the same effect as at Bay 4 and Barra Limb. In 2019, LOI has rapidly increased to within 10% of the mean Analogue value. The perennial vegetation cover is high, and the distribution of litter is a strong factor in the increased LOI from 2018 to 2019. The patches of litter extend beyond individual canopies, linking up plants that are adjacent. A lack of groundcover makes the accumulation of litter in 2019 vulnerable to erosion.

The Stability Index values were well within 30% of the Analogues by 2019. Factors with a positive influence on the Stability score are the rock armouring providing good rain splash protection, maintenance of good soil surface roughness despite the loss of the trough/bank system which is also a result of the rock armouring, intact soil crusts and very little evidence of erosion.

The Infiltration Index values in 2019 were within 40% of the Analogues. Factors with a positive influence on the Infiltration score are the high perennial vegetation cover, high soil surface roughness, intact soil crusts and good soil texture. The variable and mostly low level of litter decomposition has a negative impact on the Infiltration Index values at WD4 compared to the Analogues.

The Nutrient Index values for the WD4 transects in 2019 were at 50% of the Analogues, but these had reduced slightly in 2020. The variable and mostly low level of litter decomposition and evidence that some has been recently transported through runoff erosion has a negative effect on the Index compared to the Analogues.

In 2019 seventeen species were recorded at WD4. On average, there are 5.75 species per quadrat at the WD4 rehabilitation area in. The richness data is highly variable with one quadrat recording 10 species and another recording only 1 species. This is low compared to the average of 18 species recorded in the Analogues. By structural class, there were on average 0.5 climbers, 1.5 groundcover species, 1.25 shrub species, 2.5 tall shrub species and 0 tree species.

Seven of the target species defined by SWC (Soilwater Consultants, 2015a) were present at WD4. APM (Animal Plant Mineral, 2019) recorded 15 local provenance species on the Bay 4 landform using a 2,500 m² quadrat.

The WD4 vegetation structural class values exceed the number of plants in the groundcover strata and canopy volume in the tall shrub strata compared to the mean Analogue values. All other values are lower, particularly the complete lack of tree strata. Despite the high number of groundcover plants the canopy volume is only 3% of analogue, conversely, despite the number of shrubs being 5% of analogue the canopy volume is 61%. Despite the imbalance, in the early years of rehabilitation this high shrub cover will produce high volumes of litter and woody debris that improve the landscape function.

There is evidence of erosion on the WD4 landform with a gully occurring right on one monitoring transect. The erosion transects measured comparatively larger number of erosion features, but they were very small and shallow in size. This shows there is still landscape reorganisation occurring and while more rills have appeared, some have filled and become more stable over time.

A small number of *Melinis repens* (red natal grass) occurs at WD4 and is common in low densities across the disturbed areas of Koolan Island. *Passiflora foetida* is common on WD4, only as small individual plants scattered throughout the rehabilitation area. Additionally, a scattered few

individuals of *Malvastrum americanum* were present. A large number of *Stylosanthes hamata* are present in localised areas on the WD4 landform, whilst in 2019 they were very small due to poor seasonal conditions, they may become more dominant in the wetter years. *Leucaena leucocephala* has been recorded on the roadsides of the track in the centre of the WD4 rehabilitation area. The species is a Target weed in the Koolan Island Quarantine Management Plan and the approach to management of that introduced shrub is detailed in the Plan.

Recovery of this area has been slower than for Barra Limb, however, recovery is progressing well. There is a significant reduction in sparsely vegetated area (<2% cover) between 2015 and 2018. The percentage of moderately vegetated areas has also increased between 2018 and 2019, indicating a continuing rate of revegetation.

Also examined in greater detail more recently is the work of Hydrobiology (2024a). **Figure 91** shows a hindcast of NDVI time series with a clear seasonal annual oscillation (grey; yellow lines) at areas never disturbed (Western Reference) or rehabilitated before 1993 for almost 30 years (BHP Townsite). Median NDVI of both these 'analogue' areas is circa 0.5. There is a clear increasing NDVI signal trend with time and the seasonality in foliage cover is evident too. By early 2023, the median NDVI at WD4 was 0.4. This provides strong evidence of regrowth in native vegetation cover and applicability of the closure/rehab techniques applied. A bushfire in 2023 had a significant impact on the median NDVI which can be seen in the decrease below 0.3 in early 2024. However, this does not consider the potential future positive effect of bushfire on floral ecology.

Figure 92 shows the median linear regression predictions, projecting a trajectory for full rehabilitation. Based on this prediction, WD4 will reach reference levels for rehabilitation by 2028.

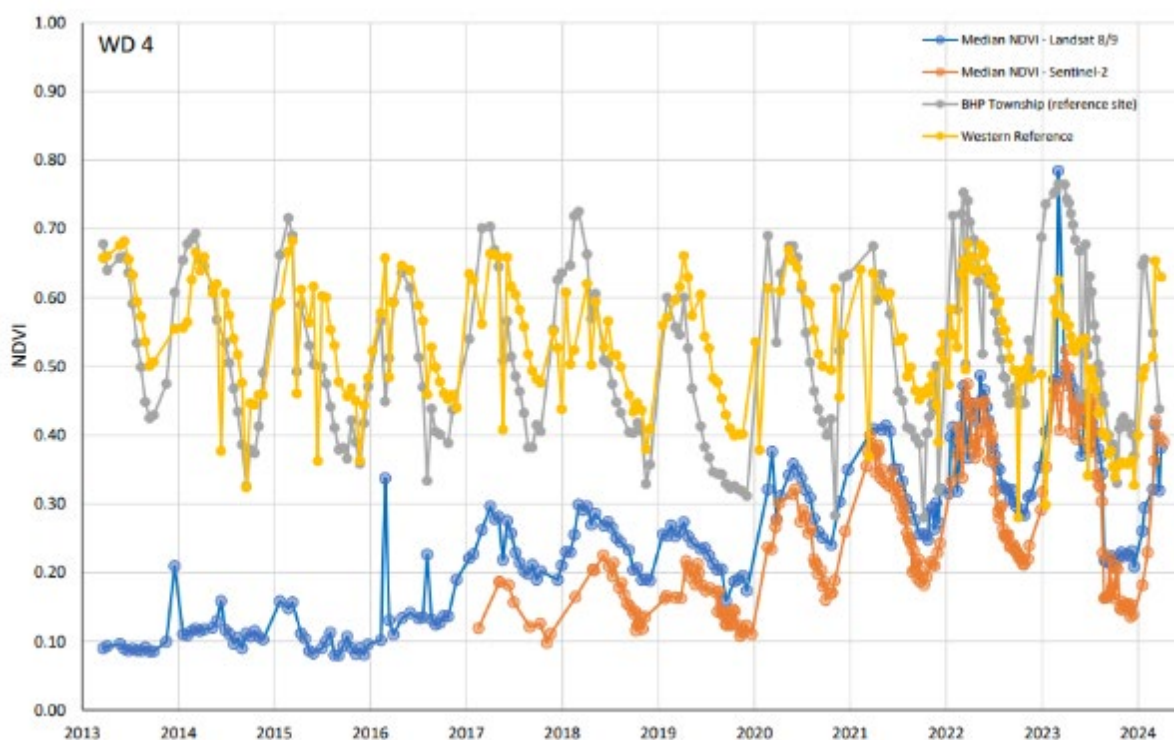


Figure 91 Median NDVI at WD4 compared to natural or fully rehabilitated land over 11 years

	2025	2026	2027	2028	2029	2030
WD 4	0.43	0.46	0.49	0.52	0.55	0.55

Figure 92 Table displaying linear model predictions for NDVI data at WD4

17.6.4 Scree

The area was mined for shallow detrital deposits of iron ore and rehabilitation was completed in 2015. Topsoil and vegetation was stripped, stockpiled and respread in less than 1 year. Deep ripping on the contour was applied after topsoil was respread. Cleared woody vegetation was respread with the topsoil, creating frequent pockets of coarse woody debris. Soil testing by SWC (Soilwater Consultants, 2015a) indicates the soil profile at Scree is derived from siltstone.

The Scree LFA transects have been monitored on five occasions between 2016 and 2020 (**Figure 93**).

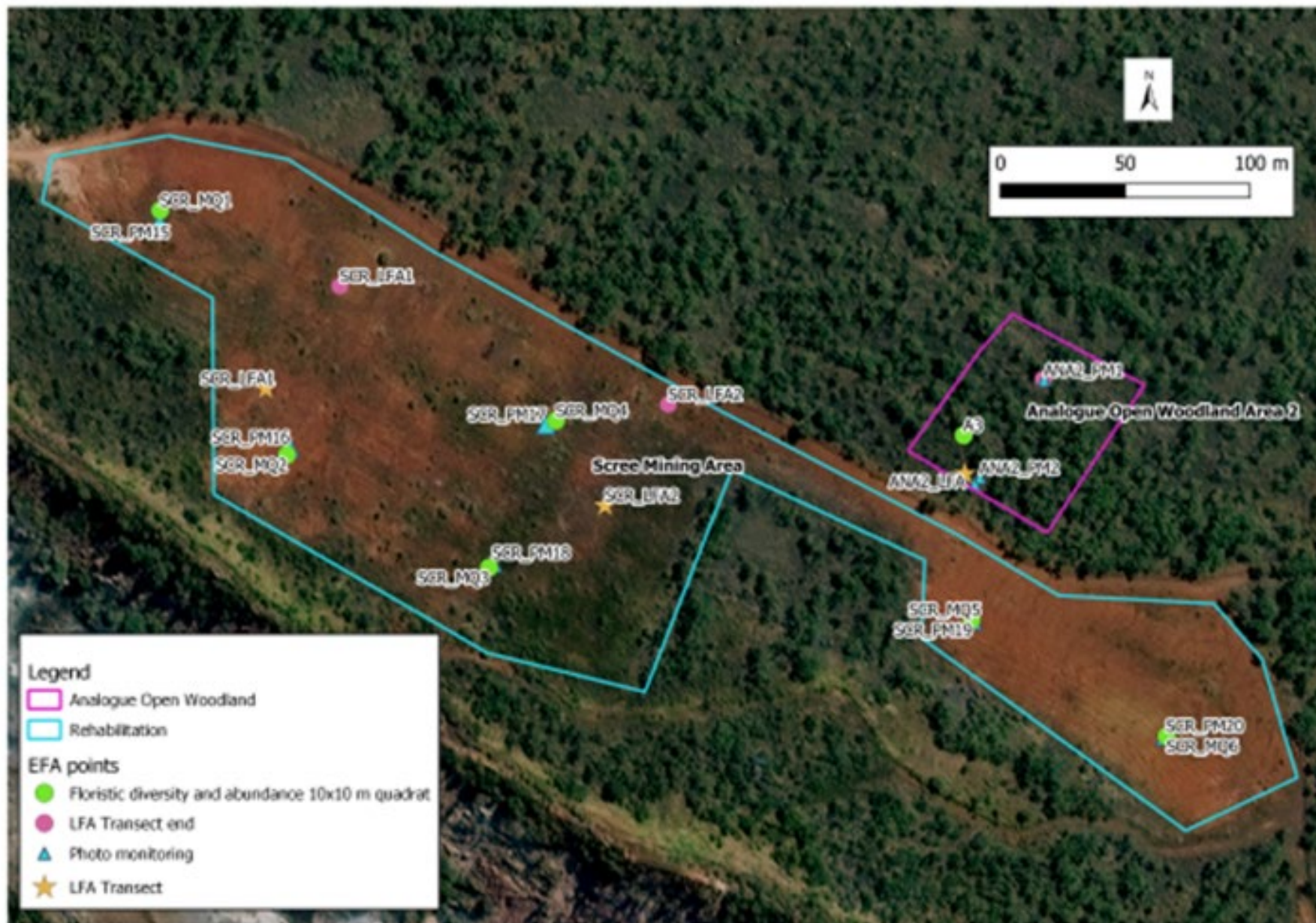


Figure 93 Scree rehabilitation area monitoring layout

The ripping on the contour of the Scree slope and the placement of coarse woody litter provided a baseline landscape with troughs and areas of woody litter recorded as occupying 60 - 70% of the transect in 2016. Between 2016 and 2017 rapid landscape evolution occurred at SCR_LFA1, where the bank and trough system eroded and some erosion features appeared on the top half of the transect where the soil profile was deep and rock content was low. Subsequent vegetation growth increased the LOI back up over 50% following the wetter than average wet season in 2017/18. For the SCR_LFA2 transect, LOI has slowly but steadily increased from 60 to 70% between 2016 and 2019. BY 2020, the LOI reached analogue levels. This is predominantly influenced by the intact bank and trough system throughout the transect and good growth of perennial woody vegetation cover.

The Stability Index at the Scree transects declined between 2016 and 2017 but in 2019 was approximately 60% of Analogue levels and improved to slightly higher levels in 2020. One factor influencing the decline and later recovery is rain splash protection measure – on slope construction rocks and logs were placed at the surface, initial erosion changed the organisation then further reorganisation of fine materials exposes additional rock and logs at the surface. A number of factors have suppressed the Stability Index from reaching the analogue levels. Lack of rock armour and erosion is the main factor for the difference in stability values between two transects. In places there is also very little litter accumulation, and the low litter build up limits the rate of decomposition. Rock armour is a key learning based on this site's results.

The Infiltration Index at the Scree transects were at 50% of analogue values in 2020. The lack of litter and the breakdown of the bank and trough system are the most prominent factors in the low scores. The bank and trough system is quickly evolving towards a slope and this reduces the surface roughness score and affects the infiltration index. The growth of perennial vegetation with the ability to slow water flow, such as dense perennial grass cover, would ameliorate this situation, as would the accumulation of litter. The Nutrient Index follow the same pattern, with values unlikely to increase without the increase in perennial vegetation cover, increased litter accumulation and decomposition and increased infiltration.

Thirty-one species were recorded on the Scree rehabilitation areas, with an average of 8.3 species per quadrat. The diversities were highly variable (with two sites recording 15 species and three sites with 3 or fewer species). Fifteen species in a quadrat is approaching the mean diversity of the Analogues.

By structural class there were on average 0.3 climbers, 2 groundcover species, 4.2 shrub species, 1.7 tall shrub species and 0.2 tree species. Ten of the target species defined by SWC (Soilwater Consultants, 2015a) were present at Scree.

APM (2019) recorded 17 species in the 2500 m² quadrat recorded for vegetation mapping.

Vegetation structural class values exceed the mean Analogue values for the canopy volume of shrub, large shrubs and the number of trees. Despite the high number of tree plants, and given the age of rehabilitation, the cover is only 3% with the majority being saplings. Mortality of these saplings may still occur if they do not have access to sufficient stored soil water to survive dry seasons, particularly following a drier than average wet season in 2018/19. This appears to have occurred by 2020 as metrics dropped, in response to less rain. In 2020, overall, canopy volume was one-third of the analogue and approx. 40% of plant density.

Erosion features were evident where 49 rills and 5 gullies were recorded totalling 11.6 m² in cross sectional area on one transect. Remedial action is required as represented by results at SCR_LFA1.

A very small scattering of *Melinis repens* was recorded at the Scree area and one individual of *Malvastrum americanum*.

Also examined in greater detail more recently is the work of Hydrobiology (2024a). **Figure 94** shows a hindcast of NDVI time series with a clear seasonal annual oscillation (grey; yellow lines) at areas never disturbed (Western Reference) or rehabilitated before 1993 for almost 30 years (BHP Townsite). Median NDVI of both these 'analogue' areas is circa 0.5. There is a clear increasing NDVI signal trend with time and the seasonality in foliage cover is evident too. By early 2023, the median NDVI at Scree was 0.4. This provides strong evidence of regrowth in native vegetation cover and applicability of the closure/rehab techniques applied. The bushfire in 2023 had a significant impact on the median NDVI, which can be seen in the decrease below 0.3 in early 2024. However, this does not consider the potential future positive effect of bushfire on floral ecology. Rehabilitation predictions could not be made for Scree due to poor model fit to the data (Hydrobiology, 2024a).

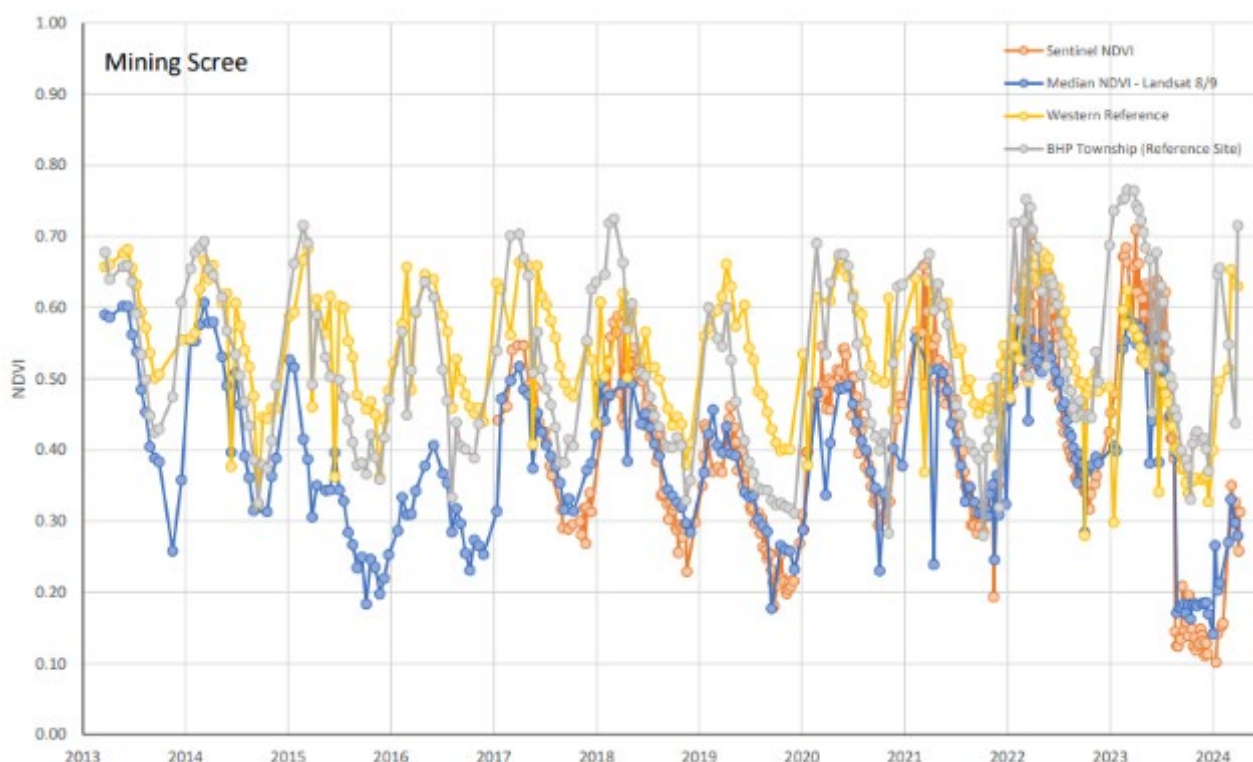


Figure 94 Median NDVI at Scree compared to natural or fully rehabilitated land over 11 years

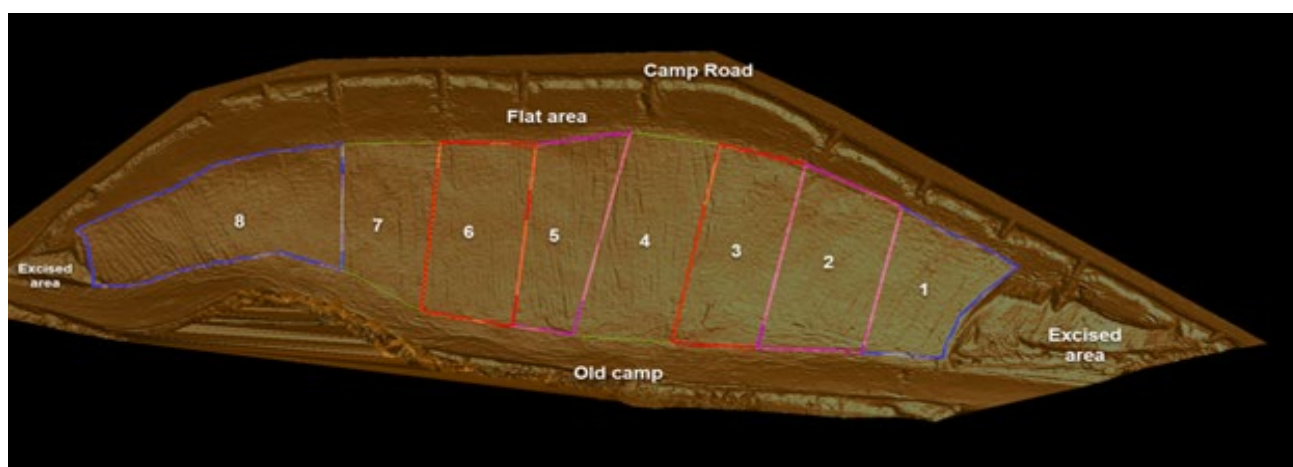
17.6.5 WD5 Cover Trial

In 2023, a single large outer slope on WD5 was identified as available for rehabilitation. Given the size and angle of the slope (**Figure 95**), a covering media trial tested the suitability of siltstone as an alternative growth medium at a large scale and identify optimum cover thickness. The slope was divided into eight different cells (two replicates of each of four treatments), represented in **Figure**

96. Siltstone was used as a growth medium over the area as it is terrigenous, non-toxic to plants, provides soil moisture holding properties and susceptible to plant root penetration.



Figure 95: Capture of WRD5 showing angle of slope is <20° across the face.



Cells	Cell 01	Cell 02	Cell 03	Cell 04	Cell 05	Cell 06	Cell 07	Cell 08
Area (m ²)	2,395	3,328	3,200	3,647	2,778	3,152	2,520	4,652

Figure 96: WD5 Trial layout and cell area

Within the eight cells, four different depths of siltstone were applied with each depth occurring twice to ensure results are replicable. The four cover depths trialed were 100mm, 250mm and 500mm and two cells that do not have siltstone applied (0mm) for control purposes: the depth of the siltstone treatment of each cell is represented in **Table 31**. The final trial surface was treated by top dumping siltstone and working the siltstone down using in machine informed by GPS to create the thickness required in each cell; a final cover and aspect is shown in **Figure 97**.

Table 31: Trial cell cover thickness – all cells cross ripped

Cell #	Siltstone cover thickness
01	0mm (No Cover)
02	100mm
03	250mm
04	500mm
05	100mm
06	250mm
07	500mm
08	0mm (No Cover)



Figure 97: Final Slope Cover prior to on-contour ripping; August 2023.

Following the application of the treatment, the batter was deep ripped using bulldozer tines for water movement to reduce erosion and sedimentation, improve water retention, decrease compaction, and improve landform stability. **Figure 98** depicts the contour plan for the rip lines creating a series of banks and throughs with a width of 1.5m to 2.5m.

There are at least fifteen native species identified as particularly favourable for rehabilitation purposes, as they provide a range of functions including colonisation, stabilisation, organic enrichment and soil nutrition, and tolerance to low water and high desiccation. Although opportunistic seed collection has been ongoing across site since 2010, conditions have not allowed for the collection of some of targeted revegetation species and many species are not yet present within available seed inventory. A revised list of species was used and sown during this trial in December 2023. The selected seed was based on recommendations made in this MCP and other available seed species with suitable inventory and hold similar function to the preferred species.

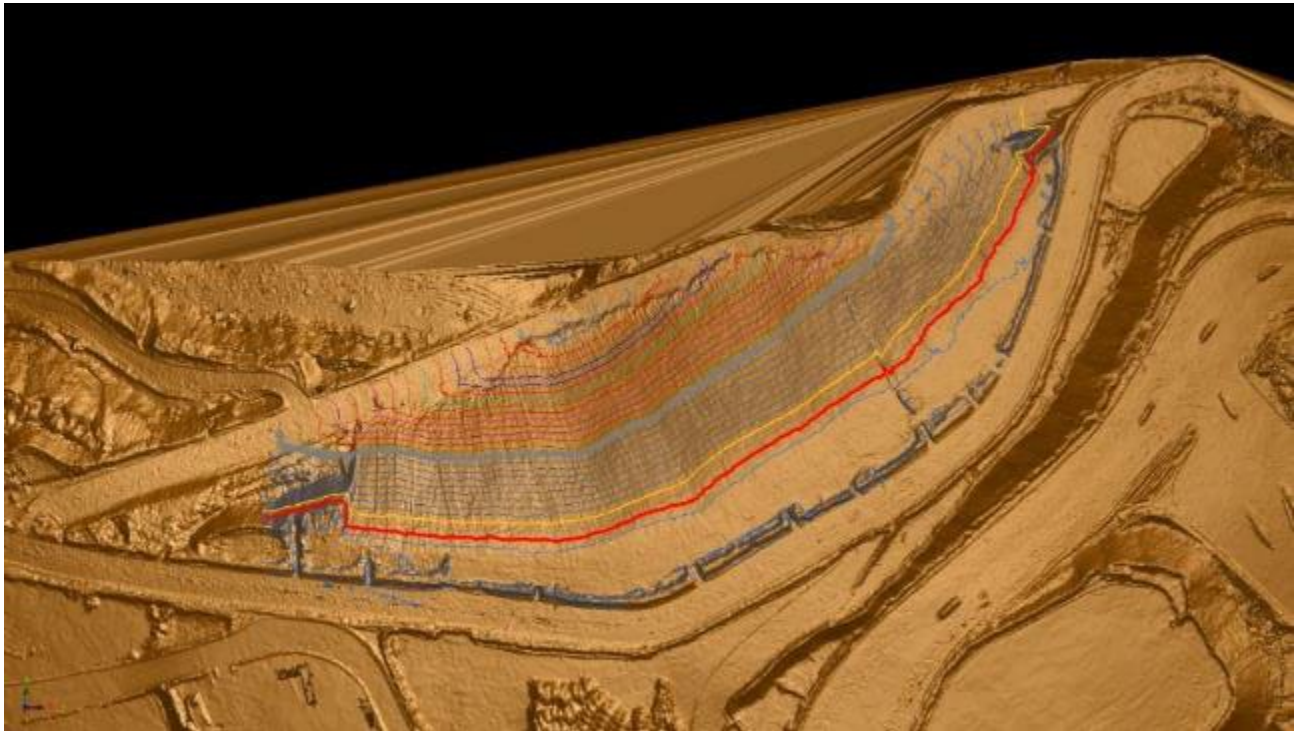


Figure 98: Contour ripping map for WD5 northern batter

The final seed mix used on this area was:

- *Acacia coleii*
- *Acacia hippuroides*
- *Acacia holosericea*
- *Acacia monticola*
- *Acacia oliganeura*
- *Acacia tumida*
- *Calytrix exstipulata*
- *Dodonaea hispidulus*
- *Grevillea pyramidalis*
- *Templetonia hookeri*
- *Triodia bynoei*
- *Triodia pungens*
- *Ptilotus fusiformis*

A seeding rate of 7kg/ha has been determined for this trial based on several factors including previous trial learnings, seed availability and revegetation monitoring data.

Seeding occurred before the first rains of the 2023-2024 wet season to ensure distributed seed can settle within the Elgee siltstone medium. The seed distribution occurred across two consecutive days in December 2023. Prior to seeding, each cell was to be marked out to ensure that works were carried out one cell at a time ensuring even distribution of the seed mix. GPS tracking was used to track coverage as personnel distributed seed to understand the route taken during seeding and ensure that cell lines were not breached.

Seed was weighed to a 1g accuracy and mixing occurred in a clean compost bin that has a tumbling function creating a uniform seed mixture. A total of 17.97kg of seed was required for the project based on a rate of 7kg/ha across the 2.56Ha site. Newer seed was used in favour to older seed to ensure best germination results. There were no prior treatments to the seed before distribution to minimise variables.

Once seed was mixed within the tumbler it was weighed and divided into 8 different amounts based on the area of each cell, the weights for each species and cell are represented in **Table 32**.

Table 32 seeding weight breakdown.

Genus	Species	Cell 01	Cell 02	Cell 03	Cell 04	Cell 05	Cell 06	Cell 07	Cell 08	Total (Kg):
		Weight (kg)								
Acacia	colei	0.50	0.70	0.67	0.76	0.58	0.66	0.53	0.97	5.36
Acacia	hippuroides	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.06
Acacia	holosericea	0.10	0.14	0.13	0.15	0.11	0.13	0.10	0.19	1.04
Acacia	monticola	0.11	0.15	0.15	0.17	0.13	0.15	0.12	0.22	1.19
Acacia	oliganeura	0.25	0.35	0.33	0.38	0.29	0.33	0.26	0.49	2.68
Acacia	tumida	0.50	0.70	0.67	0.76	0.58	0.66	0.53	0.97	5.37
Calytrix	exstipulata	0.06	0.09	0.09	0.10	0.07	0.08	0.07	0.12	0.69
Dodonaea	hispidulus	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
Grevillea	pyramidalis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
Templetonia	hookeri	0.05	0.07	0.07	0.07	0.06	0.06	0.05	0.10	0.53
Triodia	bynoei	0.03	0.04	0.03	0.04	0.03	0.03	0.03	0.05	0.28
Triodia	pungens	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.18
Ptilotus	fusiformis	0.05	0.07	0.07	0.08	0.06	0.07	0.05	0.10	0.56
Total (kg):		1.68	2.33	2.24	2.55	1.94	2.21	1.76	3.26	17.97
Seeding Rate (kg/ha)		7	7	7	7	7	7	7	7	

For an even distribution of seed mix across each cell, personnel used a GPS system (Avenza) to track coverage. Seed was spread by personnel in an arcing motion as they walk from the top of the slope to the base slowly zig-zagging from side to side of each cell. Seed was thrown from a bucket with personnel continuously agitating the seed within the bucket to randomly mix seeds and so that seed density did not affect even dispersal.

Post seeding, the site will be monitored visually throughout the 2023-2024 wet season (and beyond) through noted observations and images, particularly post heavy wet season rainfall events. Monitoring the site will examine factors that could influence the trial, including erosion and the introduction of weeds. If weeds including *Passiflora foetida* and *Melinis repens* begin to germinate and develop across the site, environmental staff will control weeds as best they can to ensure these species do not out-compete native species. Ongoing surveillance is required to track revegetation establishment.

Following several rain events greater than 20mm a visual inspection was made in late February. No signs of vegetation growth were observed during the inspection. Soil was moist and fine siltstone had settled within windrows. No major erosion is occurring across the rehab area including no run off of siltstone to the base of the slope. Each cell is now clearly visible by the different depths of the ocre coloured siltstone.



Figure 99: Slope post rainfall, Late February 2024.

Early indicative monitoring presents promising results, there was one erosion feature that occurred due to water pooling at the top surface of the slope. The erosion was between two cells, which allowed vertical water migration. The upper face of the slope has been reformed to hopefully prevent further erosion. Approximately six months post seeding saw the emergence of the first germinates. There is no specific correlation between growth media depth and germination present at this stage.



Figure 100 Initial seed germination occurred approximately six to eight months post seeding.

17.6.6WD2 Erosion Restoration

During an Environmental inspection by DEMIRS in June 2023 it was identified that there was erosion occurring due to surface water management on WD2. The erosion channel initiated from two water management drains to prevent flooding on the adjacent haul road and mining operations centre (**Figure 101**).



Figure 101 Erosion Feature on WD2 prior to remediation.

To prevent further erosion occurring KIO technical services placed approximately 1000 tonnes of oversized quartzite pieces under the discharge outlets. This was considered the best available option due to the location of the outlets. The additional quartzite was intended to reduce the overall drop from the outlet to the underlying waste rock dump and improve erosion resistivity. The remedial works were undertaken in October 2023. **Figure 102** shows the remedial works undertaken to backfill the erosion channels and significantly reduce the vertical drop from the outlet to the underlying media.

The earthworks were monitored in late March 2024, after the majority of expected rains, to understand if the solution withstood extreme rainfalls events that occurred during February 2024. After the 2024 wet season there are no signs of additional erosion, and therefore fix is considered successful (**Figure 103**).



Figure 102: surface water drain after remedial works were carried out (October 2023).



Figure 103: surface water drain after wet season (March 2024).

17.7 Knowledge Gaps and Future Work Schedule

Following the review and analysis of the closure data, a list of opportunities to further this knowledge is provided in **Table 33**. Further investigations have been identified and will be undertaken in order to accurately assess the key matters associated with closure of KIO operations and allow greater certainty in re-establishment of safe, stable and non-polluting post-mine landforms.

The list below is broad tasks that incorporate multiple smaller tasks, the discrete tasks have been further broken down into domain specific actions in Section 21.

Table 33 Overview of key Knowledge Items for successful closure planning

Factors	Key Issues	Key Actions	Lead Responsibility	Schedule	Risk posed by uncertainty*
Landforms	Geotechnical competency of WRLs	Assess local ground conditions on crests/berms for informed design of final outer slopes/berms. Develop closure designs based on geotechnical parameters	KIO, drawing on specialist consultants	Commenced Planned completion 2024	Medium
	Cover systems	Prepare mass budget and mapping of sources and placement of cover media per domain (noting short fall in topsoil as medium).	KIO – in house	Proposed 2025	High
		Additional trials to examine preferred cover systems for flat surfaces to be revegetated and sloping surfaces to be capped	KIO – in house	Commenced Planned Completion 2026	Medium
	Catchment management and land rehabilitation	Ongoing monitoring of existing rehabilitated domains for surface erosion and pathways/scour.	KIO, drawing on specialist consultants	Commenced – Monitoring Planned Completion 2025	Low
	Backfilled pits	Ongoing assessment of pit void backfilling to meet approved surface designs. Liaise with DEMIRS to verify abandonment bunding designs.	KIO – in house	Proposed 2025	Low
Marine Environments	Main Pit and seawall	Hydrodynamic modelling of vertical mixing / layering in Main Pit	KIO, drawing on specialist consultants	Proposed 2024	Low
		Conduct technical assessment to detailed design of tidal	KIO, drawing on specialist consultants.	Proposed 2024	Low

Factors	Key Issues	Key Actions	Lead Responsibility	Schedule	Risk posed by uncertainty*
		conveyance trench and seawall outer face perpetuity requirements. Refinement of designs; DEMIRS approval of designs, terrains/footprints and bunds		Proposed 2025	
Post mining land use	Stakeholder engagement	Continue to engage with DAC and Dambi people to discern further interests in land and infrastructure to be retained or re-purposed post-mining.	KIO – in house; KIO and DAC drawing on specialist consultants for business planning, land tenure and planning support to DAC.	Commenced Planned completion 2026	High
		Liaise with WA Departments (DPLH; DJTISI; DEMIRS) and Kimberley Port Authority (KPA) for support and transferral of key assets and infrastructure including airfield(s) and port.	KIO, in house. Engagement interest from other parties.	Commenced Planned completion 2027	High
Biodiversity	Flora	Flora and fauna. Collect native provenance seeds for broadcast upon rehabilitation. Information on seed viability and appropriate seed mix for use in rehabilitation.	KIO – in house	Commenced; ongoing Planned Completion 2030	Low
	Fauna	Devise, design and trial artificial quoll dens	KIO, drawing on specialist consultants.	On Hold pending review of previous study.	Low
	Fauna	Devise, design and trial coral recruitment substrates.	KIO, drawing on specialist consultants.	On Hold pending review of previous study.	Low
	Rehabilitation success	Trialling of different monitoring methodologies to understand the preferred post closure	KIO – in house	Commenced	Low

Factors	Key Issues	Key Actions	Lead Responsibility	Schedule	Risk posed by uncertainty*
		rehabilitation monitoring methodology.		Planned completion 2027	
Other Legislation	Contaminated sites status	Determine how the current status of 'Potentially Contaminated – Investigation Required' across the Island under the Contaminated Sites Act 2003 will be treated at mine closure and lease relinquishment	KIO, drawing on specialist consultants	Commenced Planned completion 2026	Low

* High = outcome will change the closure outcomes, Medium = outcome may change the closure outcomes, Low = outcome unlikely to change the closure outcomes.

18 POTENTIAL POST-MINING LAND USE(S)

18.1 Pre Project Land Uses

18.1.1 Cultural Heritage & Native Title

The Dambimangari people are the traditional owners of Koolan Island and those matters are collaboratively managed through the Wanjina – Wungurr (Native Title) Aboriginal Corporation – Registered Native Title Bodies Corporate (PBC). The PBC manages native title which, on Koolan Island, is determined as exclusive and non-exclusive land.

Heritage sites also exist on the Island and these are of significance to the Dambimangari people. Koolan Island itself is known as Goolanoo and there is a dreaming story based on Woongudd (sea serpent) that Dambimangari may choose to talk about.

Rights and Interests of Traditional Owners

KIO (and MGX) recognises the connection to country of traditional owners including that of Kimberley saltwater people and specifically at Goolanoo (Koolan Island) contemporarily through members of Dambimangari Aboriginal Corporation (DAC) and its members.

KIO will use its best endeavours to achieve rehabilitated, post-mining conditions to meet the interests and ambitions of Dambimangari, including retention and/or re-purposing of its existing assets. In this regard in 2021, KIO & DAC began a new working dialogue to examine and prioritise options for a long-term post-mining future at Koolan, including considering domestic habitation in a homeland setting on Goolanoo.

18.1.2 Historical Mining

Large scale mining was undertaken by BHP between 1965 and 1993. Decommissioning of the mine in 1993 included removal (and some in-situ burial) of infrastructure, rehabilitation of cleared areas of terrestrial land by moonscaping, and the construction of a channel to allow sea water to inundate the Main Pit (Ecologia, 2005).

During former occupation of the Island, BHP held a variety of tenure including mining leases. At the end of BHP's occupation, tenure held was relinquished back to the State.

18.1.3 Unallocated Crown Land

The predominant land use from 1993 until 2005 when KIO acquired the mining leases (L04/29, M04/416, and M04/417) was rehabilitated land from previous mining. The primary intent of KIO is to return the land to a similar state to that when KIO acquired the mining leases it currently holds. This is subject to options under consideration for post-mining use by other parties.

18.2 Post-Mining Land Use Criteria

MCP guidelines identify that the post-mining land use must be:

- relevant to the environment in which the mine will operate.
- achievable in the context of post-mining capability.
- acceptable to the key stakeholders; and
- ecologically sustainable in the context of the local or regional environment.
- KIO's proposed post-mining land use is assessed against the criteria below.

18.2.1 Relevance

The pre-mining land use before KIO was formerly undisturbed, mined and/or rehabilitated land on UCL. The Island is characterised by steep terrain and skeletal soils that would not be generally suitable for development for improvement to agriculture or pastoral use. The land is therefore considered likely to remain as UCL unless select assets are transferred to DAC and/or KPA (which would require separate tenure underlying those assets), and/or other tenured entities. Hence, UCL is a viable post-mining land use that is relevant to the location. Re-purposed assets transferred to DAC or KPA, on appropriate non mining tenure would also be highly relevant as they relate to determined native title lands and a gazetted port.

18.2.2 Achievable

Without a defined purpose for the land, achievability would be deemed to relate to whether there is a demonstrated ability to return the land to a condition consistent with the surrounding areas - such that additional management is not required post-mining. The revegetation strategy developed by KIO indicates that rehabilitation of landforms and native revegetation is achievable in the medium term. This would exclude lands by agreement retained for control of other entitled parties.

18.2.3 Acceptable

Acceptability may be judged via the outcomes of consultation completed by the Proponent and EPA (with relevant DMAs and via public review). The acceptability in the definition provided by DEMIRS appears to relate to the acceptability of the post-mining land use, rather than suitability of residual environmental risks and potential outcomes. UCL as a post-mining land use is acceptable at many other mine sites, and by extension, is considered to be acceptable for KI. Re-purposed assets transferred to DAC or KPA also would be highly acceptable should those parties ultimately accept the post mining assets under agreement.

This MCP summarises the main interests or concerns of key stakeholders in relation to mine closure. Ultimately, DEMIRS (as the key regulator of environmental management under the Mining Act 1978) will determine the acceptability of mine closure risks and outcomes through assessment of this MCP.

18.2.4 Ecologically Sustainable

As a land use, unimproved UCL is, in the true sense, ecologically sustainable. Rehabilitation has been successfully applied to thousands of hectares of WA, with sustainability questions almost entirely related to the post-rehabilitation undue effect of feral animals and environmental weeds. To be sustainable in the context of the Koolan Island environment, post-mine rehabilitation would need to enable a return to natural water, energy and nutrient cycles, and to manage weed loads and feral fauna (potentially cane toads). These natural systems on the dry tropics, skeletal soil setting are low in nutrients and highly dependent on the ability to retain water and nutrients locally to sustain levels of vegetative productivity – KIO's rehabilitation strategy aims to emulate these characteristics, and trends in past rehabilitation and revegetated areas have shown this. Re-purposed assets transferred to DAC or KPA also would benefit ecological sustainability because those parties could implement site management for feral animals and environmental weeds.

18.3 Assessment of Closure Options

Based on the current mine plan, mining is scheduled to be completed by Q3 2026 with closure activities co-occurring where operationally possible and full closure to occur post-2027. KIO have identified two potential post-mining land use scenarios in consultation with key external stakeholders.

KIO engaged Truescape to develop a 3D interactive tool to visually represent closure options 1 and 2. This tool allows navigation around Koolan Island to see what the post-mining land could look like. A snapshot of each option is presented as **Figure 104** and **Figure 105** respectively.

18.3.1 Option 1 – Complete Rehabilitation

Removal and land rehabilitation of all improvements developed by KIO with the exception of the barge ramp and jetty/boat pen (ownership of which would be transferred to the port authority (KPA)) and re-purposing of a central unsealed access track through to the Dambi cultural centre on one of the island's eastern peninsulas – this option is retained in this MCP for the purpose of closure provisions (being the most extensive works required).

18.3.2 Option 2 – Selective Asset Transfer

Removal of improvements developed by KIO and land rehabilitation with the exception of certain selected infrastructure (see Section 18.3.3), control of which would be transferred to DAC (or another interested party), and control of the barge precinct to KPA. And re-purposing of a central unsealed access track through to the Dambi cultural centre - this option is retained in this MCP for the purpose of a version showing key asset retention / re-purposing while final scenarios are being determined by KIO and stakeholders (preferred option).

KPA also may consider existing coastal infrastructure at Koolan Island to facilitate post-project maritime access – after closure, certain infrastructure may, upon agreement, be transferred as the reclaimed land adjacent the barge landing would likely be recognised as territorial baseline. Main Pit would be flooded by constructing a channel/s in shoreline rock adjacent the sea wall, constructed such that access by vessels is constrained. The remainder of the pits, WRLs and improvements developed by KIO would be rehabilitated and revegetated at closure according to the final decided option. These would generally be on UCL after mining tenement relinquishment, unless on leases acquired by others (DAC or entitled entities).

As in recent years estimated closure cost provisions of the most extensive closure Option 1 have been used as a baseline. KIO has sufficient liquidity to carry out the works required for this option to meet the stated closure objectives (section 18.3.3), following the completion criteria.

18.3.3 Current Joint Views on Post-Mining Land Uses

As a progression of closure Option 2 above, ongoing consultation between KIO and DAC since 2021 has specifically identified potentially beneficial post-mining uses for certain Project infrastructure. Option 2 would see certain assets transferred to DAC for productive utilisation in the future. Specifically, Koolan Island's values and location represent potential opportunities to engage in future tourism, aquaculture, heritage / environmental and other economic enterprises.

KIO and DAC have identified that certain project infrastructures may have beneficial uses post-mining for Dambimangari or other entities wishing to occupy the Island for economic or other reasons:

- Part of the village (reduced to a 100-person camp) and cyclone shelter (and bores for raw water production).
- A reduced workshop area to allow for equipment maintenance.
- WD1 Airfield.
- Barge precinct and part or all of the jetty/wharf (with ore ship loader removed) to be held by KPA.
- Central island-traversing roads (with roads being reduced to light vehicle access) and tracks, allowing access across the Island and fire and weed control.
- The Dambimangari Cultural Centre.

For the Dambimangari (or other third parties) to secure appropriate tenure and occupation over the parts of the Island containing infrastructure of beneficial use, parties will need to consult primarily with the Department of Planning, Lands and Heritage (DPLH), DEMIRS and the mining tenement holders (KIO). The future landholder needs to identify the type of tenure for which they wish to adopt based on the types of infrastructure and activity to be undertaken.

DEMIRS will need to provide Mining Act 1978 section 16(3) approval for any proposed action over Crown land to proceed while tenements exist. The Land Administration Act 1997 requires land assembly to be completed (inclusive of application to the Department of Planning, Lands and Heritage and referrals to other agencies for their comments) for any proposed action over Crown land before it can proceed.

The process for the handover of rights to occupy unallocated crown land from a tenement holder to another entity and/or Native Title holders is relatively new; and KIO will work with DAC (or any other entity) and agencies (DEMIRS, DPLH) so that the process is executed and the desired outcomes achieved.



Figure 104: Closure Option 1



Figure 105: Closure Option 2

19 CLOSURE RISK ASSESSMENT

This section documents the environmental risks associated with the proposed mining activities. The risk assessment is based on Australian Standard (AS) 31000: Risk Management Guidelines (Standards Australia, 2018) and Leading Practice Sustainable Development in Mining – Risk Management. Specifically, the risk assessment:

- identifies the environmental risk pathways affecting DEMIRS' environmental factors (biodiversity, water resources, land and soils) during the operations, closure and post-closure phases of the proposal, including risks arising from unexpected or emergency conditions
- includes an analysis of these risks to derive an inherent risk rating, prior to the application of treatments
- identifies appropriate risk treatments
- includes an evaluation of the risk pathways to derive a residual risk rating, and
- demonstrates that all residual risks are as low as reasonably practicable (ALARP).

KIO has applied a *Source-Pathway-Receptor* (SPR) model to identify potential risk pathways for the Proposal, based on the project scope, key activities and relevant environmental receptors/values.

Environmental risk has been assessed by determining the consequence and likelihood of each potential risk, firstly for the inherent (untreated/raw) risk, and then for the residual (treated) risk. The scales of Likelihood and Consequence used in the risk assessment are provided in **Table 34** and **Table 35**, respectively, whilst the risk ratings matrix is provided in **Table 36**. It should be noted that the likelihood and consequence are used as a guide and some subjectivity is required.

An evaluation of assigned risk was undertaken to determine whether inherent risk and the residual risk are acceptable in the context of DEMIRS' environmental objectives. Where risks are not acceptable, appropriate treatments have been identified using the hierarchy of control: eliminate, avoid, minimise or mitigate. The acceptability of assigned risk is provided in **Table 37**.

The risk assessment is provided in **Appendix D** and is qualitative, i.e., it groups risk pathways into general levels (Low to Extreme) but does not rank within each level. KIO considers this method sufficient for the assessment of environmental risk associated with the Project.

The risk assessment is informed by the baseline data presented in Section 5 through Section 17. KIO considers that the available data is sufficient to confidently predict the potential impacts of the Project.

Table 34: Risk assessment descriptor - Likelihood

Likelihood	Frequency	Probability
Almost certain	Event occurrence of <1 year	Event will occur during the Project/period under review.
		High number of known incidents.
Likely	Event occurrence of <5 year	Event likely to occur during the Project/period under review.
		Regular incidents known
Possible	Event occurrence of <10 year	Event may occur in some instances during the Project/period under review.
		Occasional incidents known.
Unlikely	Event occurrence of <100 year	Event is not likely to occur during the Project/period under review.
		Some occurrences known
Rare	Event occurrence of 1000+ year	Event will occur in exceptional circumstances during the Project/period under review.
		Very few or no known occurrences.

Table 35 Risk assessment descriptor - Consequence

Consequence	Environment	Community and reputation
Insignificant	No or very low environmental effect. Effect confined to a land area of <10m ² or involves a hydrocarbon spill of <80L or <legal reporting limits.	Isolated complaint. No media enquiry.
Minor	Low environmental effect. Rapid clean-up by site staff and/or contractors. Impact contained to area currently impacted by operations e.g., hydrocarbon spill >80L and <1,000L.	Small numbers of sporadic complaints. Local media enquiries.
Moderate	Moderate environmental effect. Clean-up by site staff and/or contractor. Effect confined within lease boundary, e.g., exceeds a licence or Ministerial condition or death of a protected species caused by mining such as Northern Quoll. Longer term land or marine impact. Potential <\$500k fine.	High frequency of complaints, repeated complaints from the same area (clustering). Elevated local media interest.
Major	Major environmental effect. Considerable clean-up effort required using site and/or external resources. Effect may extend beyond the lease boundary. Site shut down by environmental regulators. Potential >\$500k fine.	Increasing rate of complaints, repeated complaints from the same area (clustering). Increasing national/local media interest.
Severe	Severe environmental effect. Local species loss and likely long recovery period. Extensive clean-up involving external resources. Effect on a regional scale.	High level of concern or interest from local community. National and/or international media interest.

Table 36 Risk assessment matrix

Risk matrix		Most credible consequence level				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood	Almost certain	M	H	H	E	E
	Likely	M	M	H	H	E
	Possible	L	M	M	H	H
	Unlikely	L	L	M	M	H
	Rare	L	L	L	M	M

Table 37 Risk levels and acceptability

Risk level	Acceptability	Treatment
Extreme	Unacceptable	Risk will not be tolerated Modification of activity required and Mining Proposal amended
High	May be acceptable, with specific risk treatment	Risk may be tolerated with application of high reliability risk treatment Environmental outcome/closure objective required.
Medium	Acceptable, with relevant risk treatment	Risk is tolerable with application of appropriate risk treatment Environmental outcome/closure objective required.
Low	Acceptable	Low risk is acceptable, but still requires industry best practice environmental management.

Environmental and regulatory risks and opportunities associated with rehabilitation and closure have been assessed. The complete risk assessment is included as **Appendix D**. Key outcomes of the risk assessment are summarised in this section.

The process and methodology used to identify principal closure issues and risks follows the Leading Practice Sustainable Development Program for the Mining Industry as related to mine closure and rehabilitation (Department of Industry, Innovation and Science, 2016a & 2016b), considering the closure data and analysis detailed in section 17.

Risk was assessed and the highest residual risk rating for identified hazards was "Medium". A total of 16 discrete hazards attracted a moderate residual risk rating. These risks have been grouped into several broad categories:

- Geotechnical Risks,
- Landform Risks,
- Rehabilitation Risks,
- Water Resource Risks.

All risks with a residual rating of Medium or above are presented in **Table 38**.

Table 38 Summary of Risks Rating Medium or above

Domain	Risk Category	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome #
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
All of mine	Rehabilitation	Revegetation	Insufficient supply of suitable growth media	Loss of ecosystem functioning Loss of fauna habitat Erosion and instability of landform surfaces Reduced amenity	Likely	Minor	Medium	Stockpiling topsoil Maintain materials balance Revegetation trials Surface treatment trials Rehabilitation monitoring Remediation when trend analysis indicates moving away from outcomes	Possible	Minor	Medium	5
All of mine	Rehabilitation	Revegetation	Erosion of growth media prior to establishment of revegetation	Loss of ecosystem functioning Loss of fauna habitat	Likely	Minor	Medium	Stockpiling topsoil Maintain materials balance Revegetation trials Surface treatment trials Rehabilitation monitoring Remediation when trend analysis indicates moving away from outcomes	Possible	Minor	Medium	5
All of mine	Rehabilitation	Weed control	Weeds further infest disturbed and / or rehabilitated areas	Revegetation failure Reduced amenity	Likely	Moderate	High	Annual weed monitoring Weed management program Minimise restriction of surface water flows Treatment weed infested topsoil stockpiles prior to spreading Vehicle hygiene Biological agent (if development completed and assessed as suitable)	Possible	Moderate	Medium	5
Open pits	Geotechnical	Main Pit 'lake'	Tidal Fluctuation of Pit Water Levels	Erosion or collapse of Main Pit walls	Likely	Moderate	High	Geotechnical analysis of rising groundwater and fluctuating sea water levels pit wall stability prior to closure. Development of closure bunds and exclusion zones to prevent access to areas of concern.	Possible	Moderate	Medium	1/2

Domain	Risk Category	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome #
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Open pits	Geotechnical	Surface water management	Ponding of Water against abandonment	Scouring of Abandonment Bunds	Possible	Moderate	Medium	Surface flow analysis and floodplain mapping may be undertaken following establishment of the abandonment bund location. Reshape land surface to divert water away from Main Pit abandonment bund if required Construct quartzite channels through abandonment bunds to direct flows from catchments adjacent to Main Pit.	Unlikely	Moderate	Medium	1/2
Waste rock landforms	Landforms	Engineered landform slope stability	Landforms erode, slump and / or collapse	Erosion of landform slopes Revegetation failure	Possible	Major	High	Geotechnical modelling to determine stability of the batter slopes under various rainfall and water content scenarios (SWC, 2014e). Modelling indicates berm overtopping unlikely Upper WRL surfaces sloped inwards Correct use of waste rock material when completing outer surfaces Batters at < 20°. Barramundi and East Pit backfill batters separated by (≈ 5 – 10 m) berms. Batters constructed competent coarse waste rock (e.g. quartzite) Berms have upper layer of growth material sourced from mined siltstone Surface treatment trials	Unlikely	Moderate	Medium	2
Waste rock landforms	Landforms	Surface water management	Uncontrolled Surface Water Flow	Tunnelling and sinkhole development on berms	Possible	Moderate	Medium	Depth of focused siltstone placement is not deep enough with respect to the overall lift height to affect berm stability, as material below the upper portion of the berm will consist of waste rock material with much reduced potential for tunnelling development	Unlikely	Moderate	Medium	2/3
Waste rock landforms	Water Resources	Surface water management	Excessive sediment loss and deposition into the marine environment	Decreased marine water and benthic habitat quality	Possible	Moderate	Medium	Surface flow analysis on the design and 'as-built' Mullet Backfill land surfaces Void volume of 280,000 m³ Marine Monitoring Program	Unlikely	Moderate	Medium	2/3

Domain	Risk Category	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome #
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Waste rock landforms	Landforms	Landform design	Visual amenity of the WRLs is not congruent with the surrounding land surface	Reduced visual amenity	Likely	Moderate	High	Mullet Pit landform face in line with natural fall of the pit crest Barramundi and East Pit landform faces follow local slopes or existing WRL forms to integrate with surrounding surfaces. Batter heights and berm widths are likely to vary across the surface of the backfilled pits for a more natural appearance. Backfilled pits have the potential to support a woodland ecosystem that will improve the visual amenity values of the rehabilitated areas for visitors to the island. Location and outer surface design of WRLs designed to integrate with the surrounding landscape. Revegetation species specifically matched to the capabilities of the soil profile Monitoring of surface treatment trials and progressively rehabilitated areas	Unlikely	Moderate	Medium	3
Waste rock landforms	Landforms	Landform construction	Outer surface of WRLs not constructed according to the design	Erosion of landform slopes Revegetation failure Tunnelling and sinkhole development on berms Decreased marine water and benthic habitat quality Reduced visual amenity	Possible	Major	High	Monitoring of rehabilitated land surfaces against design specifications Inspection of completed landform surface waste rock material types by site environment personnel Actions taken where necessary to rectify any non-compliances.	Unlikely	Major	Medium	2
Waste rock landforms	Landforms	Rehabilitation	Operational complexity to reconstruct the Backfilled Soil Profile	Landform doesn't adequately balance surface stability and growth requirements of the revegetation	Possible	Moderate	Medium	Discussions with earthmoving operators will be undertaken prior to construction and shaping of the outer surface of the waste dump so that all personnel are aware of the need for adhering to the designs. Design consideration to preference either stability or revegetation.	Unlikely	Moderate	Medium	2/3

Domain	Risk Category	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome #
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Waste rock landforms	Rehabilitation	Rehabilitation	Soil conditions inadequate for re-establishment and growth of vegetation	Revegetation fails to meet closure outcome.	Possible	Moderate	Medium	Removal of all above ground infrastructure to ground level and reshaping of the disturbance areas. Natural disturbance surfaces deep ripped to $\approx$ 800 mm Concrete pads underlying processing plant and logistical support areas will be left in place or fragmented, depending on machinery capabilities, and covered with stable soil to sufficient depth for revegetation. Rehabilitated pads and processing plant area seeded with the revegetation species mix	Unlikely	Moderate	Medium	3
Landfill	Rehabilitation	Rehabilitated and reshaped land surfaces	Uncontrolled surface water flow	Scouring and erosion of rehabilitated areas Erosion of landform surfaces Revegetation failure Excessive Erosion and Gullyng Sediment loss into surrounding environment Tunnelling and Sinkhole Development	Possible	Moderate	Medium	Removal of above ground infrastructure to ground level Compacted soil cap profiled to direct surface flows away from the landfill Surface water flow over the cap will be analysed to ensure it is constructed as designed to direct surface water flows away from the landfill cells. Marine monitoring program	Unlikely	Moderate	Medium	2/4
Landfill	Rehabilitation	Landform construction	Soil Conditions are Inadequate for Re-establishment and Growth of Vegetation	Revegetation failure Weed infestation Erosion of landform slopes Reduced visual amenity	Possible	Moderate	Medium	Cap comprised of $\leq$ 1 m compacted clean clay fill, overlain by $\leq$ 150 mm locally sourced topsoil Topsoil manually seeded with local provenance seed mix Ongoing monitoring of progressive rehabilitation	Unlikely	Moderate	Medium	3

Domain	Risk Category	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome #
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Seawall	Water Resources	Landform construction	Uncontrolled and excessive rock and sediment loss into surrounding environment	Reduced marine water quality (increased turbidity) Reduced benthic habitat quality (sedimentation) Reduced benthic ecosystem functioning (reduced coral cover)	Likely	Moderate	High	Coral Rehabilitation Plan Once a stable seawall profile has developed, rock deposited from the seawall will form a new sea bed surface. As the rate of seawall erosion equilibrates with the local natural rate, so too will turbidity levels and sedimentation rates, which are functions of erosion. The return to natural conditions will allow benthic species to establish on the new sea floor. Regeneration will continue to be monitored in accordance with the marine monitoring plan	Possible	Moderate	Medium	3
Seawall	Geotechnical	Constructing decommissioning cut	Decommissioning cut impacts marine environment	Reduced marine water quality (increased turbidity) Reduced benthic habitat quality (sedimentation) Reduced benthic ecosystem functioning (reduced coral cover)	Possible	Moderate	Medium	Coral Rehabilitation Plan Marine monitoring program in accordance with the approved marine management plan Marine management plan will be updated prior to closure to incorporate post-closure triennial monitoring of the existing marine monitoring sites	Unlikely	Moderate	Medium	3
Seawall	Geotechnical	Constructing decommissioning cut	Decommissioning cut not constructed according to the design	Marine ecosystem fails to establish in Main Pit lake	Possible	Moderate	Medium	Monitoring program implemented to ensure decommissioning cut is constructed in accordance with design specifications Inspection of completed cut by site environment personnel to ensure that it is located and oriented correctly, utilising the correct material types Actions taken where necessary to rectify any non-compliances.	Unlikely	Moderate	Medium	3

Domain	Risk Category	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome #
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Open Pits	Water Resources	Main Pit re-inundation	Main Pit 'Lake' Water Quality Unsuitable for Environmental Values	Main pit water quality is not consistent with post mining land uses.	Possible	Moderate	Medium	Hydrodynamic modelling of decommissioning cut configurations indicates complete mixing of upper layer in 12 – 14 days with preferred single cut Construction of a second cut to be investigated if future pit lake use includes aquaculture or other activities Marine management plan will be updated prior to closure to incorporate post-closure triennial monitoring of the main pit lake marine environment Where monitoring indicates the potential for adverse effects, remedial measures will be implemented	Unlikely	Moderate	Medium	2/3/4

Risk mitigation strategies and treatments for the highest rated risks are categorized and discussed below.

19.1 Geotechnical Risks

19.1.1 Main Pit, Seawall and Decommissioning Cut

The identified geotechnical risks associated with closure are primarily associated with main pit, the seawall or the decommissioning cut. It is acknowledged that there is some uncertainty around the exact mechanisms to control the risk and therefore the precautionary principle has been applied to residual risks. The closure of main pit is complex as it has multiple sources of uncontrolled water movement.

There has been a lot of work to understand geotechnical forces to date and this work is planned to continue until definitive solutions are in place, construction is complete, and monitoring and auditing has been completed confirming the closure specifications have been met.

Geotechnical concerns are discussed throughout Section 7 with more specific discussion about the seawall, main pit and the decommissioning cut are provided in Section 17.1.

19.1.2 Abandonment Bunds

A consideration for safe closure is the placement and construction of abandonment bunds next to pits and/or on accessways. The purpose of a bund is to improve the safety of abandoned open pit mining voids, therefore, they need to be built of hardy (rock) materials and in a location that would maintain their integrity.

Koolan Island is in a tropical climate zone that has predictably high rainfall and subject to cyclonic events; this means that there is high potential for sheetflow and water erosion on infrastructure at the site if uncontrolled. However, because of this climatic setting much of the material with low structural value has been eroded via natural processes and left a competent foundation. During the mining operations a large volume of quartzite has been unearthed and stockpiled across the site. Quartzite is extremely hardy, generally blocky and erosion resistant. For the purposes of construction of abandonment bunds it contains all of the physical parameters to make it a suitable material.

Specific discussion about the placement of Abandonment bunds is in Section 17.3 and the specific design considerations of abandonment bunds is in Section 21.2.

19.2 Landform Risks

The majority of the landform risks are dialling in the specific details of a closure design. It is understood and considered that the closure design for the waste landforms remaining at closure need to strike a balance between stability and vegetation growth. Numerous trials have been progressed to date to understand the best trade-off between the two key elements. A slope utilising Quartzite is extremely stable, even at steep angles, however, there are very limited available nutrients and low revegetation potential. On the other hand, topsoil is highly viable for plant propagation with very low structural integrity, testing has shown that erosion is very high in topsoil. An intermediate solution is siltstone, that allows for improved stability over topsoil and improved plant propagation properties compared to quartzite. Testing has indicated that a slope angle of ~20° with a blend of siltstone and quartzite provides a suitable stable slope with the suitable plant

propagation properties. Topsoil will be limited to flat areas to minimise the risk of erosion of topsoil resources, compromising rehabilitation efforts.

Further discussion about ongoing trials, completed trials and closure designs is in Section 17.

19.3 Rehabilitation Risks

19.3.1 Underperforming Revegetation not meeting Completion Criteria

The growth materials (media and seed mix) which will be used in land rehabilitation, along with key species required to develop and maintain ecosystem function and diversity, have been characterised prior to revegetation so that the growth requirements of the species selected can be optimised. It means that rehabilitation can develop for each closure domain's landscape function and resilience.

Considerable research has been conducted to quantify volumes balance, material properties and growth requirements of selected species (section 17) to provide a quantitative basis for designing final landforms and developing effective rehabilitation procedures. Data detailed in section 7 indicates that a variety of growth media can support revegetation of land on both flat and sloped surfaces. Also, based on work conducted to date, a suitable floral species mix for the restoration of land has also been developed and progressive rehabilitation will extend current knowledge and work towards successful revegetation of disturbed land.

The analysis of closure data identified opportunities to build upon current knowledge. It is considered that ongoing monitoring of progressive rehabilitation and trials will continue to build upon current knowledge, provide further evidence for broad scale adoption of land rehabilitation techniques and further detail specific and achievable closure completion criteria.

In the event that revegetation monitoring indicates a significant risk of not meeting completion criteria targets, KIO will initiate a technical investigation to determine the reason/s for potentially unsuccessful revegetation. KIO would then implement appropriate mitigation measures depending on the outcomes of the investigation (e.g. surface water management, erosion control, mulching, growth matrix additives, revised seed mix, revised seeding procedures, etc.).

19.3.2 Weed Infestation

The key weed species associated with mine closure for successful rehabilitation outcomes is Stinking Passionflower (*Passiflora foetida*), which is generally constrained by soil moisture. Distribution appears to be very strongly correlated with the presence of artificial barriers to natural water flows. A key management measure is therefore minimising land forming and other activities that impede surface flows, causing the formation of ponds, soaks, and other artificially damp areas. Other key management measures include treatment of weed infested topsoil stockpiles prior to spreading.

The biological agent currently being trialled by CSIRO is likely to be used during closure if assessed as suitable for Koolan Island conditions. The next phase of CSIRO's work was undertaken at site in dry season 2023, at the time of publication an updated report was pending.

Further information is presented in Section 10.3.1.

19.3.3 Water Resource Risks

The most prominent water resource that could potentially be impacted by operations or closure of Koolan Island is the Indian Ocean. The ultimate receptor for all surface water runoff is the ocean

and likewise the pit lake for Main Pit will be tidally influenced and connected with the ocean. The ocean at Koolan Island is host to many species of fish, mammals, corals and other sea life and protection of this unique habitat is highly important to KIO and the DAC. For this reason it is management of water resources is a key consideration for closure of Koolan Island operations.

A significant tranche of investigative work has been undertaken to understand the hydrological regimes on Koolan Island and mitigate any impacts, these are discussed in depth in Section 8.

Closure of the main pit, and therefore the seawall, includes the construction of a decommissioning cut which opens a connection between the ocean and the final "Pit Lake". Modelling has been undertaken which considered the mixing of sea and pitlake waters to understand the salinity profile and the oxygenation of pitlake. A stagnant pitlake is likely to become stagnant, anoxic and prone to eutrophication. Modelling has indicated that a single decommissioning cut is sufficient to allow seawater to mix and flush which maintains water quality in the pit lake. A detailed review of the final pit lake quality is in Section 17.1.

19.3.4 Potentially Contaminated Sites Management

Legacy areas associated with potentially contaminated sites are discussed in section 16. The contaminated sites status has been incorporated into the mine closure planning framework as recommended by DWER. It is considered that target investigations where needed and if derived from KIO activity will resolve this matter and the underlying aspect of mining tenement relinquishment will be resolved in consideration of the *Contaminated Sites Act 2003* and the *Mining Act 1978*.

19.3.5 Domain Specific Closure Issues

All domains and specific risks, knowledge gaps and future work plans are discussed in Section 21.

20 CLOSURE OUTCOMES AND COMPLETION CRITERIA

KIO has developed S.M.A.R.T completion criteria (Australian and New Zealand Mineral And Energy Council & Mineral Council of Australia, 2000) and the Mine Closure Plan Guidance (Department of Mines, Industry Regulation and Safety). Closure outcomes are outlined in **Table 39** and supported by more tangible completion criteria presented in **Table 40**. The closure outcomes and completion criteria were developed in consultation with key internal and external stakeholders.

20.1 Closure Objectives

KIO's principal closure objectives and key actions are that the rehabilitated mine is proposed in **Table 39**.

Table 39: Closure Outcomes

Objectives	Closure Outcome	Reference for Risk Register
Mining activities are rehabilitated and closed in a manner to make them physically safe to humans and animals.	Rehabilitated areas are not hazardous for future site users.	1
Mining activities are rehabilitated and closed in a manner to make them geo-technically stable, geo-chemically non-polluting/non-contaminating.	Landforms are geotechnically stable and resistant of erosive forces with appropriate management to prevent problematic discharge to the environment.	2
- To maintain representation, diversity, viability and ecological function at the species, population and community level. - To maintain the hydrological regimes, quality and quantity of groundwater and surface water to the extent that existing and potential uses, including ecosystem maintenance, are protected. - To maintain the quality of land and soils so that environmental values are protected.	Rehabilitation condition is analogous to natural environment.	3
Mining activities are rehabilitated and closed in a manner to make them capable of sustaining an agreed post-mining land use, and without unacceptable liability to the State.	Infrastructure and assets re-purposed, removed and/or rehabilitated as agreed under contract with key stakeholders.	4

20.2 Completion Criteria

Completion criteria have been developed to inform closure outcomes. The completion criteria are a series of tasks that, once met, collectively show successful completion of the closure outcome. These completion criteria, and subsequently the closure outcomes, are expected to be progressively met over time and will be reported in this MCP.

As required by the Mine Closure Plan Statutory Guidelines and supporting guidance (Department of Mines, Industry Regulation and Safety, 2020) these completion criteria have been reviewed and advanced as the site knowledge and understanding has progressed over time. While these completion criteria are robust, they are still subject to further advancement and may change as new technology and/or site understanding comes to pass.

The completion criteria for the Koolan Island Iron Ore Project are presented as **Table 40**.

Table 40: Closure Completion Criteria

Closure Outcome	Completion Criteria	Applicable Domains	Monitoring tools and Inspections ¹	Compliance register
Rehabilitated areas are not hazardous for future site users.	Inadvertent access controlled through abandonment bunds or alternative mechanism agreed by the regulator. Bunds constructed outside the pit's zone of potential instability.	Open Pits	Geotechnical assessment to identify open pit zones of potential instability. Post-closure geotechnical assessment of constructed bunds	DEMIRS support of bund strategy Bunds assessed as geotechnically stable by a suitably qualified engineer Closure audit report
	Vessel access from sea into flooded Main Pit lake constrained by tidal trench design Access to Main Pit foot wall restricted by buoys and / or floating structures Signage communicating "Restricted zone" installed.	Seawall / Decommissioning Trench	Audit to confirm that final construction meets closure design.	Closure audit report Evidence of closure outcome accepted by DEMIRS
	Remove above ground plant, equipment, chemicals and consumables from ore stockpile area (OSA), processing plant, logistical support areas, and general built and infrastructure buried upto 1m depth (other than those assets agreed to be owned/controlled by lawfully entitled third parties)	All Domains	Audit to confirm removal of infrastructure.	Evidence of closure outcomes accepted by DEMIRS
Landforms are geotechnically stable and resistant of erosive forces with appropriate management to prevent problematic discharge to the environment.	Landforms constructed to closure designs. Closure designs manage any surface expressions of problematic (saline or erodible) materials Erosion features show trends towards stabilisation and are considered stable after no change (<10%) over three consecutive monitoring events.	Waste Rock landforms Seawall / Decommissioning Cut Miscellaneous mine site landforms	Post-construction geotechnical assessment of batter materials profile Audit to confirm that "As Constructed" landform meets closure design. Annual LFA / EFA or related survey of terrain shape and stability	Evidence of closure outcomes accepted by DEMIRS
Infrastructure and assets re-purposed, removed and/or rehabilitated as agreed under contract with key stakeholders;	Agreement reached on infrastructure retention and condition as consultations with lawfully entitled third parties. Appropriate land tenure in place to facilitate asset transfer.	All domains to be transferred to 3 rd Parties	Information exchanged with key stakeholders and regulators of progress towards and execution of agreements.	Legal transfer of asset
Rehabilitation condition is functionally analogous to natural environment.	Landscape Organisation Index; Stability Index and foliage cover (post-rehabilitation) trending towards natural analogues; and exceeds 30 % of analogue's values post-rehabilitation Number of plants per hectare and taxa richness (post-rehabilitation) trending towards analogue site; and exceeds 50 % of analogue site post-rehabilitation	All Domains	LFA / EFA or similar survey for soil physical condition, vegetation and other biologic quantities	Evidence of closure outcome accepted by DEMIRS.
	Groundwater rebound in higher standing water levels All groundwater analytical analytes are below risk threshold outlined in Section 22.3.	All Domains	Groundwater monitoring	Evidence of closure outcome accepted by DEMIRS.
	Main Pit Lake supports fully oxygenated marine water with photic zone benthic and pelagic organisms within tidally inundated Main Pit Water quality of Main Pit Lake meets parameters and trigger / thresholds outlined in Section 0.	Seawall/Decommissioning Cut Pit lake	Marine monitoring	Evidence of closure outcome accepted by DEMIRS.
	Coral diversity within the proposed rehabilitation locations at least 50% of adjacent undisturbed coral communities at nearby unaffected monitoring sites in Arbitration Cove. At least 0.13 hectares of coral habitat. ² Within the proposed rehabilitation location(s), a minimum of one-fifth of the mean coral cover of nearby unaffected monitoring sub-sites in Arbitration Cove. Coral habitats at the proposed rehabilitation trial locations demonstrate a clear increasing trend of diversity and cover over the course of at least five years, assuming no corresponding decreases in coral condition parameters at relevant reference sites.	Marine Environment	Marine monitoring	Evidence of closure outcome accepted by DEMIRS.

¹ Details of the values, parameters and targets to be measured are given in Section 22

² In this context coral habitat includes the substrate and area in between live coral colonies that add structurally to the functionality of the coral habitat

21 CLOSURE IMPLEMENTATION

21.1 Key Closure Domains

The following key closure domains have been identified for the Project:

- Open pits,
- WRDs,
- Seawall
- Saline water dams,
- Plant sites,
- Run-of Mine Pad, and
- Miscellaneous Mining Activities.
- Final closure options are shown in **Figure 104** and **Figure 105** and closure Domains are shown in **Figure 106** through **Figure 134**.

21.2 Open Pits

The following section outlines the tasks required to implement closure of all open voids remaining on Koolan Island.

It is expected that at the cessation of mining, the Main and Acacia East Pits will remain as the only unfilled mined voids; Mullet and East Pit will be partially backfilled with waste rock and the Barramundi Pit has already been completely backfilled and is therefore no longer considered an open void for closure purposes. The features of this closure domain can be seen in **Figure 106**.

The expected closure status of each pit is presented in **Table 41**.

Table 41 Key Open Pit Characteristics

Mine Pit	Pit floor Depth (at life of mine)	End of mine surface area (ha)	Current Status	Final Closure Status
Main Pit	186 m bsl	82.5	Active Mining	Flooded by seawater to local mean high water
Acacia East Pit	14 m asl	34.1	Pit at Terminal Depth, not sterilised	Open and bunded
Mullet Pit	TBC	TBC	Resource Sterilised and pit backfilling commenced	Partially backfilled and bunded
Barramundi Pit	Pit completely backfilled			Rehabilitated as per 21.4
East Pit	TBC	TBC	Resource Sterilised and pit backfilling commenced	Partially backfilled and bunded
Mangrove Pit (resource; proposed)	TBC	TBC	Mining yet to commence	Open and bunded

Note: mbsl = metres below sea level, masl = metres above sea level

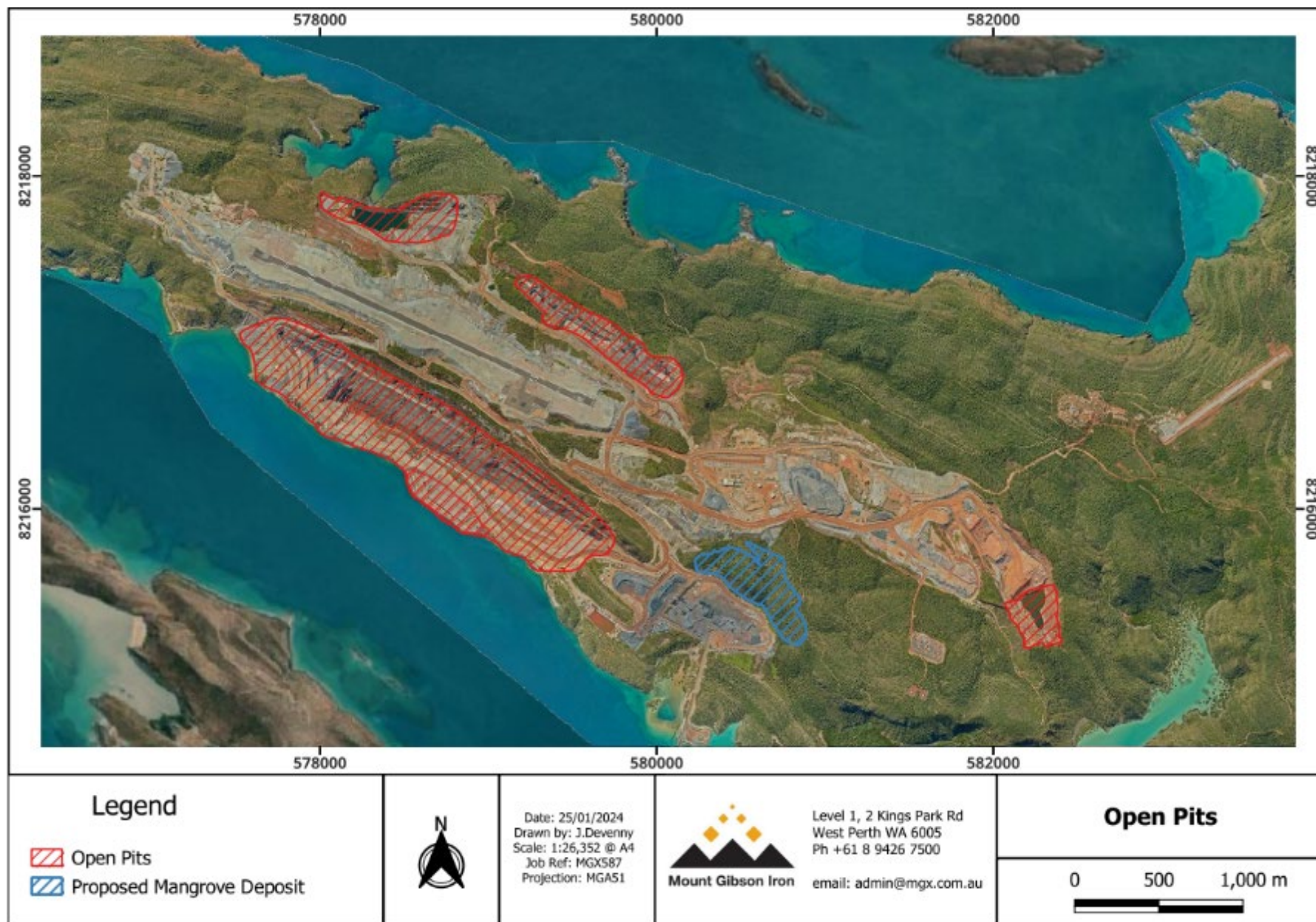


Figure 106: Open Pit Closure Domain

All open pits (classified as a void <5m in depth from the surrounding ground surface) will require abandonment bunds placed along design lines to constrain inadvertent access. Abandonment bunds will be “paired” with natural topography to limit access to open voids. Based on these conditions Barramundi Pit, which is completely backfilled, is no longer a void and will be rehabilitated as a WRL.

All abandonment bunds will be built in accordance with the *Safety Bund Walls around Abandoned Open Pit Mines* (Department of Industry and Resources, 1997) which has been summarised below:

The guidelines require the following design criteria:

- Bund walls should be constructed of the following minimum dimensions: height 2 metres, base width 5 metres.
- Wherever possible bund walls should be constructed, from unweathered, freely draining, end dumped rockfill.

To meet the criteria above abandonment bunds will be built using the minimum specifications presented in **Figure 107**.

Based on the understanding of the available materials on site the abandonment bunds will be constructed of quartzite. This material is erosion resistant and blocky creating a free draining structurally stable abandonment bund.



Figure 107: Minimum Specification of an abandonment bund

21.2.1 Main Pit

Closure Design

Main Pit will be largely flooded/inundated with seawater which is expected and allowed to be tidally influenced via a decommissioning cut trenched to the east of the seawall (**Figure 108**). The seawall and decommissioning cut closure implementation is discussed in Sections 21.3.

The final pit shell is shown in **Figure 109**, as the pit will be inundated, and the water quality is suitable for benthos, the zone that has the potential to host corals and other marine biota has been identified and artificial reef may also be installed to promote hard coral growth in these areas. The coral inhabitable zone has been highlighted green on **Figure 110**.



Figure 108 Conceptual tidal trench location through the coastline natural modified abutment



Figure 109 Conceptual closure design of the seawall and decommissioning trench. Purple shows outer armour rock re-processing zone



Figure 110 Conceptual closure over Main Pit. The green band represents benches potentially available for coral habitat as they occur in the forecast photic zone.

Diurnal tidal seawater flushing will quickly promote marine pelagic and benthic habitats to be created to provide a beneficial environmental outcome for the land. The presence of the rise and fall of the tide within the pit lake “equilibrates” the southern seaward side of the Main Pit domain. That leaves the other northern and western sections requiring a bunding solution.

Abandonment Bund Location

Abandonment bunds locations are shown in **Figure 111**.

Options, Knowledge Gaps and Future Work Plans

Table 42 outlines the closure tasks, options, knowledge gaps and work plans for Main Pit.

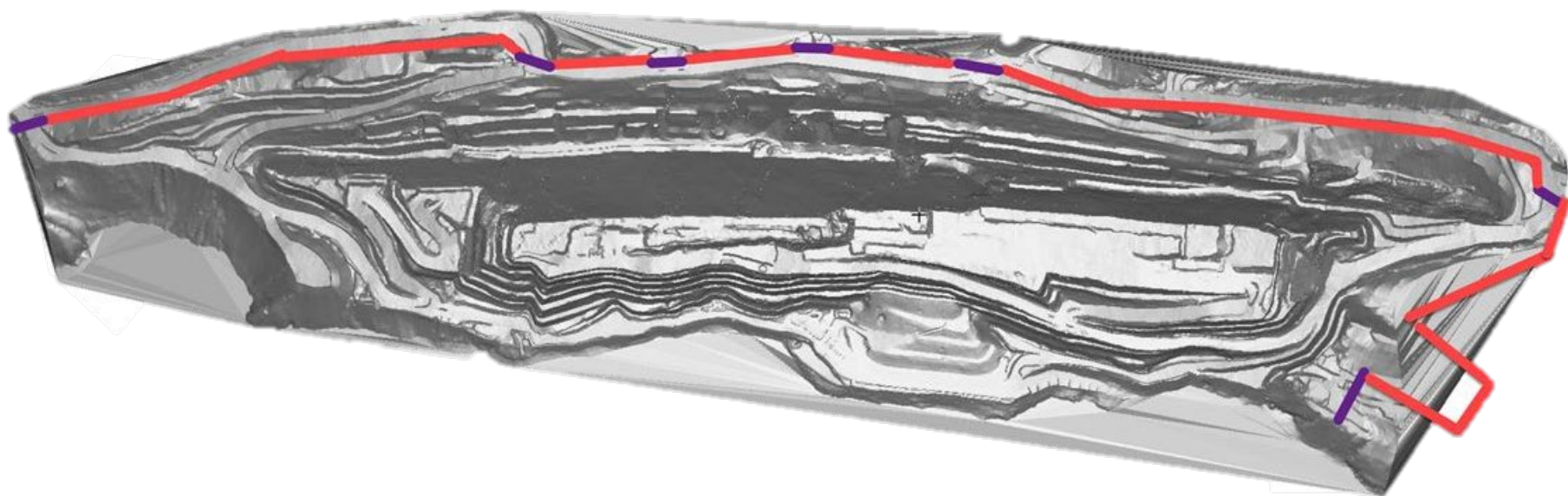


Figure 111: Main Pit Abandonment Bund Location (Red indicates bund parallel to a road, purple indicates road crossing is required).

Table 42: Closure Requirements for Main Pit

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Main Pit	- Main Pit will be flooded with seawater - Install decommissioning cut - Construct. - Abandonment bund - Install exclusion zone markers.	Geotechnical assessment and modelling of proposed abandonment bund alignments will be undertaken prior to closure.	- Optimum abandonment bund alignments yet to be determined and approved by DEMIRS. - Confirm final land use including potential to install artificial reef.	- Unexpected closure would require that the closure tasks identified are implemented immediately. - Construct abandonment bunding – conceptual locations depicted in Figure 59 and barricade pit ramps.	- Disconnect and remove dewatering equipment, and associated pipelines - Construct decommissioning cut (refer Infrastructure section below) - No other specific decommissioning tasks necessary.

21.2.2 Mullet and Acacia Pits

Closure Design

Acacia Pit has not been sterilised and there is remnant resource available, for this reason Acacia Pit will not be backfilled and the pit will remain a void at closure.

Mullet Pit has been sterilised and there is not available economic resource. Mullet pit is approved to receive waste and reduce the overall depth of the pit. As part of the planning process for the closure of Mullet Pit a sediment and water sump has been left to allow sediment laden water to settle in the pit rather than be distributed further downstream. Currently the backfilling of Mullet Pit has commenced, however, due to haulage distances and the requirement for waste to build infrastructure in Main Pit waste has been diverted away from Mullet Pit prior to completion of the approved design. It is currently unknown if Mullet pit will receive the full allotment of waste to complete the closure design. For this reason two scenarios have been presented.

Option A – Complete Backfill - is presented as **Figure 112** shows the completed backfill of Mullet Pit with the Red line representing the Abandonment bund.

Option B – Incomplete Backfill – is presented as **Figure 113** which shows the most conservative location of an abandonment bund for Mullet Pit and Acacia Pit.

During mine planning and optimisation, the final closure option for Mullet and Acacia Pits will be decided and advanced.

Abandonment Bund Location

During the assessment for the potential backfill of Mullet pit a design for a conservative abandonment bund location was developed should backfill not go ahead (**Figure 113**) and an alternate design should backfill be completed (**Figure 112**).

Currently backfill is partially complete and therefore it is likely an balance between the two strategies will be required, however, this will be confirmed once mine planning and waste placement strategy has been completed.

Options, Knowledge Gaps and Future Work Plans

Table 43 outlines the closure tasks, potential options and knowledge gaps as well as the work plans for Acacia and Mullet Pits

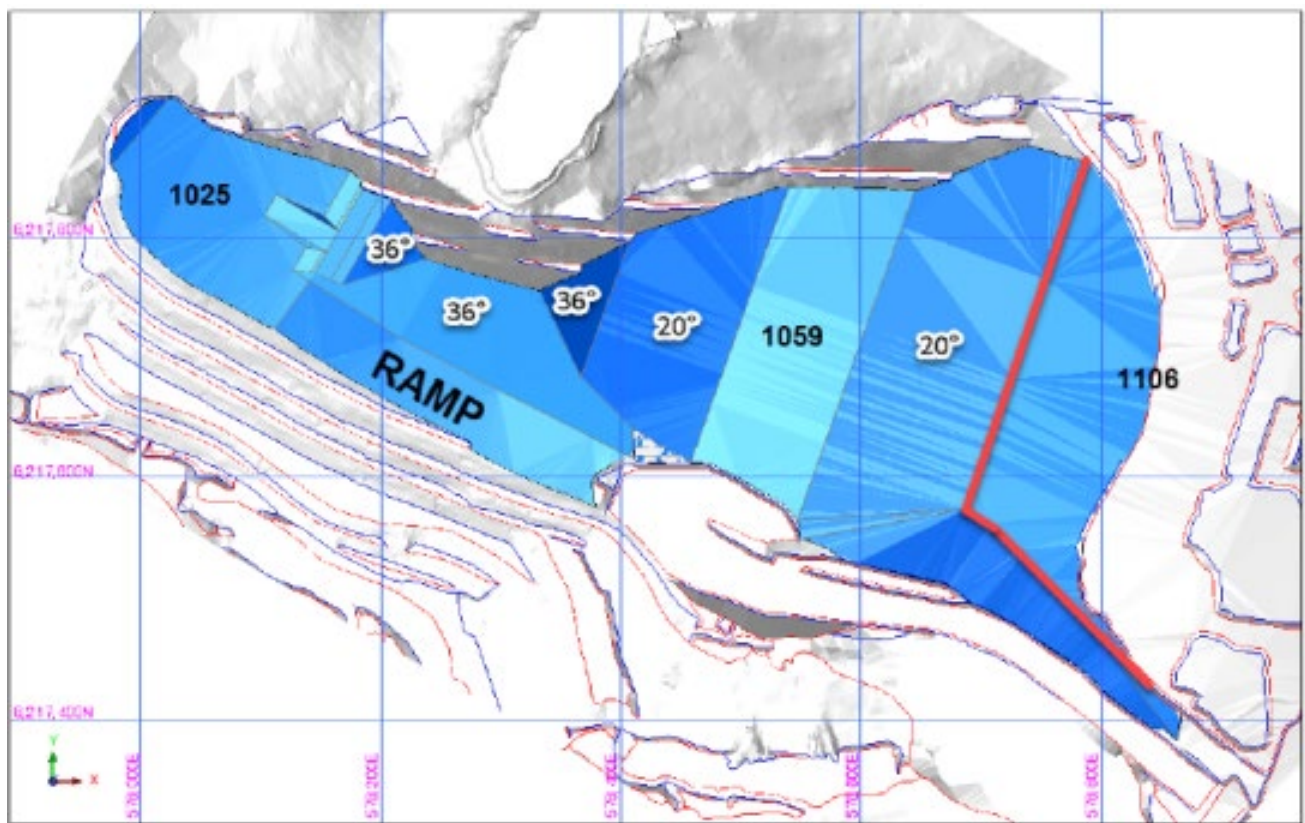


Figure 112 Detailed approved backfill design for Mullet Pit

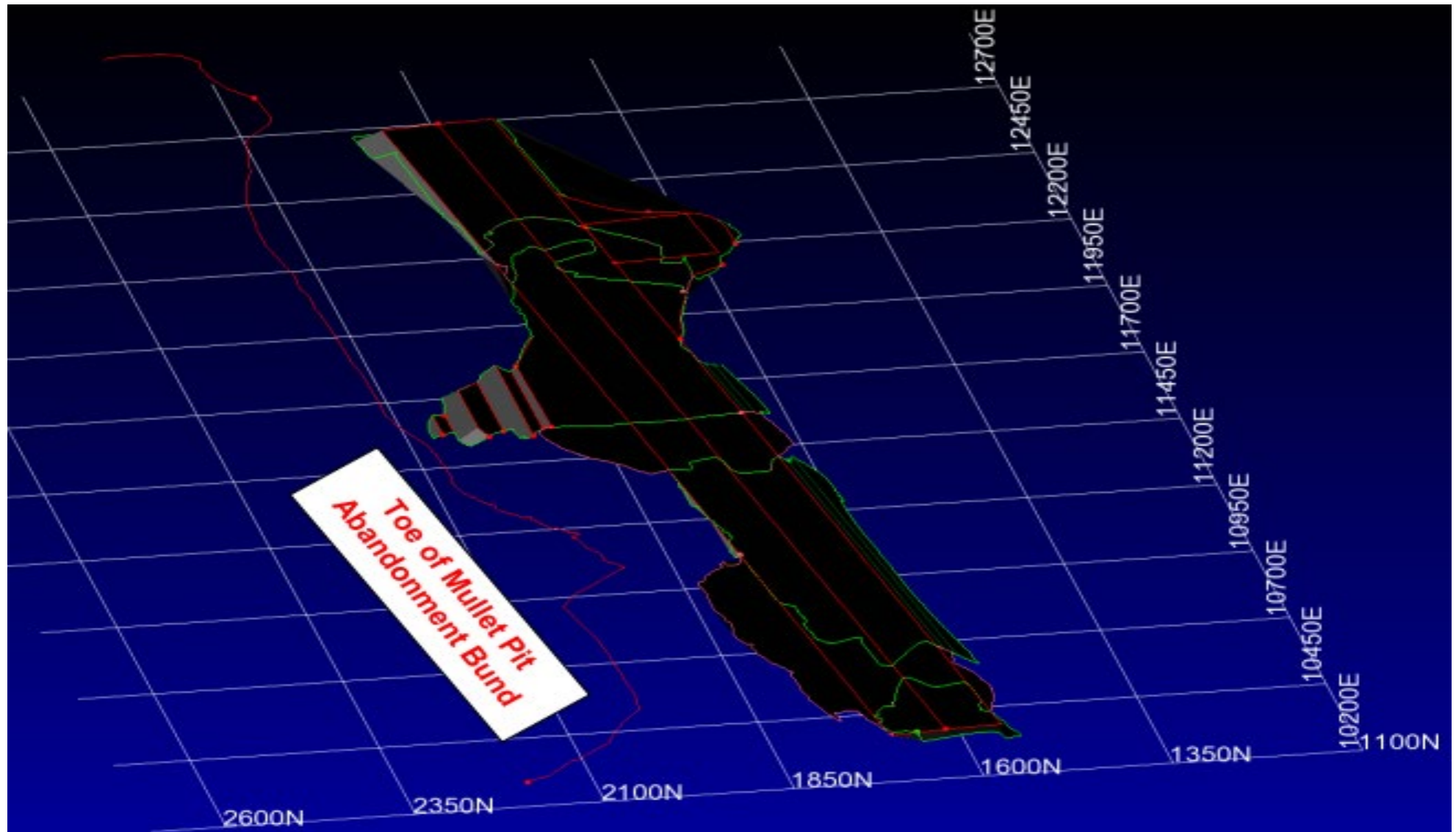


Figure 113 Northern-Toe of Conceptual Abandonment Bund Along Crest of Mullet and Acacia Pits (Red – Line) with Conceptual Airstrip in Black

Table 43 Closure requirements for Acacia and Mullet Pits

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Acacia East Pit	- Acacia East is currently at its final depth but is not mineralogically sterilized. - Construct abandonment bund around mine void. - Pit ramps barricaded with competent and stable waste rock.	There are no current tasks planned.	Optimum abandonment bund alignments yet to be determined and approved by DEMIRS.	- Implement closure tasks immediately. - Construct abandonment bunding and barricade pit ramps.	As per closure tasks. No other specific decommissioning tasks necessary.
Mullet Pit	Install abandonment bunds in accordance with closure strategy.	Finalise backfill strategy and confirm abandonment bund strategy.	Backfill completion confirmation	- Implement closure tasks immediately. - Construct abandonment bunding – conceptual locations depicted in Figure 112 and Figure 113.	As per closure tasks. No other specific decommissioning tasks necessary.

21.2.3 East Pit

Closure Design

The East Pit has been sterilised and approved for backfill with mined waste. The pit is partially backfilled and currently waste is being deposited into the pit. It is expected that East Pit backfill will be completed to the extent of the approved closure design as outlined in **Figure 114**.

Once backfill is completed the closure implementation of East Pit will occur.

Abandonment Bund Location

Based on an assessment of topography, closure infrastructure and the zone of pit instability there is only a small section of abandonment bund required to successfully deter inadvertent access to east pit.

In lieu of abandonment bunds to the south the rugged terrain will prevent inadvertent access. To the North strategic development of WD5 and closure of the main haul road will serve as an abandonment bund. The small section of abandonment bunding required across the eastern access road on the southern border of WD5, this is illustrated in **Figure 115**.

Options, Knowledge Gaps and Future Work Plans

The knowledge gaps associated with East pit are presented in **Table 44**.

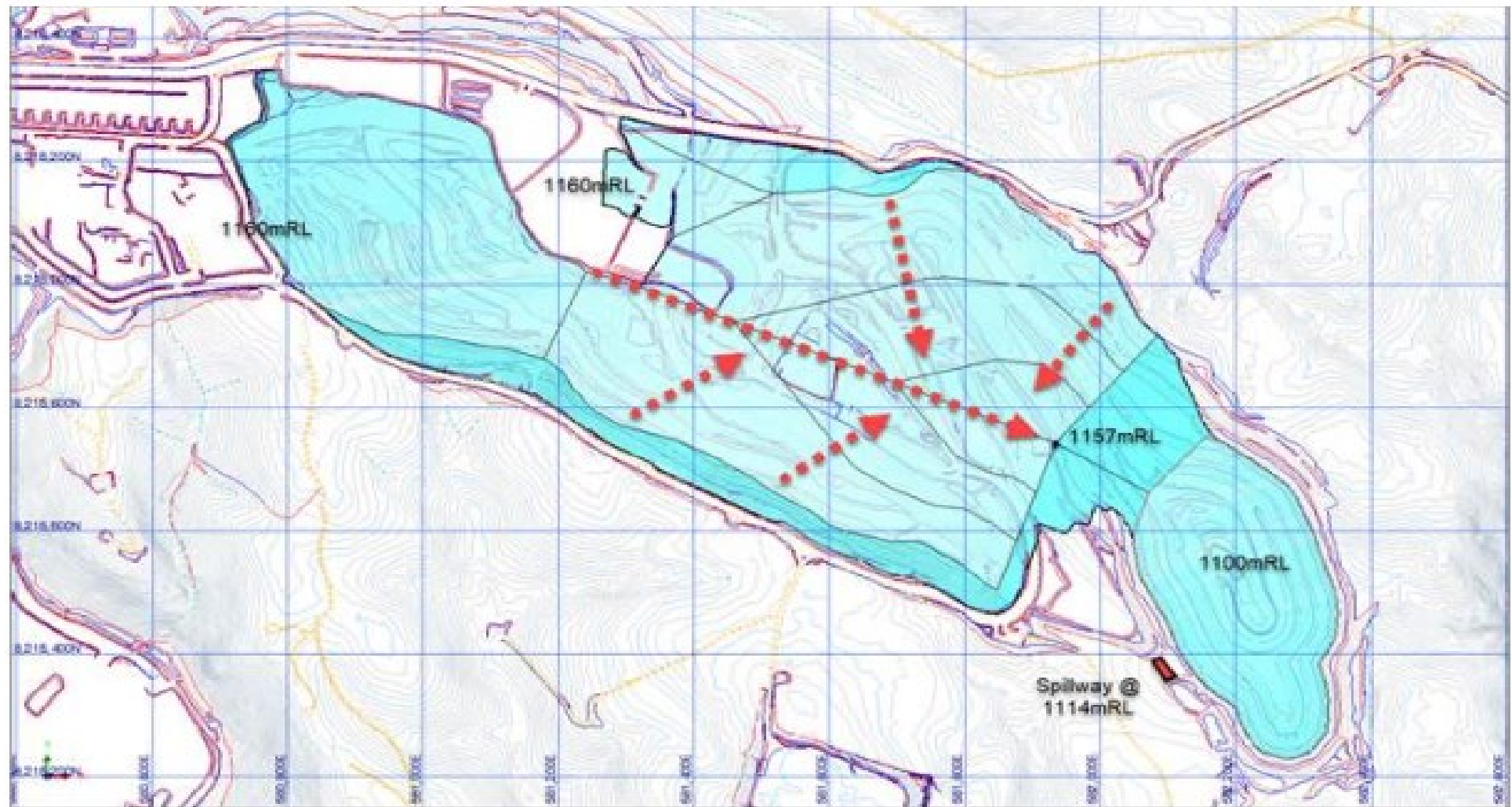


Figure 114 Approved Closure Design for East Pit.



Figure 115: East Pit Abandonment Bund Location

Table 44 Work plan for Closure of East Pit

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
East Pit	- East Pit will be backfilled by approved design to 57 metres below the adjacent WD5. - Construct abandonment bund around mine void. - Pit ramps barricaded with competent and stable waste rock.	Geotechnical assessment and modelling of proposed abandonment bund alignments will be undertaken prior to closure.	Optimum abandonment bund alignments yet to be determined and approved by DEMIRS.	- Implement closure tasks immediately. - Construct abandonment bunding – conceptual locations depicted in and barricade pit ramps.	As per closure tasks. No other specific decommissioning tasks necessary.

21.2.4 Mangrove Pit

Closure Design and abandonment bund location

Mangrove pit is a resource that is yet to be mined. The pit will have been planned, however, geometry may change to facilitate optimisation. Based on the current pit design the floor of the pit will cease at approximately 15m below the ROM/Stockpile area. This will result in a remnant void at closure. Until a final pit design has been executed and the zone of pit instability has been defined by geotechnical engineers a conceptual abandonment bund location is provided on **Figure 116**.

This bund has been located to tie into existing topographic features while still meeting the DEMIRS requirements. A final abandonment bund location will be completed once a final pit shell is established.

Options, Knowledge Gaps and Future Work Plans

The knowledge gaps associated with East pit are presented in **Table 45**.



Figure 116: Conceptual location of the Mangrove deposit planned pit abandonment bund.

Table 45 Work plan for Closure of East Pit

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Mangrove Pit	- Mangrove Pit will be backfilled by approved design to 15 metres below the adjacent Stockpile area / ROM. - Construct abandonment bund around mine void. - Pit ramps barricaded with competent and stable waste rock and block access.	Geotechnical assessment and modelling of proposed abandonment bund alignments will be undertaken prior to closure.	- Confirm final pit geometry. - Optimum abandonment bund alignments yet to be determined and approved by DEMIRS.	- Implement closure tasks immediately. - Construct abandonment bunding – conceptual locations depicted in Figure 116 and barricade pit ramps.	As per closure tasks. No other specific decommissioning tasks necessary.

21.3 Seawall and Decommissioning Cut.

21.3.1 Closure Specifications

The seawall closure domain can be seen in **Figure 119**.

The exact closure design of the seawall needs to be finalised. However, based on iterative 2D predictive modelling of water quality and sediment movement the following design specifications have been selected as preferred.

There will be a single trench build to the east of the seawall, conceptually presented in **Figure 117**.



Figure 117: Conceptual location of the Decommissioning Cut (location, size and water levels are all approximated).

The Decommissioning Cut will be built into the natural fill and sufficiently armoured to mitigate erosion forced of the tidal movements. The design of the decommissioning cut will need to take into account the additional closure armouring and re-sloping of the seawall proper. Conceptually the integration of the seawall and the decommissioning cut is shown in **Figure 118**.

Seawall Closure Specifications

The exact closure specifications of the seawall are subject to ongoing surveillance during the operational phase of works. The rate of erosion of the outer facia of the seawall is observable since the rebuild. The erosion rate is less than anticipated in the rebuild design (Coffey, 2017), which indicates that the energy produced during tidal and wave action is lower, when compared to the erosive resistance of the construction materials. A final assessment of the erosion of the construction materials will be required prior to development of a final design.



Figure 118 Conceptual closure integration of the seawall and decommissioning cut.

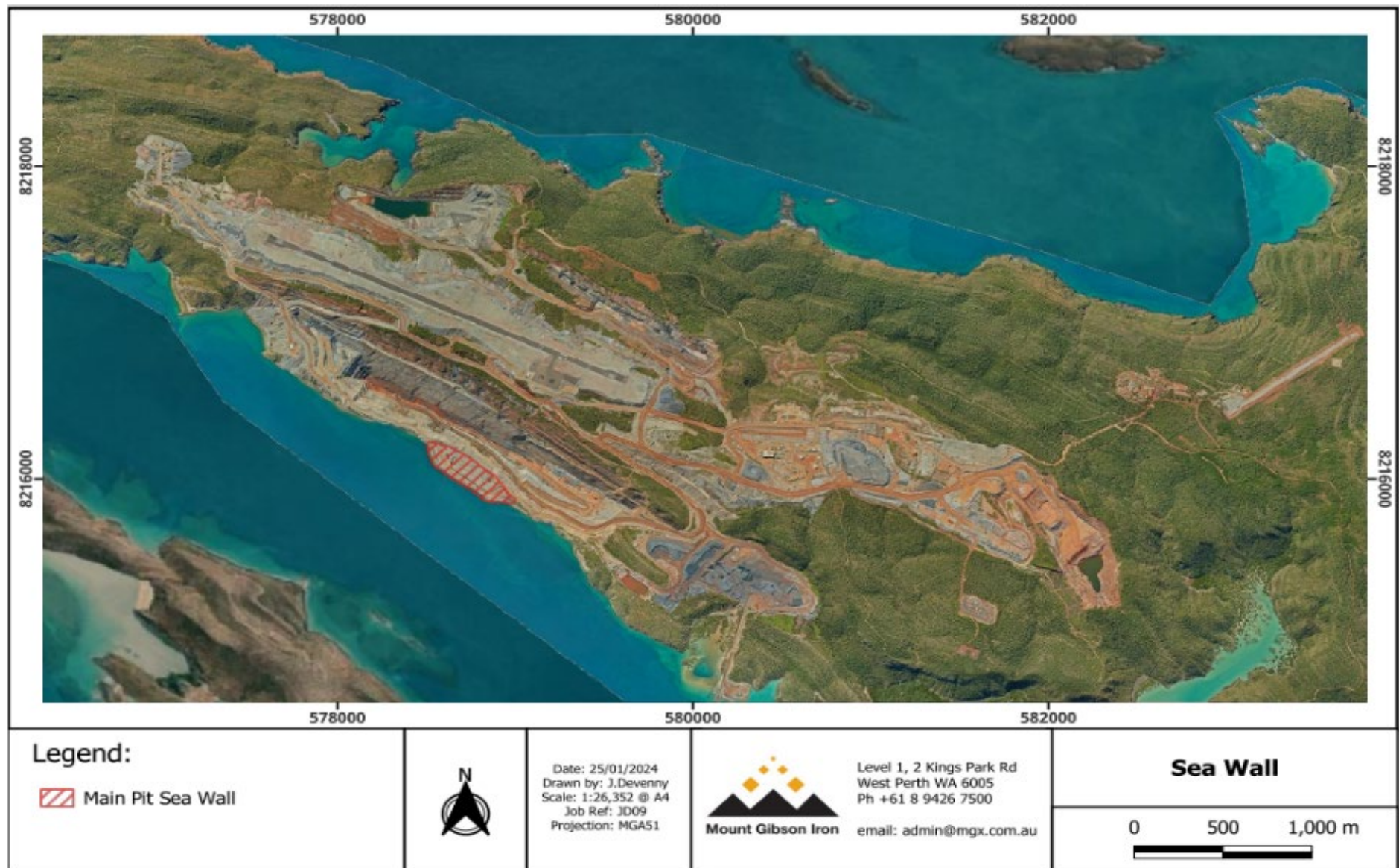


Figure 119: Seawall Closure Domain

The closure slope angle of the outer facia of the seawall will be designed to mimic the angle of a natural beach which is intended to dissipate energy over a longer slope angle, reducing erosion potential and improving long term stability. Preliminary slope assessment has been completed (**Figure 120**). Analysis of the slope is provided in Section 17.1. Currently a slope delta of between 1V:1.5H and 1V:2.5H are being considered, with the former having less of a footprint requirement and the latter improving energy dissipation. Geotechnical analysis of suitable rock is underway. The combination of these two studies will culminate in the closure design of the outer facia of the seawall/

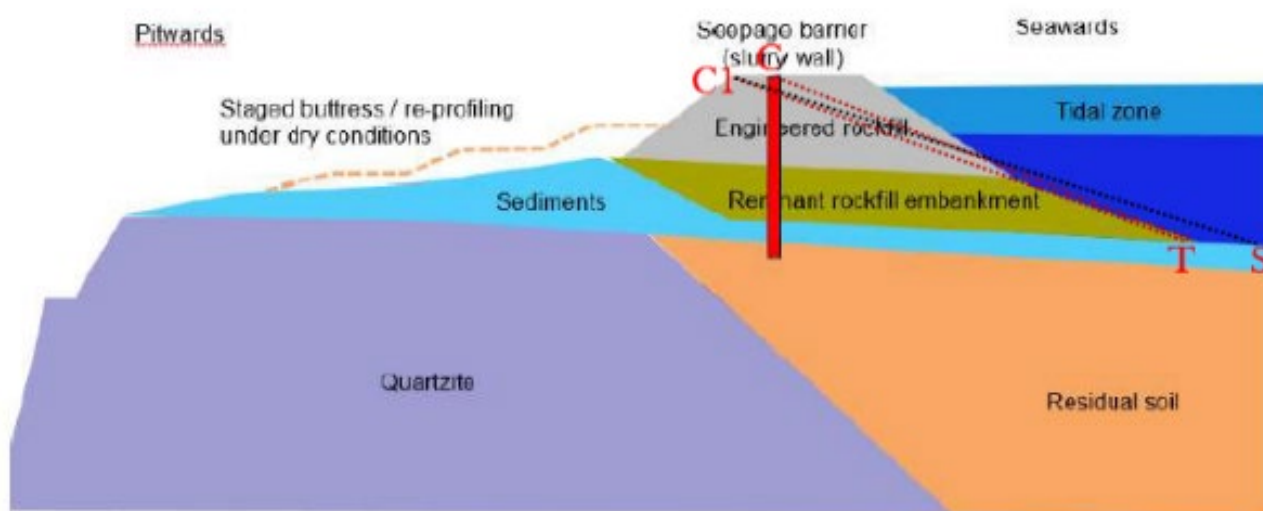


Figure 120: closure options of the seawall.

Decommissioning Cut Closure Specifications.

The decommissioning cut will be installed to the east of the seawall using the selected design parameters from E1d, summarised: E1d is trapezoidal with a 10m wide base at a -1.5m MSL invert, with 1V:2H side slopes and pictorially represented in **Figure 121**.

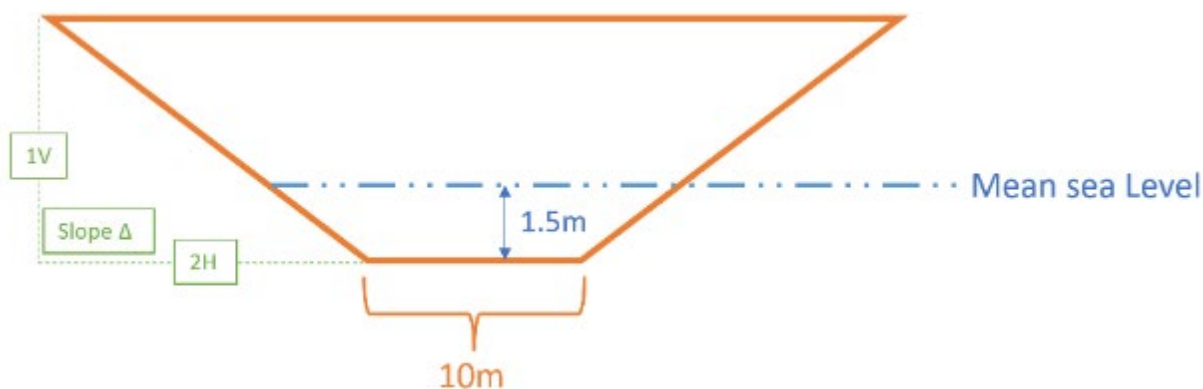


Figure 121: Decommissioning Cut Closure design cross section.

The engineering specification of rock armouring has commenced and will continue to advance along with other geotechnical assessments.

Likewise, a detailed construction specification needs to be built to ensure that the decommissioning cut is built during the correct tidal patterns and will require rigorous management to ensure that the pressure of the sea water does not breach the cut prematurely or cause seawall failure. The detailed construction specification will include a methodology and timeline to allow for the pit to fill through natural process (groundwater and seawater infiltration), pressurization of the seawall to improve stability and any armouring required on the pit floor to prevent undercutting.

21.3.2 Options, Knowledge Gaps and Future Work Plans

The closure work schedule, including unknowns, is presented in **Table 46**.

Table 46 Closure work Schedule for The Seawall and Decommissioning Cut

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Decommissioning Cut	Construct decommissioning cut	- Hydrodynamic modelling of flows to determine optimised cut design. - Engineering Design for cut.	- Engineering and construction design to flood Main Pit. - Final DC closure design.	Unexpected permanent closure would require that the closure tasks identified are implemented immediately.	Any infrastructure passing through or appended to the decommissioning cut would require removal.
Seawall	Reprofile both inner and outer facia of seawall.	Engineering and closure design for the seawall.	- Final closure design. - Long term erosion rate of quartzite due to tidal movements.	Final closure design will be implemented during unexpected closure.	Gradual removal of monitoring infrastructure.

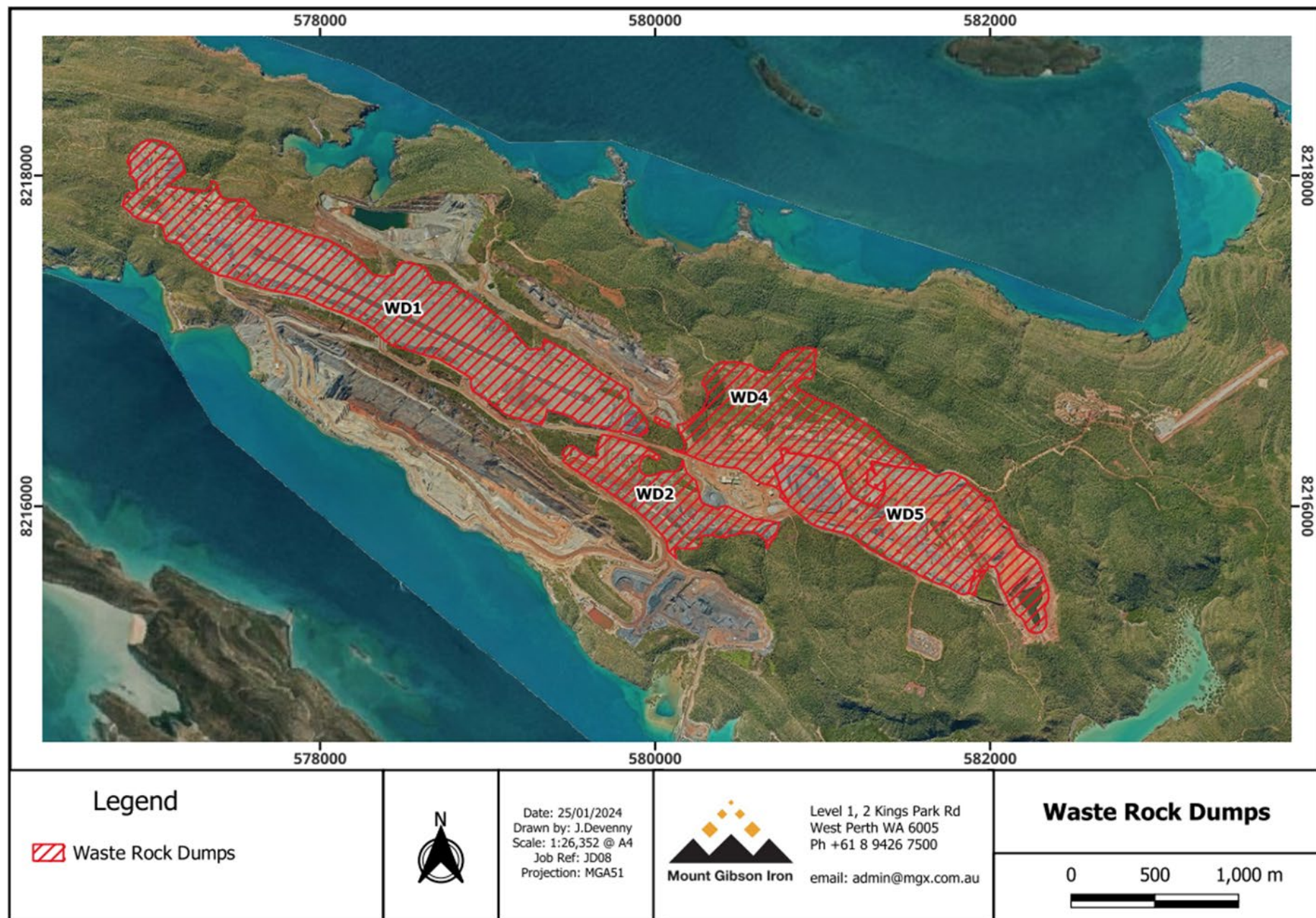


Figure 122: Waste Rock Landform Domain

21.4 Waste Rock Landforms (WRL)

The waste rock landforms present at Koolan Island are:

- WD1,
- WD2,
- WD4, and
- WD5.

Key WRL characteristics are listed in **Table 47** and their locations are shown on **Figure 122**.

Table 47: Details of the Constructed Landforms on Koolan Island Tenements

WRL ID	Area (ha)	Maximum elevation (m RL)	Land Under Rehabilitation (Ha)
WD 1	119	1,170	0
WD 2	24	1,165	0
WD 4	30	1,160	22
WD5	33	1,165	4

21.4.1 Closure Specifications

All waste dumps, except for landforms with specific designs considerations below, will meet a generic closure design. There are several closure designs for the Waste Rock Landforms as shown in **Figure 123** through **Figure 125**.

An option that may be considered on shorter slopes but was not considered by the Soilwater group in 2014 is sub-20° slopes with longer (~70m) batters and 15m back sloping berms (**Figure 126**). The upside of this design is that based on onsite trials Elgee siltstone is likely a suitable growth media that is robust enough to maintain stability but also facilitate plant growth. The downside is that the footprint and the required material handling is much larger than the comparative options. This would mean external slopes would likely need additional clearing to allow construction. Clearing additional natural vegetation is not a desired outcome to likely create an overall negative impact on the environment. It is considered that the improvement in sustainability is modest in this scenario and the negative impacts outweigh the benefits, therefore, this design will likely only be applied to internal slopes.

These designs compromise between long-term stability, constraints of existing footprints and ability to meet closure outcomes, the findings of the assessment are presented in . This assessment was conducted by Soilwater Group (2014a).

Depending on the slope length there is a potential to use one of two designs, a single continuous slope, using a combination of quartzite and siltstone to create a stable surface with potential for vegetation establishment. The second option, preferable for long slopes, is to interrupt the slope with back-sloping berms. This will allow for internally draining features to capture surface water flow and reduce the overall velocity and volume of water moving down out batters. Both options are conceptually presented as **Figure 128** and **Figure 129** respectively. As closure approaches each landform will require a review to determine which if the designs that will be incorporated.

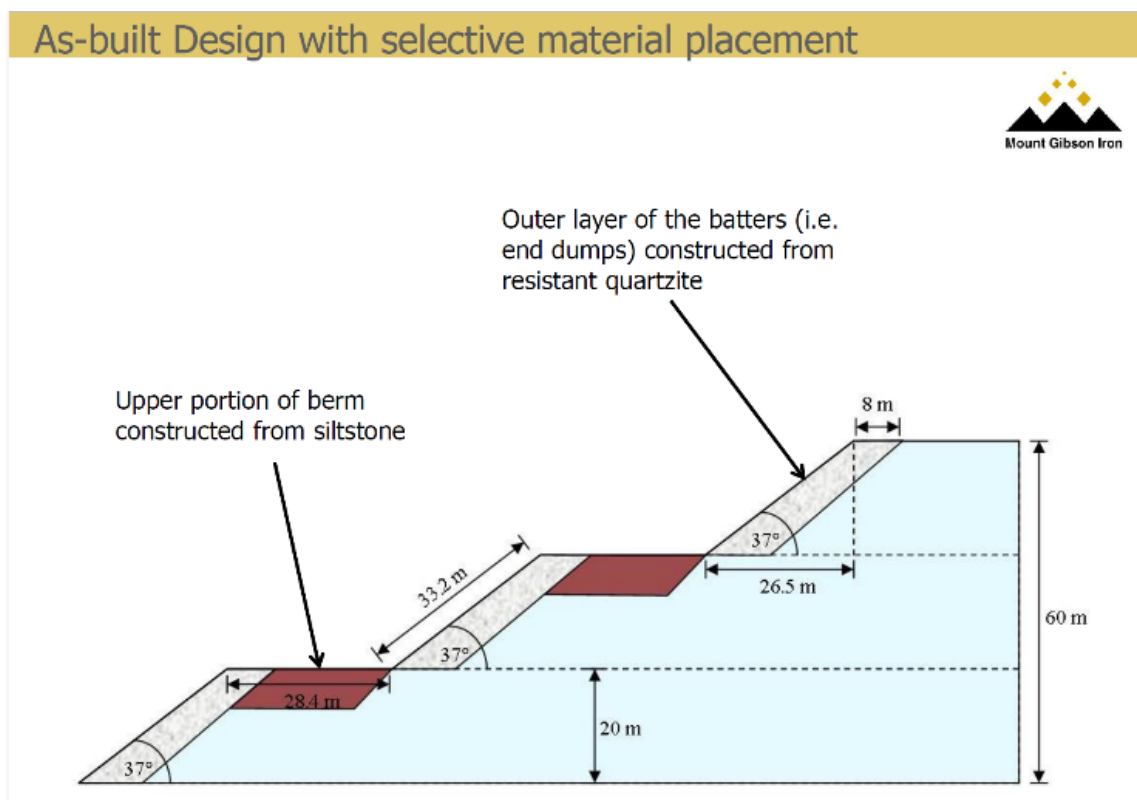


Figure 123 As build design with selective material placement

30° Batter Slope

Design



- Reducing the slope angle increases the geotechnical stability
- Battering down has the effect of armoring the 'up slope' portion of the berm, protecting this area from any potential run-off which may occur from the batter

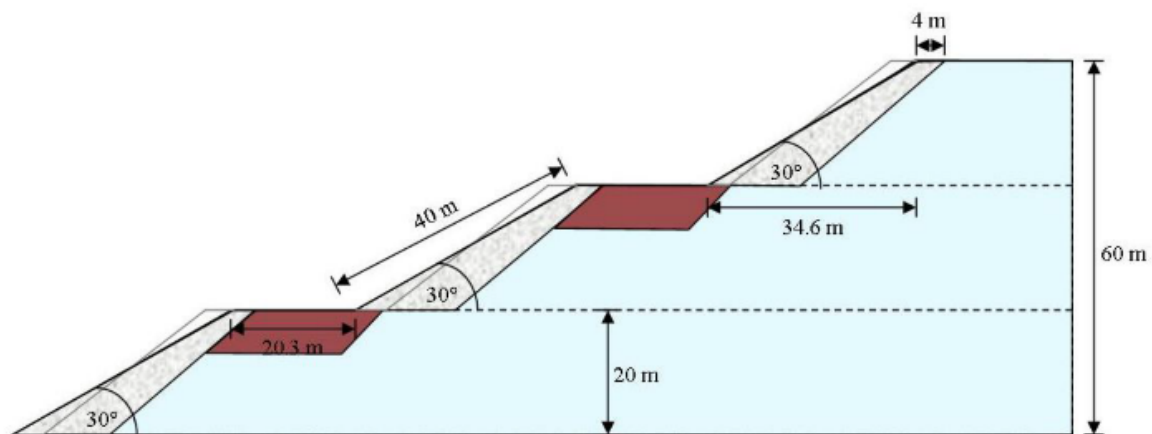


Figure 124: 30-degree slopes, with 40m batters and back-sloping berms

20° Batter Slope

Design



- Erosion testing has shown topsoil retention unlikely over this slope length and configuration
- Quartzite/schist are the only materials likely to be stable over the long term

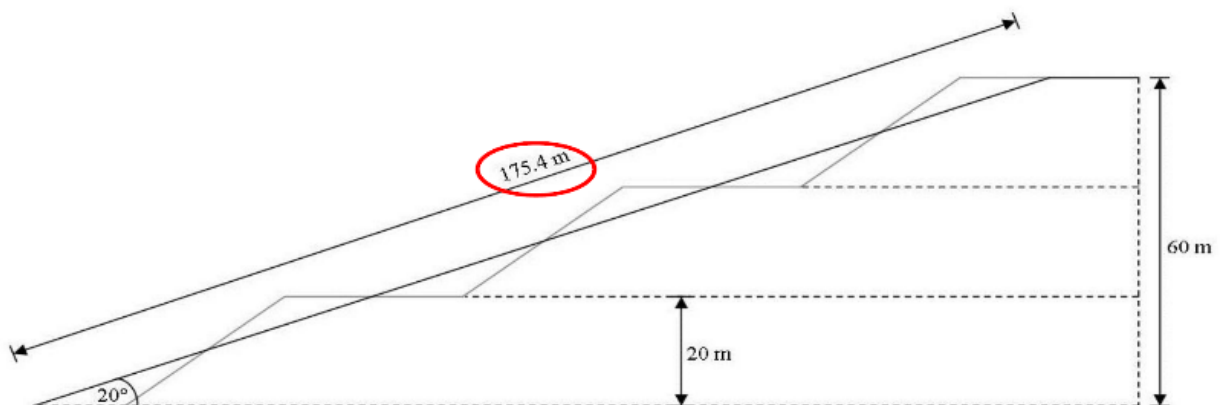


Figure 125 20-degree single batter slope

As Built Waste Rock Landform (WRL)
- Option Two surface design

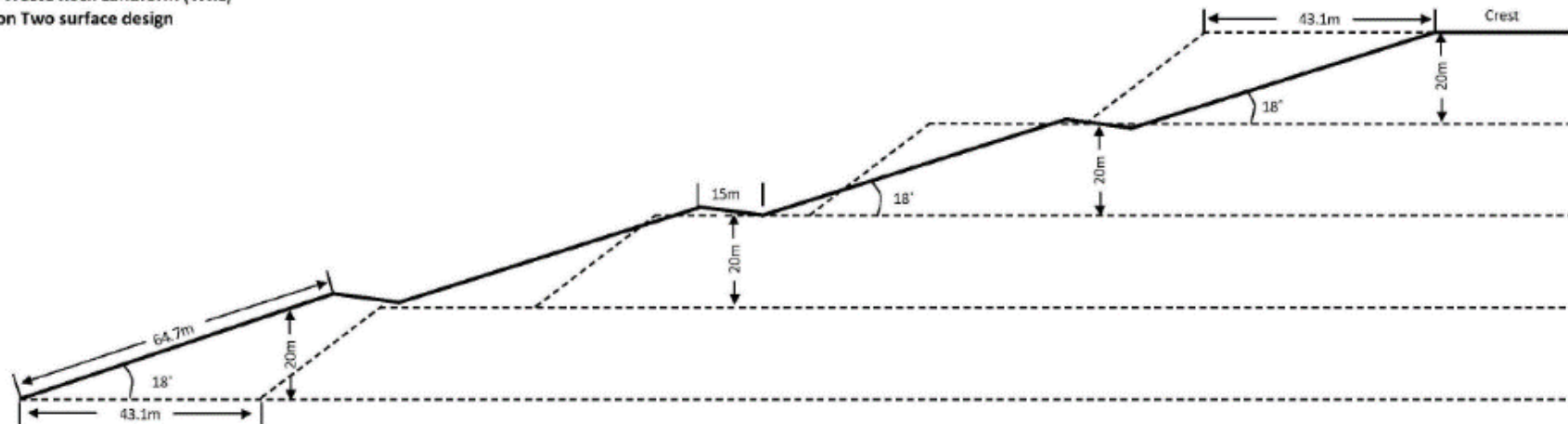


Figure 126 Sub 20-degree batters with backsloping berms

WRL Design Form	Stability	Sustainability	Movement Cost	Scheduling Difficulty
As-built landform	Low	Medium	Low	Low
As-built landform with quartzite within the batter slopes and siltstone placed on the berms	Medium	High	Medium	Medium
Long 20° batter slopes	Low	Low	Medium	Low
Long 20° batter slopes with quartzite placed on the batter slopes	High	Low	High	High
30° batter slopes with quartzite within the batter slopes and siltstone placed on the berms	High	High	Medium	Medium

Figure 127 Assessment of WRD closure Design options

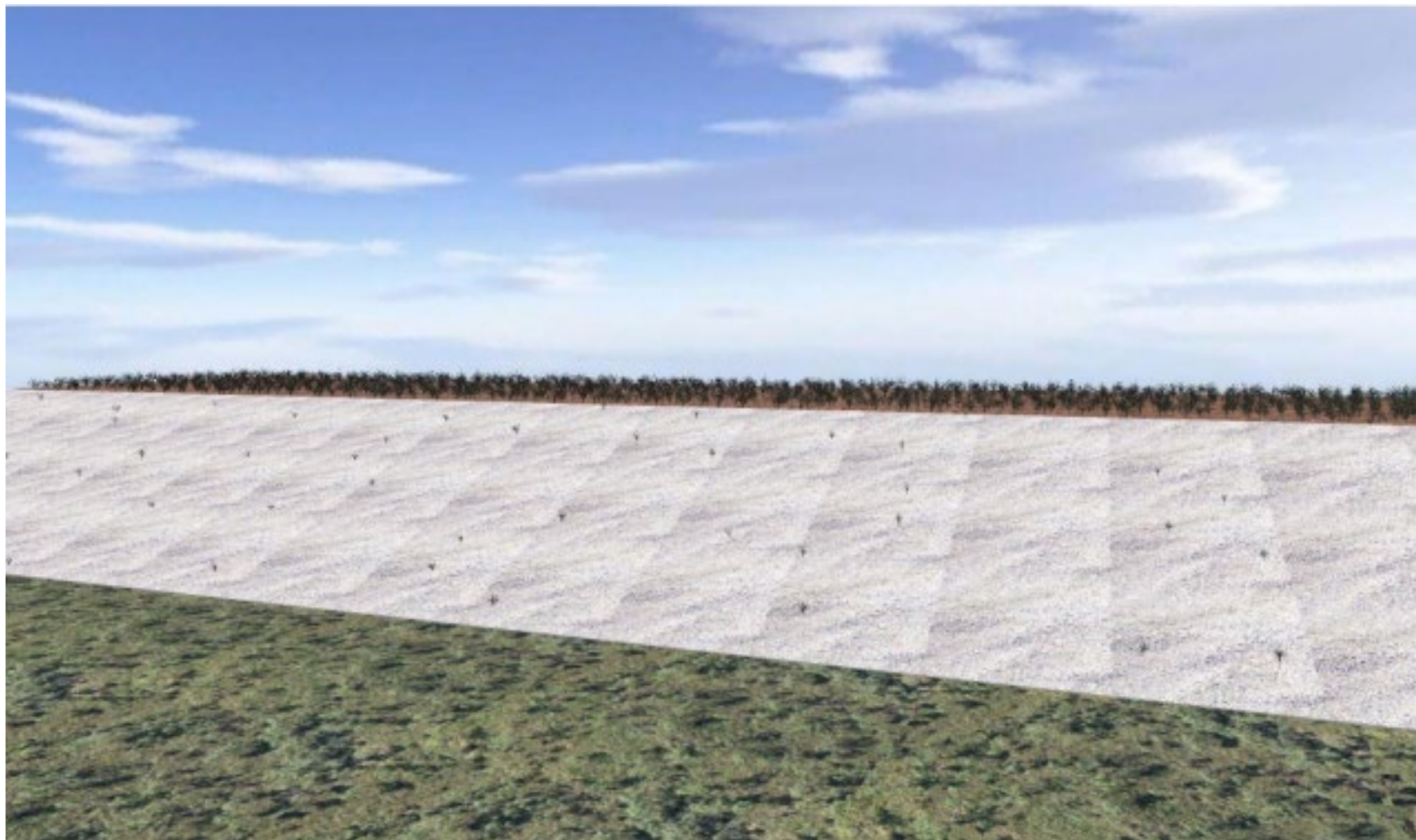


Figure 128 WRL batter design 1 - single slope.



Figure 129 WRL batter design 2 - Battered and berm slope.

As can be seen from the below assessment there is a trade-off between long-term stability and sustainability. The two options that best balance the priorities are selective material placement of waste on the outer slopes of as-built landforms and use of a 30° batter and berm design. Where additional clearing is not required a longer slope at sub-20° batter and berm design will be considered to improve the coverage of native vegetation

21.4.2 WD1 Closure Design

As discussed in Closure Designs for WD1 there is currently no firm design for WD1. The ongoing considerations include the maintenance of the airstrip (should a third party take custody post closure), removal of the airstrip and reprofiling of the outer batters or selective buttressing to improve stability with the current geometry. Should a design not be finalised and the site enters permanent closure, the design for WD1 will default back to the closure parameters outlined in section 17.2.

Analysis of the closure options is presented in section 17.2. The geotechnical analysis of available waste materials and subsequent design parameters for closure remain key knowledge gaps.

Until a final design is developed WD1 will broadly meet one of the options outlined in Section 21.4.

21.4.3 WD4 Closure Design

A preliminary WD4 closure design for the additional panel on the upper lifts of WD4 has been progressed. This design allows integration into the previously rehabilitated panels of WD4.

The design is currently only in wireframe and will need review and refinement by the technical services engineers. The design is a cut and fill design created to maximise use of existing materials while still broadly meeting the requirements of Section 21.4.

The cut and fill will have approximately 200mm deficit of material that will allow an amalgamated armour/ cover of 100mm of quantize and 100mm of siltstone blended.

Once the final design is complete and materials are sourced a underlying engineering schedule will be required to calculate machine and worker requirements.

The wireframe preliminary closure design are presented as **Figure 130** through **Figure 132**.

21.4.4 Options, Knowledge Gaps and Future Work Plans

The closure work schedule for waste rock landform domain is presented as **Table 48**.

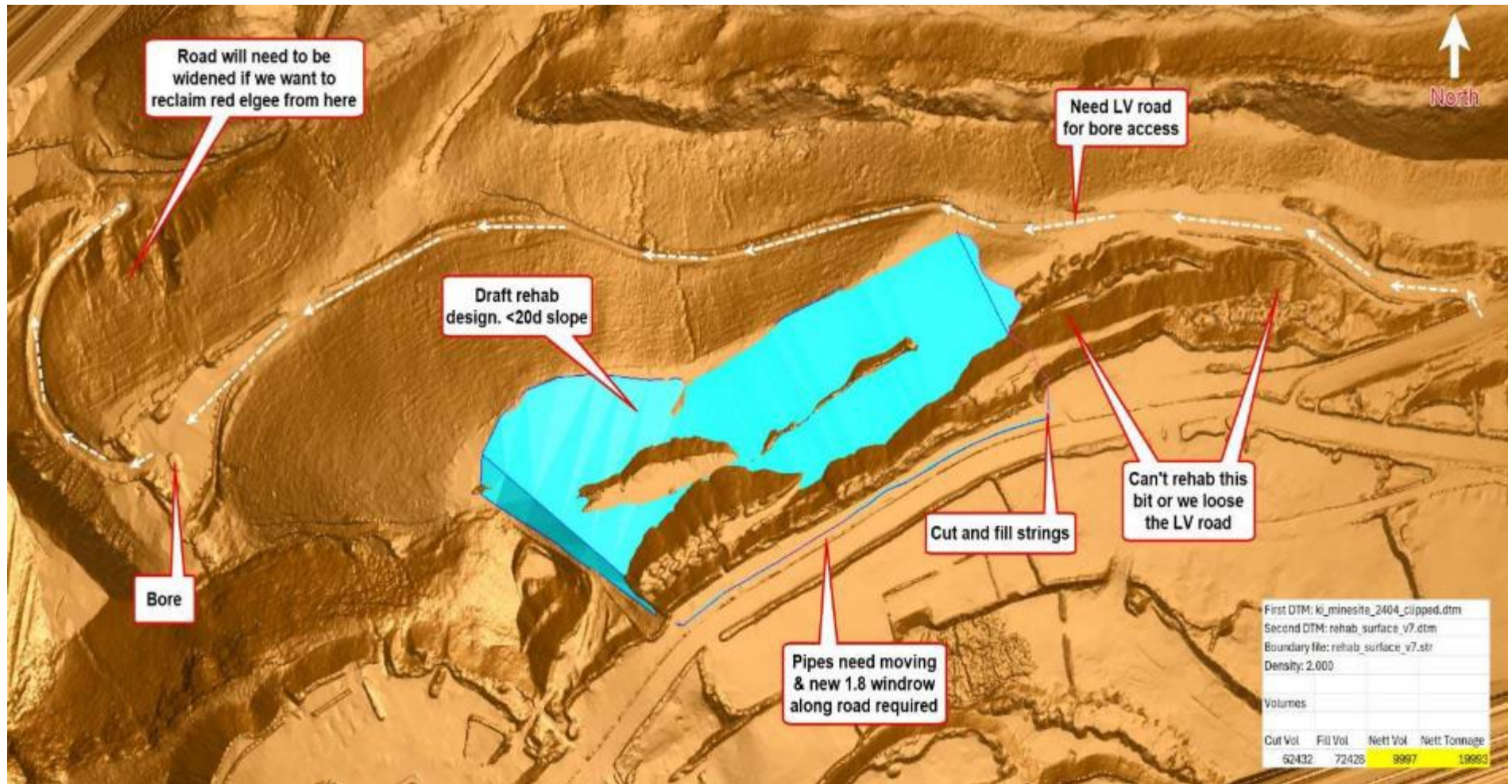


Figure 130 - WD4 closure design and commentary.

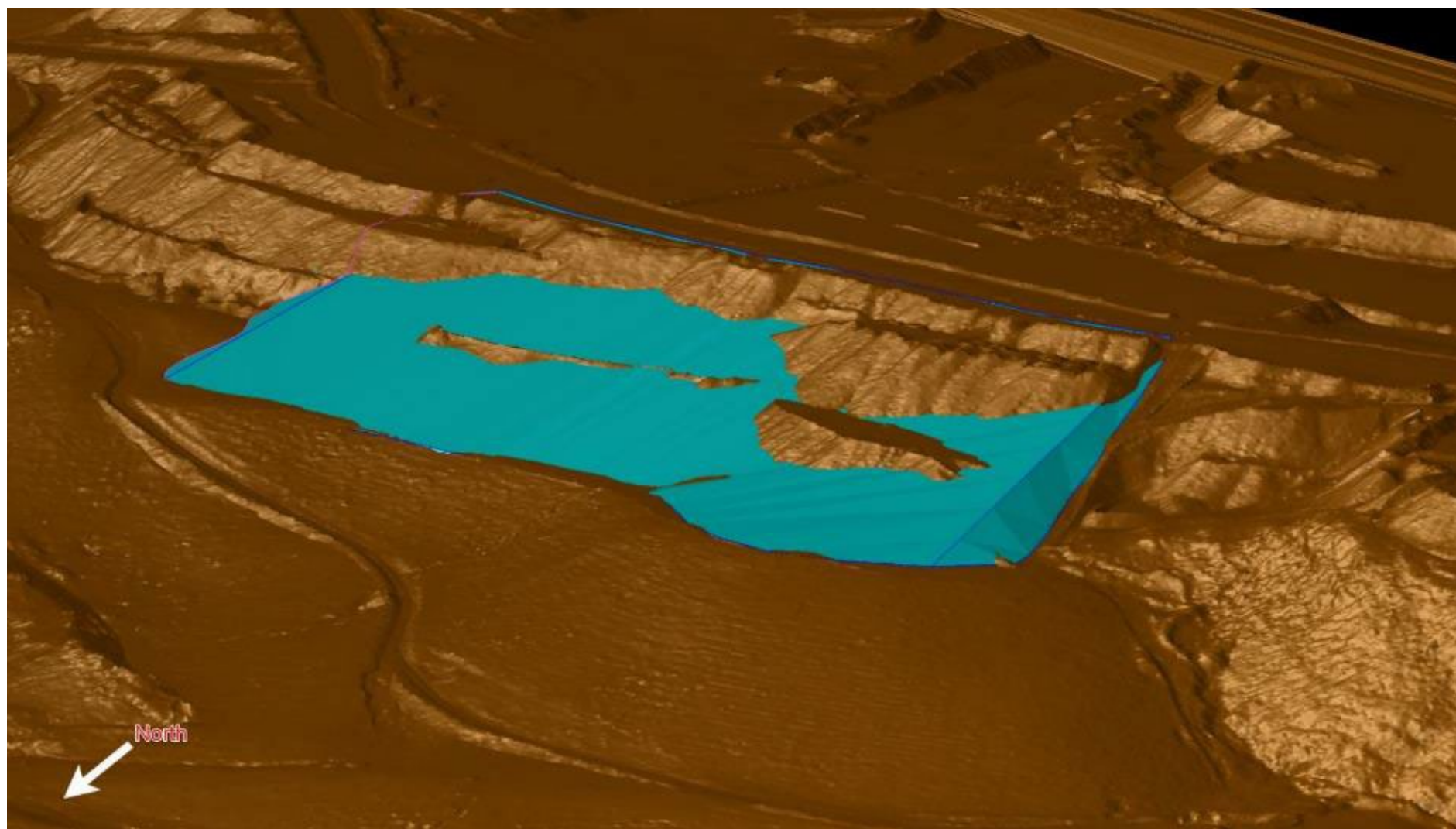


Figure 131 - WD4 closure design

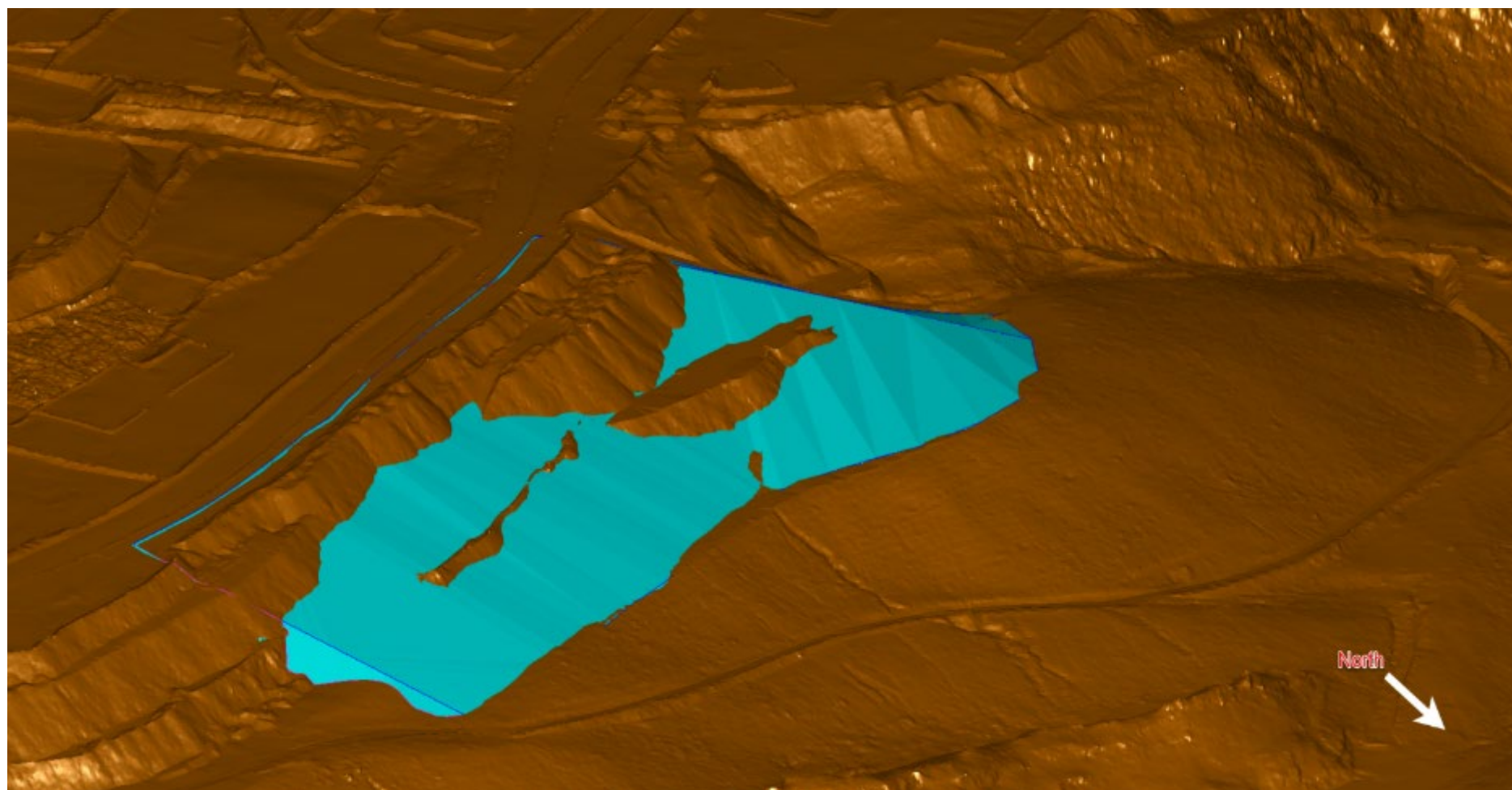


Figure 132 - WD4 closure design

Table 48: WRL Closure work plan

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Waste Rock Landforms					
Waste Rock Landforms (WD1, WD2, WD4, WD5)	- Both WD1 is being used to support the modern airfield. Options (1) and (2) has the airfield removed as it is only approved for MGX only for FIFO use. - As built WRLs will be a heterogeneous composition comprised quartzite batter slopes and siltstone tops/flats. Existing siltstone used as a growth medium where flat surfaces are already similarly composed. Where necessary (i.e. flat areas not composed of siltstone), siltstone will be placed on flat areas at a depth of at least 0.5 m. - Batter slope surfaces in accordance with final landform design specifications. - Back sloping outer berms used as surface water control - Back slope crest / top of WRLs for water retention and vertical infiltration - Deep rip berms ≥ 800 mm - Deep rip top / flats of WRLs - Seed with Island seed mix.	- Trial spatial analysis monitoring compared to EFA/LFA - Maintenance of topsoil stockpiles for rehabilitation. - Regular monitoring of trials and progressive rehabilitation. - Active rehabilitation of WD4 ongoing, with management and monitoring of land forming and revegetation.	- Final Closure design for each landform required. - Surface water analysis.	- Key objective is for WRLs to remain safe, stable and non-polluting. - In the event of unexpected closure targeted surveys will be undertaken to identify aspects requiring remedial measures necessary to meet these requirements.	No specific decommissioning tasks

21.5 Saline water Dams

The feature of this domain are presented in **Figure 133**.

21.5.1 Closure Specifications

Saline water captured in dams will be allowed to evaporate or be legally discharged in accordance with operating licences., once the water is removed the liner and associated pumping infrastructure will be removed from site or disposed of in an appropriate class landfill. Finally, the dam will be land formed, capped with growth media, deep ripped and seeded.

There are no specific designs required for this domain.

21.5.2 Options, Knowledge Gaps and Future Work Plans

The closure work schedule, and uncertainties, is presented in **Figure 133** and **Table 49**.

21.6 Plant Site and Run-of Mine (ROM) Pad

There are two plant sites on Koolan Island, one permanent crusher circuit and a secondary mobile crushing circuit. The total area of the crusher is approximately 2.5 ha. Both the permanent and temporary plant is located within the boundary of the ROM pad. The crusher is the only processing on site and there is no beneficiation.

The ROM Pad is a large, delineated area that includes numerous ore stockpiles, the crushing and screening units, conveyor belts and the commencing end of the ship loader. There are also several offices located within the bounds of the ROM, however, these have been excluded from this domain and will follow the requirements of Section 21.7.3. The ROM Pad encompasses an area of 24 ha.

The ROM closure domain is presented in **Figure 134**.

21.6.1 Closure Specifications

At the completion of mining there will be a lag to process and ship remanent ore, for this reason the ROM Pad will be one of the last areas available for rehabilitation.

The temporary crushing circuit is owned and operated by a contractor; therefore, they will demobilise the mobile plant from site. This will likely occur prior to final ore process as the campaign demand for crushing is required and will not require any specific decommissioning given the nature of mobile plant.

The crusher will be a marketable item and will be decommissioned and removed from site, likely sold. The decommissioning of the crusher will occur once the final ore has been processed and is awaiting shipment.

Once the ore has been removed the ROM is essentially a large laydown area, the surface will be scraped to allow any final ore repatriation before being managed as per the hardstand sub-domain. Given the nature and methodology of the ore processing at site the land is unlikely to be polluting.

A surface water management design is required for the ROM pad to ensure water is directed correctly and prevents erosion.

21.6.2 Options, Knowledge Gaps and Future Work Plans

The closure schedule, including knowledge gaps, for the Crusher precinct and ROM pad are presented in **Table 50**.

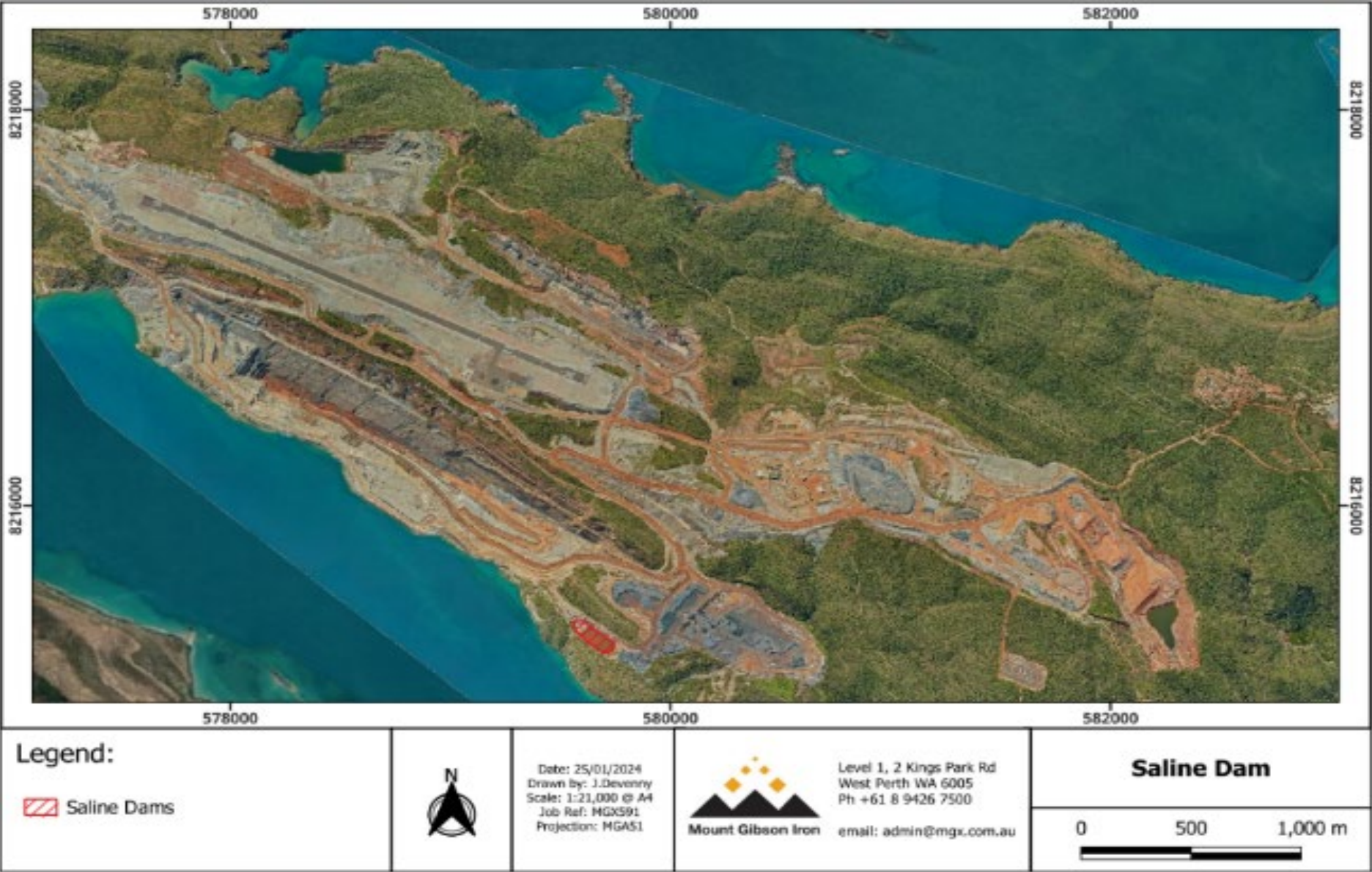


Figure 133 Saline Water Dam closure domain

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Settlement Pond and Turkeys Nests Ocean Diffuser	- Conduct contamination assessment of areas and remaining water for potential contamination and treat as necessary. - Undertake decommissioning tasks. - Keyed-in surface terrain with surrounding areas and flow patterns and reshape the land surface. - Cover all rehabbed areas with topsoil (or surrogate material) to a minimum depth of 100 mm. - Rip siltstone growing medium. - Seed all rehabbed areas with Island seed mix. - Deconstruct moored diffuser structure and remove buoyant pipeline to shore. - Where economically feasible, salvageable, recyclable, or resalable clean decommissioned equipment will be removed from site. - All remaining infrastructure will be demolished and buried within a licenced landfill in accordance with DWER (2018) waste classification definitions.	No further research, investigation or trials are required.	Nil.	No further tasks other than those detailed.	- Drain ponds of water in accordance with Licence 8148. - Treat, handle and dispose of soil and water according to contaminated sites and waste classification guidance. - Cut HDPE pond liners and fold into base of pond for burial as approved landfills or relocate to licensed landfills. - Concrete and other inert rock may be tipped into settlement pond. The former pond may be used as a licensed landfill. The surface will be dozed and levelled. - Doze and push in pond embankments making the ground level. - Shape surface making it flat and key into surrounding surface hydrology. - Rip and seed.

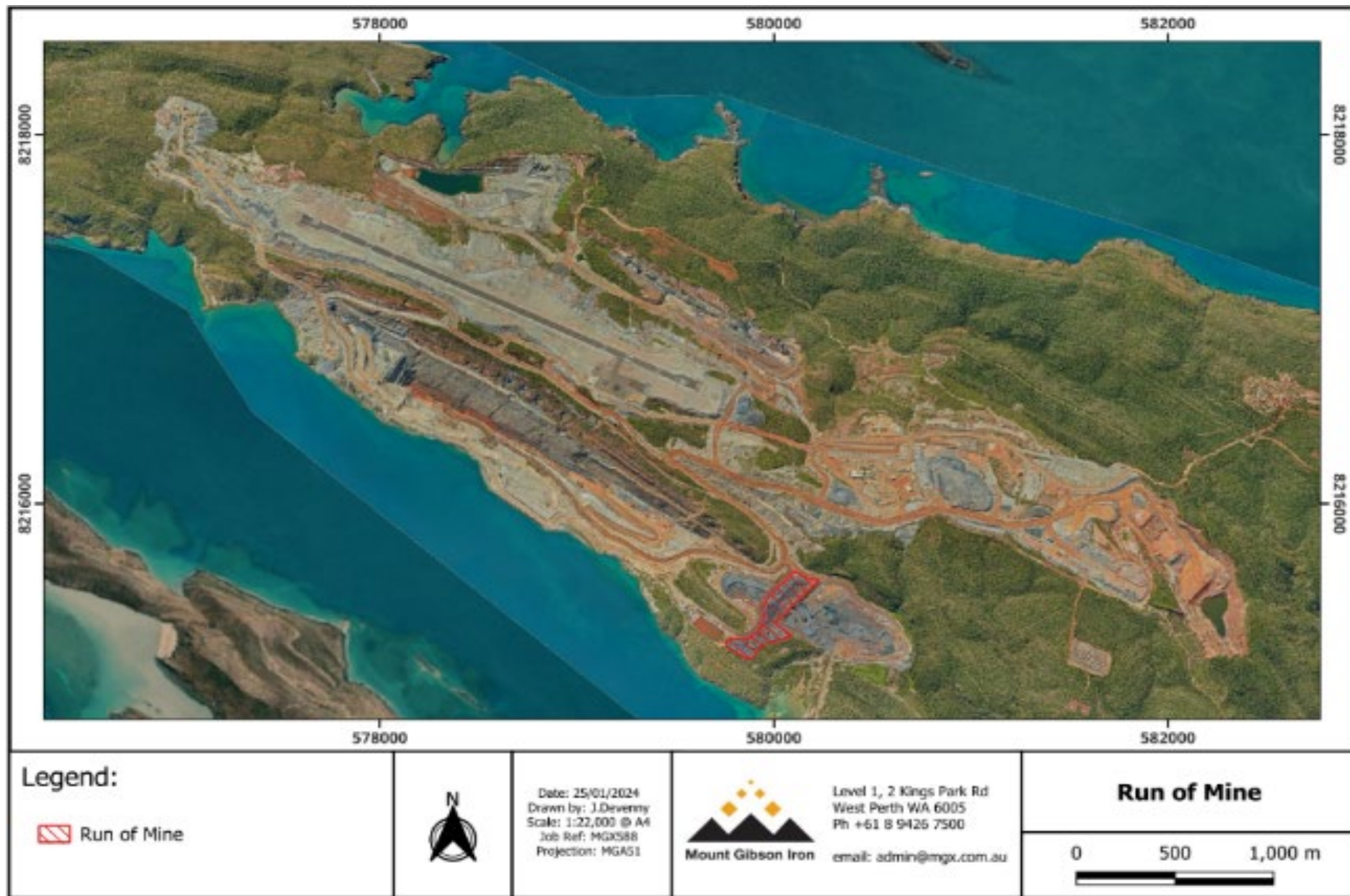


Figure 134 ROM Pad and Plant Site Closure Domains

Table 50 Closure Schedule for ROM/Crusher precinct

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials, and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Crusher, ROM, and Product Stockpile Pads	- Conduct contamination assessment. - Remediate any contaminated material identified. - Excavate ore bed atop stockyard and waste to pit void or WRL. - Keyed-in surface terrain with surrounding areas and flow patterns and reshape the land surface - Rip compacted surfaces ≥ 800 mm with appropriate machinery. - Cover all rehabbed areas with topsoil (or surrogate material) to a minimum depth of 100 mm. - Batter off the eastern end of the product stockpile to ≤ 20 degrees. Spread subsoil material and deep rip on contour and hand spread seed. - Seed all rehabbed areas with Island seed mix.	- There is approximately 60,000 m³ of subsoil available for use in this area. - Processing plant, ROM and product stockpiles and the soil dump cover an area of approximately 32.5 ha. The rehabilitated profile of the eastern end will cover an area of approximately 1.1 ha and will be the priority for receiving spread available subsoil. - Rehabilitation for the eastern end of the precinct is similar to that for the WRLs. Ample subsoil to spread at a depth of 100 mm across this sloped area. Balance of material will be used elsewhere on ROM rehab where siltstone growth medium is required to supplement the existing profile. - Siltstone will be spread over unbroken interred flat concrete pads with ample volumes of material available for vegetative growth.	Surface water diversions and management needs to be considered and designed.	- Remove all chemicals and hydrocarbons from site. - Disconnect electricity supply. - Block access to the crusher, ROM and product stockpile pads.	- Product stockpiles shipped off site during operations. - Demolish all infrastructure including processing plant and other buildings. - Disconnect all above and below ground utilities. Retain any buried services conduits intact. - Remove all mobile equipment and supplies from site. - Where economically feasible, any salvageable, recyclable or resalable clean waste and decommissioned equipment will be removed from site. - All remaining infrastructure will be demolished to ground level and buried within a licenced landfill in accordance with DWER (2018) waste classification definitions. - Concrete pads may be left in place if machinery is not capable of breaking it and buried to ≥ 1 m depth

21.7 Miscellaneous Mine Activities

These infrastructure items have been noted as being potentially beneficial for use by another entity post mine closure:

- Certain internal access roads.
- Parts of the Village and cyclone shelter.
- Production bores and pipelines.
- Airstrip/s.
- Jetty and Barge Landing.
- Cultural heritage and training centre; and
- Cyclone moorings (buoys).

21.7.1 Accommodation village

The accommodation village houses employees and contractors working at the mine site. The village (or camp) covers an area of approximately 9.5 ha, and consists of the following facilities:

- Single person ensuite rooms;
- Laundry modules.
- Kitchen and dry mess.
- Village administration office.
- First aid facility.
- Wet mess.
- Recreation room.
- Vehicle parking areas.
- Wastewater treatment facility.
- Maintenance laydown area.
- Cyclone shelter.
- Backup generators; and
- Firebreaks.

21.7.2 Airstrip

An airstrip has been used on the northeast end of Koolan Island. It was originally established by BHP for its mining activity on the Island up until 1993 and has since been refurbished by KIO. The facility covers an area of 8.6 ha and consists of:

- An 870 m paved airstrip,
- Parking area for light vehicles,
- Waiting room; and
- Hardstand for parked aircraft.

On 15 August 2019, DEMIRS approved the Mining Proposal for the construction and operation of a new Airfield at Koolan Island over approximately 60 ha of the WRLs used as WD1 and WD3. The new airfield was constructed to the Civil Aviation Safety Authority specifications to become a certified Airfield, and includes:

- Runway lighting and communications,
- Aprons for taxiways for safe movement of aircraft,
- 45 m wide runway and 30 m wide taxiway,

- Passenger terminal,
- Aircraft washdown bay, and
- Refuelling area including bulk fuel storage.

The new Airfield reduces the number of aircraft required to safely transport personnel to site, therefore reducing the number and frequency of take offs and landings that currently occur at Koolan Island. It also reduces travel time to and from Koolan Island, as flights link Perth with the Island directly. Note, once the new airfield commenced, waste rock was no longer placed on to waste dumps other than for maintenance of the formation. It promulgated the development and use of WD5/6/7 according to new approved designs.

21.7.3 Mine Site Offices

Mine site offices have been established in a central location known as the mine operational centre (MOC) located to the northeast of the Main Pit and south east of Acacia East Pit. The MOC covers a total land area of approximately 14.4 ha, and consists of the following:

- Office workspace,
- Ablutions (Septic tanks with leach drains),
- Crib rooms,
- Other general office facilities,
- Parking areas,
- Mobile Equipment Workshop,
- Stores and warehouse,
- Fuel storage.

21.7.4 Dewatering facilities

Dewatering equipment removes water from certain Pits when under mining. This equipment typically consists of:

- Floating pontoons with a diesel powered pump.
- Booster cyclone pumps with two 77,000 L staging tank
- Polyethylene pipelines, each approximately 850 m in length.
- A settlement pond for the treatment of turbid water, when necessary.
- Floating pontoons on the discharge pipe; and
- Post sediment pond sampling point with Mag flow meters.

The pumping equipment and pipe inlet rests on a floating pontoon. The pipeline runs from the Main Pit, over the land surface into a settlement pond, then down slope to the sea. Water is discharged approximately 70 m offshore at a location approximately half-way between the Seawall and the ship-loading jetty. KIO also holds approval to discharge to the ocean from the Main Pit and Mullet Pit under licence L8148/2006/4.

21.7.5 Fuel Storage

Four fuel facilities exist on site and are located at the barge landing, power station, MOC and the Village. All four areas are managed under the site Dangerous Goods Licence. The facility at the power station is used for the storage of hydrocarbons, and as fuelling stations for mine site vehicles. The site at the barge landing is used for transferring fuel to the storage tank at the power station. The facility at the MOC is used to fuel light vehicles and the facility at the Village is used to

fuel the power station. The sites cover a total approximate land area of 1 ha and consist of the following:

- Double skinned self-contained tanks within concrete bunding.
- Fuel transfer facility.
- Fuel pumps; and
- Fuelling pad.

21.7.6 Warehouse and Logistics Facility

The supply warehouse is located at the MOC and stores bulk supplies for mine site operations, including packaged hydrocarbon and chemical stores. The warehouse facility consists of indoor and outdoor storage and staging areas.

21.7.7 Jetty, Ship Loader, and Barge Landing

Facilities have been constructed to transport processed ore from the OSA pad and to load the material onto Bulk Ore Carriers. The facility also serves as a loading and offloading facility serviced by supply barges from the mainland, referred to as the Barge Landing. The facility is managed under Commonwealth law which requires customs and quarantine arrangements are observed. Part of the facility is located within the Crusher area and is used to load the material onto a conveyor.

- The loading facilities are located on the coastline approximately 1.5 km southeast from the Main Pit, and consist of:
- A 130 m concrete access jetty, built out from an area of reclaimed land.
- Barge Landing built out of an area of reclaimed land.
- Ship Loader service platform.
- Mooring dolphins; and
- Connecting walkway.
- The main work areas are connected by approximately 950 m of conveyors.

21.7.8 Laydown areas

Laydown areas have been established around the mine site for temporary storage of equipment during normal mining and contractor operations. Each of the laydown areas consist of an open, compacted area of waste rock used for temporary outdoor storage. There are no permanent structures or utility connections in these areas. The laydown areas associated with different activities around the site include:

- Acacia Pit hardstand.
- Tip road laydown.
- Old Central Warehouse Facility laydown; and
- Other laydowns / hardstands.

21.7.9 Explosive Magazine and Bulk Explosives Batching Facility

Bulk materials used to make up explosives in a batching plant are stored within sea containers situated on three compacted rock pads, in an isolated location away from the rest of the mine infrastructure. Ignition systems including boosters and detonators (High Explosives) are stored in a purpose-built Magazine and separated from the batching plant. Batching and storage are managed in accordance with explosives and dangerous goods regulations under the site license.

These sites cover a total approximate land area of 4.1 ha and consist of the following:

- Compacted rock or gravel pads.
- Concrete mixing pads.
- Power generation equipment; and
- Storage tanks and containers.

21.7.10 Buried Services

A total of approximately 10 km of buried services (i.e. power lines) have been installed at the mine site to service equipment within the main work areas. Most of the buried services are installed within the Accommodation Village, MOC and processing areas.

21.7.11 Power station

A diesel power station is near the crushing plant to supply electricity to the ore processing plant, ship loading facility and associated infrastructures. Fuel is supplied to the power station from the neighbouring bulk fuel storage facility via a dedicated day tank. Electricity is transmitted from the generation facility to the work area by a network of high voltage and low voltage buried service cables.

- The 2.5 Megavolt ampere (MVA) ROM power station covers approximately 0.1 ha and consists of the following,
- Five (5) 500 Kilovolt-Ampere (kVA) diesel generators
- Distribution transformers
- Concrete pads including transformer containment facilities.
- Switch room / control building
- Site office and maintenance/service containers

A diesel power station is adjacent to the MOC and associated maintenance infrastructures. Fuel is supplied to the power station from a bulk fuel storage tank and via a dedicated day tank, both located within the power station containment bund. Electricity is transmitted from the generation facility to the MOC and associated infrastructures by a network of low voltage buried service cables.

- The 1.5 MVA MOC power station covers an area of approximately 0.06 ha and consists of the following:
- Three (3) 500 kVA diesel generators.
- concrete pads and containment facilities; and
- Switch room / control building.

A diesel power station is at the accommodation village. Fuel is supplied to the power station from a dedicated bulk fuel storage tank located within the power station containment bund. Electricity is transmitted from the generation facility to the village and associated facilities by a network of low voltage buried service cables.

- The 2.0 MVA Village power station covers an area of approximately 0.04ha and consists of the following:
- Four (4) 500 kVA diesel generators.
- Concrete pads and containment facilities; and
- Switch room/control building.

21.7.12 Roads

A network of approximately 16 km of haul roads and >20 km of light vehicle tracks exists for access to the different areas of the site and for haulage of ore and waste. Haul roads are intended primarily for large mine vehicles and are approximately 25-30 m in width.

Existing light vehicle tracks are approximately 8-12 m in width and provide access for light four-wheel-drive vehicles.

21.7.13 Ore Stockpile Area (OSA) and processing plant

The OSA and processing plant are located to the east of the Main Pit. The OSA is used for storing unprocessed and processed ore. Product stockpiles are 8-10 m in height and contain 100,000-250,000 t of product each. The stockpile yard is designed with a capacity of approximately 250,000 m³ of product, though this may be increased if required.

The crushing plant consists of a two-stage dry crushing and screening plant and stacker. No chemical processing of the ore is undertaken with the product and therefore it is considered a Direct Shipping Ore product.

The OSA and crushing plant comprise a combined area of approximately 32 ha. This includes a laydown area along with the OSA pad.

21.7.14 Workshops

A workshop area has been established for the repair and maintenance of mine equipment at the MOC.

The workshop area consists of the following:

- Main workshop.
- Storage areas; and
- Oil separation facility.

Hydrocarbons and chemicals for maintenance are stored at the workshops. The workshop catchment areas are separated from general storm water interaction and native surface water catchment areas. Wastewater from the workshop area is treated onsite by an oil separator prior to reuse for dust suppression or licensed and monitored discharge.

21.7.15 Landfill and Bioremediation Facilities

A landfill has been established amongst WD4, near the eastern end of the mining operation, approximately 100 m south of the East Pit. This is currently licensed as a Class II landfill (DWER Licence: L8148/2006/4). Inert and putrescible wastes are buried in this facility. The trenches are excavated and backfilled upon filling with waste to minimise wind-blown rubbish, odours and the risk of fire.

The landfill is separated into two areas; the western landfill is used for industrial waste, while the eastern landfill is used for domestic waste disposal.

The base of WD3 has also been used in the past as a landfill area for inert industrial waste such as scrap metal. All landfills have been constructed and operated in accordance with approvals originally obtained by KIO from both the DEMIRS and DER.

Bioremediation facilities have been established for the management of hydrocarbon-contaminated soil and biodegradable absorbent materials. At these facilities, the material to be treated is spread

and periodically aerated by turning and sprayed with water to encourage aerobic biodegradation of contaminants. Each facility has been constructed and maintained in accordance with licence conditions (DWER Licence L8148/2006/4).

21.8 Closure Implementation Work Plan

Closure implementation for Miscellaneous mine activities is detailed in **Table 51**. A table has been utilised for ease of interpretation by on ground personnel who are responsible for implementation of the tasks.

For the purposes of Miscellaneous Mine Activities, the infrastructure has been broadly broken down into key categories and will apply to all sub domains. Should a domain need specific work plan developed this will be outlined in the relevant closure subsection above.

Table 51: Closure tasks, schedule of work for research, investigation, trials and materials required, identification and management of information gaps, key tasks for unexpected and temporary closure, decommissioning tasks.

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials, and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Laydown Areas / Parking Areas / Unoccupied Cleared Land					
Laydown / Hardstand / Parking Areas Or Areas previously occupied by other mining activities that have been decommissioned.	'Keyed-in' surface terrain with surrounding areas and flow patterns and reshape the land surface. The site will be flattened using appropriate machinery and deep ripped ≥ 800 mm. The areas will then be seeded with the Island mix.	- These areas are composed of a heterogeneous mixture of quartzite, siltstone, clay/silts above natural ground. For this reason and based on rehabilitation investigations and trials to date, the materials will support vegetation. - Decommissioning of the laydown areas will take place near the completion of the overall mine closure. These areas will be decommissioned sooner, where possible, but they are expected to be required for ongoing mine operations and to support other decommissioning and rehabilitation activities.	The detail required to determine if the facilities will be handed over to another entity are currently unknown. This will be determined at least two years prior to mine closure.	Remove all chemicals and hydrocarbons from site.	Remove all mobile equipment and supplies from site.
Roads, Tracks and Access Routes					
Roads	- For roads to be handed over to a third party entity: - Ensure appropriate land tenure is in place prior to handover and any relinquishment of mining tenure - For roads to be rehabilitated: - Compacted surfaces ripped ≥ 800 mm. - Seed with the Island mix	Consultation completed with third party entity at least 2 years prior to mine closure to determine the details required for the handover of infrastructure.	Undertake review of roads being transferred to third party ownership.	- Proceed with closure tasks immediately. - Engage with third party entity to finalise details on handing over infrastructure and securing appropriate tenure.	Nil.
Buildings					
Accommodation Village	- For the part of the village not handed over to a third party entity, the following will apply: - Conduct an environmental assessment for potential contamination - Adjoining areas are currently vegetated in areas absent of infrastructure. Rehabilitation works will include ripping the ground following the removal of infrastructure to enable the density of vegetation to invade and increase naturally - This will be monitored post closure and ripped areas hand seeded with native species - For the part of the village to be handed over to an entity: - Ensure appropriate third party tenure in place prior to handover and relinquishment of mining tenure can proceed. - Undertake any additional work, as per requirements of consultation (e.g. remediation of contaminated areas, rehabilitation with native plants).	Consultation with entity/s acquiring infrastructure at least 2 years prior to mine closure to determine the details required for the handover of infrastructure.	The final assignment of built assets onto the tenure of third parties to be determined in coming years, well prior to end LoM. This will be determined prior to closure and through further consultation with an identified entity.	- Remove all chemicals and hydrocarbons from site. - Remove solids from the waste water treatment facility. - Disconnect electricity supply. - Proceed with closure tasks immediately.	- Remediate any contaminated material identified by the environmental assessment. - Remove, recycle or demolish any infrastructure not to be handed over to an entity.



Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials, and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Airstrip and Cyclone Shelter	- For Option (1) if the airstrip and cyclone shelter are to be handed over to a third party entity: - Check appropriate tenure in place prior to handover and relinquishment of mining tenure. - Undertake any additional work, as per requirements of consultation (e.g. remediation of potentially contaminated areas). - Undertake additional work as per outcomes of consultation for the handover of infrastructure.. - For Option (2), if the airstrip and cyclone shelter are to be rehabilitated: - Demolish runway pavement and cyclone shelter. Recycle demolition materials or dispose to licensed landfill. - Conduct an environmental assessment for potentially contaminated areas. - Deep rip ≥ 800 mm and seed with Island seed mix.	Consultation with an entity at least 2 years prior to mine closure to determine the details required for the handover of infrastructure.	Nil.	- Proceed with closure tasks immediately. - Engage with entity receiving infrastructure to finalise details on handover of infrastructure and securing appropriate tenure	Nil.
Cultural & Training Centre	- Handover to Dambimangari Aboriginal Corporation (DAC) once its underlying tenure is established - Undertake any additional work, as per agreement with the TOs reached through consultation for the handover of infrastructure	Within the bounds of the co-existence deed, the DAC will be engaged by 2023/24 to determine the details required for the handover of the infrastructure.	Nil.	- Proceed with closure tasks immediately. - Engage with entity receiving infrastructure to finalise details on handover of infrastructure and securing appropriate tenure.	Nil.

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials, and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
MOC (Administration, Workshop, Warehouse)	- Conduct contamination assessment. - Remediate any contaminated material identified. - The surface which the MOC covers is a heterogeneous composition of siltstone and/or clay silts. Rehabilitation trials to date have demonstrated the capacity for materials to support vegetation. For this reason it is not considered that the import of topsoil or surrogate growth medium will be necessary. - Keyed-in surface terrain with surrounding areas and flow patterns and reshape the land surface - Rip compacted surfaces ≤ 800 mm with appropriate machinery. - Seed rehabbed areas with the Island mix.	No research, investigation or trials will be undertaken for the decommissioning and rehabilitation of this area	Nil.	- Remove all hydrocarbons and chemicals from site. - Disconnect electricity supply.	- Decommissioning of the MOC etc will take place at the end of mining operations as the infrastructure is required to support ongoing operations. - Disconnect all above and below ground utilities. Retain any buried services conduits intact. - Remove all mobile equipment and supplies from site. - Where economically feasible, any salvageable, recyclable or resalable clean waste and decommissioned equipment will be removed from site. - All remaining infrastructure will be demolished to ground level and buried within a licenced landfill in accordance with DWER (2018) waste classification definitions. - Concrete pads may be left in place if machinery is not capable of breaking it and buried to ≥ 1 m depth.
Marine Infrastructure					
Wharf – Jetty	- All ship load out facilities other than the cyclone moorings, jetty and maintenance platform are to be decommissioned and removed from site as they items will be handed over to another entity. - Cyclone moorings are to be handed over to the Traditional owners and for the other infrastructure to be handed over to another entity, appropriate tenure will be acquired as described. - Conduct an assessment to identify any adverse effects to the marine environment and contamination by deconstruction. - Undertake any additional work, as agreed through consultation with the entity receiving the infrastructure (e.g. remediation of contaminated areas).	- No topsoil or growth medium is required. - Closure tasks cannot occur prior to full decommission as infrastructure is required for ongoing operations. - Consultation with entity/s acquiring infrastructure at least 2 years prior to mine closure to determine the details required for the handover of infrastructure.	The final assignment of built assets onto the tenure of third parties to be determined in coming years, well prior to end LoM.	- Safe and non-hazardous preparations including remove all chemicals and hydrocarbons from site. - Disconnect electricity supply.	- Remediate chemicals and any contaminated material identified. - For infrastructure being decommissioned and removed from site, the following will apply: - Disconnect any above and below ground utilities. - Deconstruct all steel components and where economically feasible barge all steel components off site for recycling. - Any remaining materials will be buried on site either within mine voids or within licenced landfills as per DER Waste Classification Guidelines and Licence 8148. - Implement closure tasks including disposal or recycling of inert materials.

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials, and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Barge Landing Precinct	- Handover to an entity (likely Port Authority). - appropriate tenure by third party in place prior to handover and move towards full rehab and relinquishment of mining tenure. - Undertake contamination assessment of the barge landing as per DWER guidelines and update the registration as suitable condition for the post-closure land use. - Undertake any additional work, as per consultation with an entity to which the infrastructure will be handed over to (e.g. remediation of contaminated areas).	- Closure tasks cannot occur prior to full decommission as infrastructure is required for ongoing operations. - Consultation with entity/s acquiring infrastructure at least 2 years prior to mine closure to determine the details required for the handover of infrastructure.	The final assignment of built assets onto the tenure of third parties to be determined in coming years, well prior to end LoM.	- Proceed with closure tasks immediately. - Engage with entity to finalise details on handover of infrastructure and securing appropriate tenure.	As per closure tasks.
Water Infrastructure					
Dewatering and Production Bores	- For Option 1, removal of infrastructure and rehabilitation must take place at the end of mining operations when the infrastructure is no longer required. - The dewatering infrastructure pipelines cover a long narrow corridor in which little vegetation is disturbed. - Rehabilitation of dewatering and production bore areas is not necessary as they cover very small areas and the re-emergence of vegetation will occur naturally. (This is inclusive of production bores and dewatering infrastructure for the Main Pit).	Consultation with entity/s acquiring infrastructure at least 2 years prior to mine closure to determine the details required for the handover of infrastructure.	Currently, it is not formally resolved if production bores will be handed over to an entity for domestic use.	- Proceed with closure tasks immediately. - Engage with entity receiving infrastructure to finalise details on handover of infrastructure and securing appropriate tenure.	- All remaining infrastructure will be demolished to ground level and removed. - All Production bores will be decommissioned as per the Minimum Construction Requirements for Water Bores in Australia (National Uniform Drillers Licensing Committee, 2012).
Industrial Infrastructure					
Fuel and Bulk Storage	- Conduct an appropriate environmental assessment to test the storage areas for contamination prior to rehabilitation. - If contaminants are found in the soil below / around the facility: - Remediate any contaminated materials. - Conduct further tests. 'Keyed-in' surface terrain with surrounding areas and flow patterns and reshape the land surface. This will include covering broken inert concrete pads retained in situ. The site will be flattened using appropriate machinery and deep ripped ≥ 800 mm. The areas will then be seeded with the Island mix.	- Consultation with an entity at least 2 years prior to mine closure to determine the details required for the handover of infrastructure. - Contamination assessment at closure. - Surface hydrology assessment of rehabilitated landform prior to seeding.	The detail required to determine if the facilities will be handed over to another entity is currently unknown. This will be determined at least two years prior to mine closure in consultation with another entity.	- Remove all chemicals and hydrocarbons from site. - Disconnect electricity supply.	- Remove all chemicals and hydrocarbons from site. - Remediate any contaminated material identified during the environmental assessment. - Disconnect above and below ground utilities. - Remove mobile equipment and other supplies. - Any salvageable, resalable or recyclable clean waste and decommissioned equipment will be removed from site. - Concrete pads will be left in place, broken and buried to a depth of at least 1 metre.

Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials, and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Landfill	- Landfills are located on flat areas and ongoing mining operations will allow the landfills to be progressively covered and interred within a mixture of siltstone and quartzite - Removal of above ground infrastructure to ground level - Construct cap comprised of ≤ 1 m compacted clean clay fill, overlain by ≤ 150 mm locally sourced cover medium profiled to direct surface flows away from the landfill. - Seed with the Island mix	- Landfills which are no longer in use will be rehabilitated progressively during operations when rehabilitation materials derived from the pits are available. - All other landfills will be decommissioned and rehabilitated at the end of operations when they are no longer required for ongoing operations. - Conduct soil contamination assessment. - Surface water flow diversion from over the cap designed to direct surface water flows away from closed landfill cells.	Nil.	No further tasks other than those already identified.	- Remove all mobile equipment and supplies from site. - Remediate contaminated material identified by the environmental assessments as per DWER guidelines. - Inter and cover all disposed waste soil/rock material likely to be composed of quartzite and siltstone (this activity is ongoing throughout the life of the mine, and will be completed when the landfill is decommissioned).
Bioremediation Facilities	- Conduct an environmental assessment to determine the presence of contaminants below the clay liner. - The materials composition of the bioremediation facilities will be capable of retaining water and therefore capable of supporting vegetation - Following absence of contamination, the facilities will be flattened and deep ripped ≥ 800 mm. The areas will then be seeded. - Consider surface terrain so that rehabilitated areas are 'keyed-in' with the surrounding areas and flow patterns and reshape the land surface.	No research, investigations or trials are required.	Nil	No further works required other than those already identified.	- Remediate any contaminated material identified during the environmental assessment. - Remove all mobile equipment and supplies from site. - Stockpile the treated material from the bioremediation facility and remediate contaminated materials for disposal according to DWER (2018) waste classification definitions.
Magazine and bulk explosives batching facility	- Conduct an appropriate environmental assessment to test the storage areas for contamination prior to rehabilitation. 'Keyed-in' surface terrain with surrounding areas and flow patterns and reshape the land surface. The site is made up of waste rock materials similar to those which have demonstrated successful revegetation. For this reason, it is not considered that the import of growth media will be necessary. - Reshape the land surface as necessary – this will include covering of any concrete pads left behind. - Rip compacted surfaces ≥ 800 mm, with appropriate machinery. - Seed disturbed areas with the Island seed mix	As the area is similar to other laydown, flat land, no specific research or trials will be undertaken for the decommissioning and rehabilitation of this area. Contaminated site status and condition will be important.	Nil.	- Remove all hydrocarbons and chemicals from site. - Disconnect all above and below ground utilities.	- Decommissioning will take place at the end of the overall mine closure process as the facilities are needed for ongoing mining operations. - Safely remove all explosives or detonate on site by appropriately qualified persons - Remove all hydrocarbons and chemicals from site for either disposal at licensed facilities or use elsewhere. - Disconnect all above and below ground utilities. - Remove all mobile equipment and other supplies from site. - Where economically feasible any salvageable, resalable or recyclable clean waste and decommissioned equipment will be removed from site. - All remaining infrastructure will be demolished to ground level, removed and buried to ≈ 1 m depth in appropriate areas.



Domain / Area	Closure Tasks	Schedule of work for research, investigation, trials, and materials required	Identification and Management of Information Gaps	Key tasks for unexpected closure	Decommissioning Tasks
Power Stations and Power Lines	- Power lines / cables are located throughout other domains (specifically infrastructure). Remediate any contaminated materials identified during the environmental assessment. - Keyed-in surface terrain with surrounding areas and flow patterns and reshape the land surface - The areas on which the power stations are located is a heterogeneous composition of siltstone and/or clay silts. Rehabilitation trials to date have demonstrated the capacity for materials to support vegetation. For this reason it is not considered that the import of topsoil or surrogate growth medium will be necessary. - Rip all compacted surfaces ≥ 800 mm with appropriate machinery. - Seed rehabbed areas with the Island mix. - Note for Option (1) post closure, the village power station may be retained for handover to a third party entity along with the part of the village which that entity will retain and operate.	Consultation with an entity at least 2 years prior to mine closure to determine the details required for the handover of infrastructure.	Confirmation of any infrastructure to be retained and, therefore, power stations and power lines required to be retained. This will be determined at least two years prior to mine closure in consultation with the appropriate entity identified.	- Disconnect electricity supplies. - Remove all hydrocarbons and chemicals from site. - Switch off and lock out the power plant.	- Remediate any contaminated material identified by the contamination assessment. - Tasks for power lines include: - Disconnect all power lines from infrastructure. Retain any buried services conduits intact. - Remove all above ground power lines and send off site for recycling where economically feasible or dispose of in a licenced landfill in accordance with DWER (2018) waste classification definitions. - Tasks for power stations inclusive of the MOC and ROM units would be: - Remove chemicals and hydrocarbons from site. Disconnect all above and below ground utilities and remove - Remove all mobile equipment and other supplies. - Where economically feasible any salvageable, resalable or recyclable clean waste and decommissioned equipment will be removed from site. - All remaining infrastructure will be demolished to ground level, removed and buried to a depth of at least 1 metre in a licenced landfill in accordance with DWER (2018) waste classification definitions.

21.9 Unexpected Closure

21.9.1 Care and Maintenance (C&M)

Operations at Koolan Island entered a formal period of C&M in early 2016, lasting until 2018 when the seawall was reconstructed, and Main Pit dewatered in readiness for mine site restart. The activities required for a formal period of C&M were implemented in accordance with a C&M Environment Management Plan (Mount Gibson Iron, 2016).

The C&M plan would be updated and re-implemented within 3 months of the mine entering C&M.

Temporary Closure

A list of actions taken during temporary closure is provided for each domain is presented in Section 21.

Permanent Closure

In the event of permanent closure, this MCP will be initiated.

22 CLOSURE MONITORING AND MAINTENANCE

There will be a period of post-closure monitoring, following the closure phase and during the rehabilitation phase. Section 20 briefly outlined monitoring tools to be related to completion criteria of the various domains of Koolan Island. This section provides further details of these monitoring systems, including the general approach and related concepts for monitoring and data collection to test completion criteria. The overarching goals for monitoring systems at Koolan Island are to provide managers and stakeholders:

- Clear and robust data on progress towards closure outcomes and completion criteria.
- Integrated information that considers pathways for contaminant, water, and energy flows in the wider receiving environment; and
- Definitive endpoints for closure against completion targets.

KIO is committed to implementing monitoring systems that meet these goals with the aim of timely closure of the rehabilitated post-mining environment.

Monitoring systems on Koolan Island are well-embedded with the implementation of the set management plans required by MS 715. Monitoring required by these plans since the start of operations, and this MCP, provides a strong background for assessment against specific closure criteria, as the requirements will be also necessary post-closure. Should monitoring requirements differ to those required during operations, those plans will be updated, and approval sought from the necessary agency (either WA EPA and / or Federal Department). The plans include:

- Significant Flora and Fauna Species Management Plans.
- Northern Quoll Management Plan.
- Quarantine Management Plan.
- Marine Management Plan (including the Coral Rehabilitation Plan).
- Water Management Plan.
- Contamination Management Plan; and
- this Mine Closure Plan

These plans will be interrogated and integrated into this MCP for the purposes of closure, this will ensure that even as operational requirements decay the ongoing monitoring will maintain the required level of integrity.

The progression of temporal trends in monitoring data relative to completion criteria targets will dictate the suitability of the site for tenement relinquishment. Nominally, this may take in the order of five to ten years post-closure; current landform stability and revegetation data upholds this view. If additional time is required to meet closure outcomes than additional monitoring may be required.

22.1 Geotechnical Monitoring

22.1.1 Methodology

Geotechnical Monitoring will be managed and overseen by a qualified geotechnical engineer to ensure that the correct specifications and methodology are used.

As-Built audit

Closure infrastructure that requires a closure design will have a final closure specification developed prior to the infrastructure is due to undergo rehabilitation earthworks and armouring. The designs will incorporate various closure factors based on the local topography and surface water movement, environmental receptors, and specific closure outcomes. The design will be required to include a tolerance that the as build construction can vary away from the specified design.

Upon completion of construction there will be two separate, yet important steps to verify the as built construction meets the design parameters.

Visual and desktop Inspection

A visual inspection will be undertaken by a professional engineer qualified to undertake geotechnical assessment. This engineer will be different to any supervising the construction, however, may be the same as the one who designed the original construction specifications. The visual inspection will ensure that the final exterior of the infrastructure meets the specifications. This will ensure that the final armouring is present which will manage environmental exposure.

The desktop assessment will review any documentation, photographs and reports generated during construction to verify that internal specifications for any structures not visible during visual inspection.

Either or both inspections can occur at any point during the construction along with a mandated final inspection at the completion of construction.

Once the inspecting engineer is content with the construction a letter or report outlining the conformance will be written outlining the fact. Failure to meet the satisfaction of the engineer will result in the requirement to undertake remedial work to return the infrastructure to compliance.

Zone of Pit Instability and abandonment bund placement Assessment

Prior to the cessation of mining and final closure of all mining voids remaining post closure will have an assessment undertaken to understand the zone of pit instability. The assessment will review the geology intercepted and classify it based on its geotechnical properties. Each lithology will also be classified as either "weathered" or "fresh" in accordance with the Safety Bund Walls Around Abandoned Open Pit Mines Guidelines (Department of Industry and Resources, 1997).

As per the guidelines a conservative angle of 25° or 45° will be applied when intercepting "weathered" or "fresh" rock respectively. Once mapped out this will determine the potential zone of pit instability.

Under the guidelines there is ability to undertake bespoke assessment of the materials encountered within the pit shell and refine the zone of pit instability to be less conservative. Should KIO decide to exercise this option it will engage with DEMIRS prior to undertaking the work to determine acceptability of the proposed methodology.

Once the potential zone of pit instability is identified the abandonment bunds will be constructed a minimum of 10m further from the pit crest. Abandonment bunds will be audited using the as constructed methodology described in Section 22.

Where natural topography is used to prevent inadvertent access to pit faces, the feature will need to meet the requirements outlined in Section 22 and be a minimum of 10m beyond the potential zone of pit instability.

Seawall Erosion Monitoring

Seawall Erosion monitoring will be monitored using underwater survey methods. Generally, these undertaken by LiDAR, or similar remote sensing modelling, using boats towing sensing equipment or remotely operated underwater vehicle (ROV) equipped with the sensing materials. Erosion rates are monitored by comparing the calibrated height of a surface with its changed height overtime and expressed at cm/year.

The seawall currently does not have a final closure specification or design. Once the closure design is complete the design will include a predicted rate of erosion, this will be based on theoretical assessment of the material and the monitoring undertaken during monitoring. The actual erosion rate will be compared to the design specification and if within tolerance will be deemed acceptable, if it fails to meet, or exceed, specification remedial actions will be required.

22.1.2 Reporting

All audits, inspections or monitoring will need to be signed off by a competent engineer. Therefore, a final sign off report is required. The standard of report may differ based on the type of monitoring/inception; however, all reports must include the details and authorised signature of the inspecting engineer.

22.1.3 Remedial Action Trigger

Remedial actions are triggered by the failing to satisfy the inspecting engineer.

22.1.4 Remedial Actions

All remedial actions are similar for the geotechnical monitoring. The failing condition will be tested and compared to the relevant geotechnical engineering and/or safety standards. If the constructed infrastructure meets the relevant standard, then a revised monitoring regime will be developed to confirm the design.

If the constructed landform fails to meet the relevant standard a revised design will be developed, and physical reparations will be required to be made to meet the standards. Once the reparations are made a revised monitoring schedule will be developed to re-test the design parameters.

22.2 Marine Monitoring

Once the decommissioning trench is open the monitoring described below will include both the seaward side of Main Pit and the waters within Main Pit.

22.2.1 Methodology

Marine monitoring of the Key Environmental Factors (KEF's) will be conducted annually by MGX environmental personnel, and analysis of the collected data and samples will be carried out by the same laboratories and specialist consultants used during mining operations.

Post Closure Site Activity

It is likely that the Dambimangari, (Traditional Owners) of Koolan Island, will have an ongoing presence on the island post the closure of mining operations. If so, they will be briefed on the relevant aspects of the MMP and the location of the most vulnerable monitoring sites to reduce the risk of inadvertent disturbance of benthic communities.

Water Quality Monitoring Water Chemistry

With cessation of mining and completion of site rehabilitation, dewatering will also have stopped and landform stabilisation should have removed the pathway for the transfer of contamination from mine site to the marine environment.

Consequently, providing there are no water chemistry monitoring exceedances one year post closure, the monitoring for this aspect of water quality will be discontinued.

Remedial Trigger Level

If there is an exceedance, DWER will be notified within two days of receiving the sampling analysis results. If the exceedance is significant and without historical precedent a recent satellite image of the site will be obtained to check for a run-off point source, and a desktop investigation will be conducted to determine the cause of the exceedance. The exceedance will be reported in the annual marine monitoring report and the next ACAR.

If the investigation is unsuccessful, water chemistry monitoring will be repeated in the next annual monitoring campaign.

Physio-Chemical Quality

Physio-chemical water quality monitoring will be conducted in conjunction with the annual marine monitoring for two years post closure. The monitoring method will be in accordance with Marine Management Plan version 22.4, and will take into account the relevant levels of ecological protection. Because monitoring for this KEF gives real-time results, it should be conducted on the first day of the annual monitoring campaign, allowing time to recheck a particular site should it be necessary.

Remedial Action

If a site exceeds the EQG's, DWER should be notified of the exceedance within two days. Further monitoring of the site should continue daily and at the same time as the initial monitoring. This should establish whether the exceedance was a temporary variation, or a more permanent change.

If the exceedance repeats, and by an amount that indicates it is unlikely to be caused by natural variability, a search for the cause should be conducted in the vicinity of the affected site, particularly if the exceedance is for turbidity, a recent satellite image of the site will be obtained to help identify the source of sediment run-off.

If the cause of the exceedance is found a remediation plan will be prepared and implemented.

If a search does not reveal a cause, monitoring at the nearest BCH site should be conducted along with the relevant reference site, for comparison to determine if the exceedance has impacted the nearby BCH.

The exceedance will be reported in the annual marine monitoring report and the next ACAR.

Sub-Tidal Temperature Loggers

The sub-tidal water temperature loggers first deployed in November 2019, will continue to monitor water temperatures until the tenements are relinquished. They will provide secondary data in the event of monitoring anomalies, and particularly in the event of significant coral mortality or damage.

Marine Management Plan monitoring sites

Benthic communities and habitat monitoring will be conducted each year post closure as part of the annual marine monitoring campaign until the tenements are relinquished. The monitoring method used will be in accordance with the MMP.

It is anticipated that with the cessation of mining and completion of marine and terrestrial rehabilitation, the risk of mining induced stressors impacting local benthic communities will be eliminated and excluding oceanic warming events, both the test and reference habitat monitoring sites should continue to be species diverse and maintain ecological integrity.

Remedial Action

In the event of post monitoring coral analysis identifying a loss of coral cover at a test site, which is not reflected at the relevant reference site, and is not the result of an oceanic warming event, DWER is to be notified within two days.

If the change is identified while monitoring is being conducted, access to previous images of the same site, will be available, and will be compared to the current site to quantify the size of the loss and the species. If the comparison shows a clear decline the nature of the cause for the decline should be identified (e.g. sedimentation or direct impact).

If the coral loss has been caused by the presence of sediment, a recent satellite image of the site should be arranged to identify a sediment run-off point source.

If the decline appears to be the result of direct physical impact or interference, an investigation will be implemented to identify any marine activities close to the impacted site, and the specific mechanism that caused the damage.

Sediment Quality Triennial Monitoring

A round of sediment sampling will be included in the annual marine monitoring campaign one year post closure. It is anticipated that with the cessation of mining and completion of marine and terrestrial rehabilitation, contamination pathways to the marine environment will no longer exist. However, an accurate positioning fix will be taken at each sampling site, so it can be located again if necessary. If all sites are clear, the triennial sediment quality monitoring will be discontinued.

Remedial Action

If sediment quality trigger criteria are exceeded at a test site, DWER will be notified within two days, and an assessment will be made of the ecotoxicological risk. A recent satellite image of the site should be obtained to assist in the visual identification of a sediment run-off point source.

If the contamination is shown to be ecotoxicological an additional sediment sampling campaign must be undertaken to ascertain the extent of contamination and establish whether any benthic impacts have been caused adjacent to the contaminated sediment site.

If the source of the contamination has been identified, a plan will be developed and implemented to eradicate, contain or mitigate that source.

The investigation and management measures taken will be reported in the annual marine monitoring report and the ACAR. A further round of sediment sampling will be undertaken in conjunction with the marine monitoring campaign in the second-year post closure to confirm all sites are clear.

Invasive Marine Species Triennial Monitoring

Invasive marine species (IMS) collectors will be deployed during the one-year post closure marine monitoring campaign and retrieved during the second-year post closure campaign. It is anticipated that with the cessation of mining, visits to Koolan Island by foreign ore carriers, will also cease, significantly diminishing the likelihood of invasive marine species being transported to the local marine environment.

If the analysis of the collectors shows them to be clear, the triennial monitoring for IMS will be discontinued.

Remedial Action

If an invasive species is detected, DPIRD will be notified and shown records within 24 hours, DWER will also be notified, within two days.

A plan to quantify and eradicate the identified species will be developed and implemented with guidance from DPIRD.

The Traditional Owners will also be notified of the presence of the invasive species, and updated appropriately as the eradication plan is developed and implemented.

IMS collectors will be deployed once the eradication plan has been implemented, and retrieved during the third year post closure monitoring campaign.

Coral Rehabilitation Monitoring

In order to meet Ministerial Conditions 7.15 and 7.16 and offset coral loss at Arbitration Cove, a coral rehabilitation plan was developed in consultation with DWER and implemented in the waters of the Canal on the south side of Koolan Island.

Annual monitoring will track the progress of the rehabilitation and provide data to enable the modelling of the rehabilitation trajectory.

Remedial Action

If aspects of the rehabilitation fail an investigation will be conducted to identify the cause and ascertain whether the failure was specific to the individual or species or the result of a mechanism that could continue impact rehabilitation or native benthic habitat.

The coral rehabilitation monitoring will be conducted each year post closure in conjunction with the annual monitoring of BCH sites and will continue until the tenements are relinquished.

If area of the failed rehabilitation is relatively small in relation to the total area of rehabilitated coral, it may not be necessary to conduct any remediation.

If the investigation shows that the area of failed rehabilitation is too large in relation to the total area or that the impact was caused by a vector that could continue to impact both rehabilitated and native benthic habitat, a plan will be developed in consultation with DWER to eradicate or mitigate the cause of the failure and replace the lost rehabilitation.

Progress of the remediation measures will be assessed by the following years monitoring.

22.3 Groundwater Monitoring

22.3.1 Methodology

Groundwater Monitoring is required to understand the chemical impacts to groundwater resources due to mining. Groundwater Monitoring has been undertaken throughout the duration of mining and there is a good understanding of the chemical composition of groundwater prior to mining and during operations.

Groundwater Monitoring will have three main requirements:

- Field Analysis will comprise field instrument measurement of physicochemical properties (EC, pH, DO, temperature and salinity).
- Groundwater sampling using a recognised methodology and broad compliance with AS/NZS 5667.11:1998 Water Quality – Sampling - Guidance on Sampling of Groundwater
- Submission of groundwater samples to a NATA accredited laboratory under a chain of custody for chemical analysis.

The operational suite of analysis is outlined in **Table 52**.

Table 52: Operational Groundwater Monitoring requirements

Table 3.4.1: Monitoring of ambient groundwater quality				
Monitoring point ¹	Parameter	Units	Averaging period	Frequency
M1	Standing water level ²	m(AHD)	Spot sample	Annually
M3	pH ²			
M4	Electrical conductivity ²	µS/cm		
M5	Total Recoverable Hydrocarbons	mg/L		
M6	Hardness (as equivalent CaCO ₃)			
M9	Total Alkalinity (as CaCO ₃)			
M10	Total Nitrogen			
	Total Phosphorus			
	Bicarbonate			
	Carbonate			
	Nitrate			
	Sulfate			
	Aluminium			
	Arsenic			
	Barium			
	Boron			
	Cadmium			
	Calcium			
	Chromium			
	Copper			
	Iron			
	Lead			
	Magnesium			
	Manganese			
	Mercury			
	Molybdenum			
	Nickel			
	Potassium			
	Selenium			
	Sodium			
	Zinc			

Full details of analysis are outlined in the Koolan Island Operating Licence (L8148/2006/4).

Rationalisation of the suite of analysis is required prior to commencement of closure monitoring, however, to ensure completeness the full suite of analysis will be undertaken until such point that potential contaminants of concern can be ruled out.

22.3.2 Reporting

A groundwater report will contain the following information at minimum:

- Sampling date,
- Sampling personnel,
- Sampling methodology,
- Decontamination procedures,
- Quality assurance procedures and controls,
- Any variance from the sampling plan,
- A copy of sampling field sheets,
- A copy of signed and completed chain of custody documentation,
- A signed and completed certificate of analysis.

A new groundwater sampling report will be generated after each post closure groundwater monitoring event and all statutory report will be completed in addition to the groundwater report.

A report may include a comparison of groundwater chemical composition to relevant guidelines, or this may be completed additionally to the groundwater sampling report.

22.3.3 Remedial Action Trigger

A tiered risk-based approach will be undertaken to determine the applicability of the post closure land use based on the chemical composition of the groundwater. The risk assessment will progressively remove potential contaminants of concern, once a contaminant of concern has been extinguished it will not be included in the next tier and will be considered suitable for the proposed post mining land use.

1. Application of a tier 1 risk guidelines

It is likely that groundwater will be extracted as potable water regardless of the post closure land use. Therefore, the use of the Australian Drinking water guidelines (ADWG) 2011 (NHMRC & NRMMC, 2011) are likely the most applicable guidelines. However, groundwater extraction for drinking is likely to occur at specific extraction points and therefore the guidelines will only be applicable at those points where exposure can occur.

A secondary guideline will need to be applied to other extraction points, this will be dependant on the agreed post mining land use. It is premature to apply specific guidelines, and therefore risk, to receptors when the intended use of groundwater is ill-defined.

2. Comparison of groundwater quality to pre-mining conditions

Any analytes that exceed the guidelines will be compared to the baseline groundwater concentrations, if the post closure concentrations are within two (2) standard deviations of the pre-mining concentration these are considered to be unimpacted by mining and therefore not require further analysis or remediation.

3. Development of tier 2 risk guidelines – Site specific target levels

Should any analytes fail both previous tests a tier 2 risk assessment will be undertaken to understand the risk quotient of the analyte of concern, this will determine based on local conditions and specific toxicological data if the analyte is suitable for the proposed post closure scenario.

22.3.4 Remedial Actions

Should any analytes remain above the risk threshold KIO will implement further measures to either determine the water is suitable for the post closure usage, actively manage the water via a site management plan/interest only deposited plan or actively remediate to improve water quality.

The exact measures will be developed based on the remnant risk and analytes present to ensure the most efficient and effective remedial strategy.

22.3.5 Expected Timelines

At the cessation of mining and once the licence to operate has ceased monitoring will be undertaken annually. Groundwater monitoring will be undertaken at approximately the same time each year to allow trend analysis.

The monitoring is expected to continue for a minimum of 3 years post closure.

22.4 Rehabilitation Monitoring

22.4.1 Methodology

Rehabilitation monitoring includes both vegetation monitoring, including fauna habitat assessment, and erosion and stability assessment. All methodologies outlined below include the assessment of all these factors.

The currently industry standard is to use ecosystem functionality assessment (EFA) to understand if the system is equilibrating towards one like the natural environment. However, there are some key limitations that need to be considered when undertaking monitoring into closure. The key one is the remote reality of Koolan Island means that on ground monitoring for EFA is difficult and presents a health and safety concern. For this reason, two assessment options are presented and will be trialled side by side to understand the best options for closure:

Ecosystem Functionality Assessment

EFA is the current industry standard and there is a long history of EFA on site. For this reason, the trends are well understood and lineage throughout mine life is strong. The downside is that the further into mine closure the operation progress the less site support that will be available and therefore available resources scarce.

If EFA is the selected methodology it will be required to meet the methodology outlined in Landscape Function Analysis: Procedures for Monitoring and Assessing Landscapes With special reference to Mine sites and Rangelands (Tongway, D. & Hindley, N., 2004).

Spatial Monitoring

Spatial monitoring uses various techniques to map, identify and extrapolate data into usable metrics. To successfully interpret data the spatial data collected is analysed by artificial intelligence and machine learning technologies to identify key rehabilitation indicators, including vegetation metrics, erosion and stability metrics and temporal trends.

To ensure the software used to interpret the data is correctly calibrated it is ground truthed by botanists on ground. The system also uses all data collected from all sites to ensure that the machine learning has the largest dataset possible to provide the best results.

KIO has engaged Spectrum Ecology and Spatial to undertake spatial analysis and ground truthing in a multi-year trial. At the end of the trial period a final monitoring method will be selected to continue post closure.

22.4.2 Reporting

LFA/EFA has a long-standing reporting structure. It uses a lineage of results to show a trend in rehabilitation, this can then be compared to closure outcomes. The LFA/EFA report will be generated for each monitoring event. As landforms meet closure criteria a final closure report will be written to progressively relinquish monitoring requirements.

The exact reporting methodology has not been defined for the spatial monitoring. This will be investigated and advanced during the three year trial phase. Without a standard reporting template, the results will initially be directly transcribed into the MCP.

22.4.3 Remedial Action Trigger

Where a rehabilitation indicator moves away from the target, which is counter to a reference site for the same indicators over the same time period, for three monitoring events in a row, rehabilitation will be considered to be failing and require remedial action. The failure needs to be seen on a scale that can be considered representative of the landform, rather than a subset of the landform.

For example, if vegetation canopy cover across a rehabilitated feature is showing a declining cover percentage for three years in a row but the analogue/reference site shows increasing cover percentage for the same three reporting periods then remedial actions will be advanced.

Alternatively, if a landform has six (6) monitoring points and a single monitoring point is trending away from both closure outcomes and analogue remedial actions are not required as the landform is considered to still be projecting successful rehabilitation. In this instance remedial actions will not be automatically be triggered, however, KIO may undertake spot remediation in these instances.

22.4.4 Remedial Actions

Remedial actions will include, but not limited to:

- Corrective earth works,
- Construction of engineered environmental management structures (e.g. surface water management features),
- Covering/armouring of landforms,
- Direct seeding,
- Direct watering.

The exact remedial action will be developed on a case-by-case basis.

22.5 Erosion Monitoring

Erosion monitoring is a subset of both EFA/LFA and spatial monitoring, and therefore will follow the same procedure.

22.6 Northern Quoll Monitoring

Northern Quoll Monitoring is planned to be undertaken in accordance with the Northern Quoll Management Plan. A summary of the sampling methodology is provided below with full details outlined in the Koolan Iron Ore Northern Quoll Management Plan (Mount Gibson Iron, 2011).

22.6.1 Methodology

Annual Northern Quoll Monitoring is conducted in accordance with the *Annual Northern Quoll Monitoring Procedure* which requires:

- Annual monitoring to be undertaken in April to allow for effective comparison of results over time.
- A total of 300 Elliot Traps to be set out, with each trap to be open for a minimum of five nights. Traps to be set out in transects of either 25 or 50 traps, spaced at 25 metres apart.
- Utilisation of the same transects each year (where available and accessible) – current transects are shown in **Figure 135**.
- Where transects are not available and accessible new transects will be identified to replace them, future replacement transects will be determined using the following criteria:
- Transects will be located to maximise the number of traps. Any shortfall in trap numbers will be augmented by additional transects.
- Transects will be located in areas with a low likelihood of interference by mining operations.
- Replacement transects will have safe access i.e. existing tracks.

The purpose of annual monitoring is to determine potential impacts to the Northern Quoll.

22.6.2 Reporting

An annual survey report will be produced outlining the methodology, results and analysis of results.

22.6.3 Remedial Actions

Monitoring is expected to extend 5 years into closure. A statistical population improvement or steady trend indicates successful results and therefore over 5 years would indicate no further monitoring is required. A statistical decline in population would trigger a review and actions to be taken to improve population dynamics.

The Northern Quoll Management Plan makes the assumption that there are no factors impacting quoll populations other than mining. Should another external impacts arise (e.g. Cane Toads) the management of Northern Quolls would need to be reviewed.

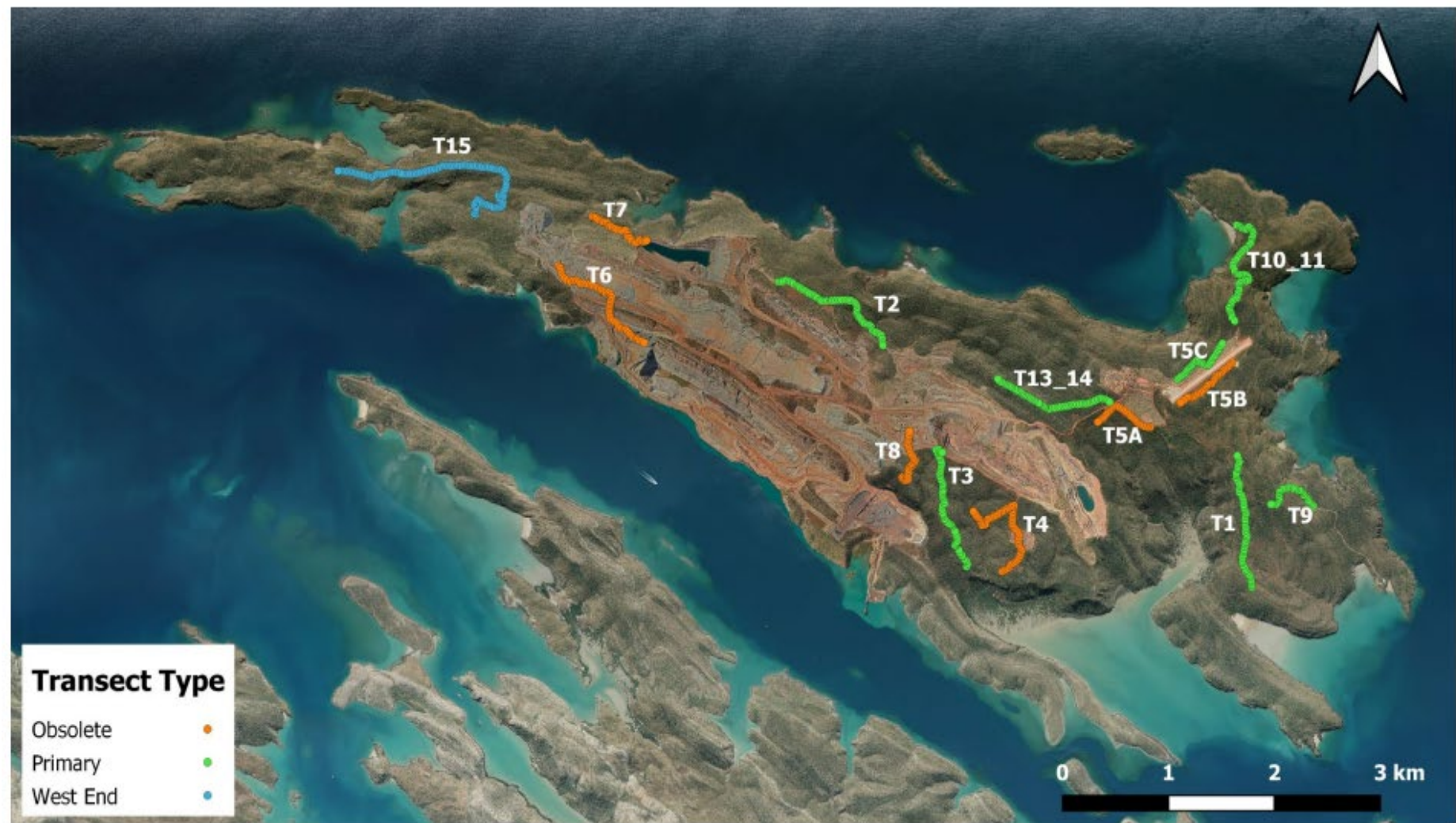


Figure 135: Quoll monitoring Transects.

22.7 Monitoring Summary and Timeline

A monitoring timeline is presented in **Table 53**. This outlines the expected monitoring frequency post closure. The timeline will be reviewed periodically and will be extended or truncated where resulting dictate that action.

Table 53 Post closure program summary of methodology for monitoring, completion criteria and targets

Monitoring Type	Sub-type	During life of Mine	End of mine life	Post Closure									
Year		-1	0	1	2	3	4	5	6	7	8	9	10
Geotechnical	As built Audits				1								
	Zone of Pit instability	2											
	Abandonment Bund Audit				3								
	Seawall Erosion Monitoring												
Marine	Water Quality												
	Coral												
Groundwater													
Rehabilitation	Vegetation												
	Erosion												
Fauna	Northern Quoll												

Notes:

- 1 – This point represents the expected date that all as build audits will be complete for all applicable landforms.
- 2 – Completed prior to construction of Abandonment bunds
- 3- All abandonment bunds expected to be completed and in place, except where pit access is required for closure requirements.

Key

Colour	Descriptor
	Periodic / Ongoing - Biennially
	Periodic / Ongoing - Annually
	Periodic / Ongoing - Biannually
	Once off
	Operational Monitoring

23 FINANCIAL PROVISIONING FOR CLOSURE

MGX has used industry standard rehabilitation costing models to calculate closure and rehabilitation provisions for KIO. The closure cost estimates are reviewed annually, at both a site and corporate level, and are updated based on revised costs from KIO operations and relevant rehabilitation activities. KIO's closure provisions cover decommissioning and rehabilitation costs scheduled to be incurred after mining has finished at the site. Rehabilitation and closure activities undertaken during the mining phase are funded from operating budgets. KIO recently undertook a review of the closure costs for provisioning in June 2024. The review was conducted following the International Financial Reporting Standards (**IFRS**) and the scope of this review consisted of the following:

- Review the existing MCP to identify key closure and rehabilitation requirements and commitments.
- Consider the options in MCP and assess key features for rehabilitation and closure, and discuss the closure and rehabilitation requirements and capability with relevant personnel. Access any unit costs particular to the operation that are relevant to the closure cost estimate; and
- Prepare a set of assumptions to base the closure and rehabilitation costs.

This review was based on an extensive database of closure costs including actual (contractor) and estimated "contractor equivalent" costs from rehabilitation at other mine sites. The cost estimate has been developed from bottom-up first principles (capital and operating costs) and calibrated against actual rehabilitation earthworks contractor rates from a rehabilitation cost database.

The closure cost provisioning is described in greater detail below. Internally, an annual review is also conducted by a third party.

23.1 Methodology and Key Assumptions

The following matters are considered in the review:

- Earthworks cost associated with rehabilitating disturbed footprints including waste rock landforms, stockpiles, run of mine pads, open pits including abandonment bunding, all associated infrastructure footprints including ore processing plant sites, laboratories, reagent storage facilities, workshops, administration, stores, warehouse, camp, airstrips, lay downs, water containment facilities, drainage infrastructure, water supply facilities, pipelines, storage sheds etc.
- Costs were included for maintenance and repair earthworks during the passive post-closure period as the rehabilitation set up and stabilizes. The conceptual footprint aligned with Closure Option 2.
- Decommissioning and demolition costs for dismantle and removal of all infrastructure from the site, breakup and burial of demolition rubble, rubbish and non-recyclable materials.
- Costs associated with contamination investigations, removal and reporting.
- Consultant costs associated with the active and passive closure periods (note that consultant costs needed during operations have been excluded from the LOM estimate).
- Mobilization and demobilisation of equipment and personnel needed during all closure periods.

- Project management costs including engineering, procurement, management and supervision, QA/QC, owners' costs, travel (FIFO) and accommodation costs associated with each of the closure periods.
- Costs associated with all contracted services obligations such as power supply contract agreements, land access and tenure agreements, and any other contractual commitments including stakeholder agreements and communications contracts, and supply contracts required during the various closure periods including fuel, general supplies, camp, and commute costs etc.
- Stock inventory and asset disposal costs.
- Environmental and mineral tenement license monitoring and reporting obligations during the closure periods.
- Corporate costs including insurances, levies, equipment leasing payments, and overhead costs.
- Employee costs including salaries and wages and on-costs (workers compensation, payroll taxes, annual and long service leave obligations, severance and retrenchment obligations, superannuation obligations etc.).

Likely contingencies that may be applied to any and all of the costs.

The cost estimate is based on assumptions. The key assumptions relating to mining were:

- In 2024 the resource would be mined out in the next 2-3 years and the closure decommissioning, demolition and rehabilitation works execution phase will commence thereafter (noting that the estimate is based on the current disturbance footprint as per IFRS requirements).
- Topsoil stockpiles removed ahead of mining operations have been found and stockpiled in an appropriate manner and are available in each domain for rehabilitation purposes.
- Where topsoil and growth media are to be used for rehabilitation purposes, revegetation seeding is assumed to be applied to at least 95% of the area or as specified.
- Low grade ore stockpiled during mining operations will be processed prior to final closure. The cost estimate allows for rehabilitation of the low-grade stockpile footprint.
- Waste rock landforms are constructed as per design and any problematic materials have been fully integrated into the landforms as per DEMIRS requirements and commitments.
- Assumed required earthworks for closure can be completed within the scope of the current approvals, or if approvals are needed, they will be accommodated within any LOM footprint approval amendments.

The key infrastructure cost assumptions included:

- costs associated with decommissioning, demolition, and removal off-site of all ore processing and handling plant and equipment, and associated infrastructure and buildings including all infrastructure support related components (power, water, buildings...).
- closure and rehabilitation of structures and building foundations, including concrete slab break-up and removal for burial within the Main Pit dewatering settlement pond and breaking down (using excavator mounted shears) and removal of scrap steel to an appropriate landfill site or off site depending on the prevailing scrap metal price at the time of the works.

- clean up and removal of contaminated material for treatment within the bioremediation facility prior to its final rehabilitation. The key source of potential contamination is assumed to be hydrocarbons as all earlier removal and remediation of asbestos has been completed.
- closure and rehabilitation of all infrastructure footprints including storage areas, lay downs, landfills; borrow pits, go-lines, car parks...
- removal of the accommodation village apart from a limited number of accommodation units and the dry mess and kitchen facilities needed for use during the passive post closure monitoring period and then assumed to be agreed to be left for the benefit of another entity at the end of closure.
- Retention on site of a vessel and facilities to enable marine post-closure monitoring.
- Decommissioning and removal of all potable water infrastructure including the water treatment plant and water storage tanks (one tank to remain for rainwater storage for post closure monitoring period).
- The cultural centre will be retained for the continued use and benefit of and management by the TO's.
- The barge landing area and the adjacent laydown area is to be cleared of assets and infrastructure, cleaned and prepared for retention once all closure activities have been completed and all equipment is demobilised. The retained facilities are for use during the passive post closure monitoring period and prospectively for another entity once relinquishment is achieved.
- Barging for mobilisation and demobilisation of all equipment and infrastructure has been based on current contractor rates for marine travel to Derby.

Other key assumptions are:

- Revegetation costs are based on typical native species of the Western Kimberley. It is estimated that a total of 3,800kg of native seed will be required for revegetation across all disturbed areas of the project and is based on a 8 kg/ha dispersal rate.
- No salvage value is ascribed to infrastructure items for the purpose of provisioning.
- No re-sale value or ongoing management cost is ascribed to any retained accommodation units and support infrastructure, the cultural centre, or adjacent port laydown area after lease relinquishment.
- Marine barging costs, diesel fuel costs (ex-rebate), fly in fly out costs, and camp costs are as per current contracts.

23.2 Details on Closure Cost Provision

The following section provides detail for key cost elements included in the review and draws on the mine's footprint:

23.2.1 Landforms

The review assumed that all ore stocks will be removed and processed for shipping and the only requirements will be to rehabilitate the stockpile footprint to establish a stable surface. It was assumed that the soils beneath the stockpiles will not require covering with suitable growth media or topsoil but will be capable of re-establishing vegetation across the footprints once drainage works and deep ripping has been carried out.

23.2.2 Stockpile rehabilitation tasks include:

The cost review also assumed some additional costs to ensure the integrity and stability of the landforms are maintained during the post-closure monitoring period. This allowed for weed management and erosion repairs.

23.2.3 Infrastructure Facilities

The key infrastructure facilities include ore processing facilities, ship load-out facilities, the mining operations centre, workshop, and stores, and the accommodation village and airstrip. Other operations support infrastructure is in place and includes power, water supply, wastewater treatment, fuel storage, landfill, and laydowns.

23.2.4 Mining Infrastructure

The review looked at each pit as it currently exists and for making the pits safe as per DEMIRS requirements. This included installing abandonment bunding around the pits where there is a risk of inadvertent vehicle access. The guidance on abandonment bunding has been used to calculate the costs required to build the bunds.

In accordance with the currently proposed post mining land use, Preston Consulting took into account the costs associated with cutting a channel into the seaward side of the Main Pit according to the DHI (2019) concept design.

23.2.5 Water Containment Facilities

This includes the Main Pit dewatering treatment / settlement pond and a small turkey's nest dams. All works are assumed to be undertaken during the closure period and the ponds are dry and free of any sediment that would require special contamination treatment.

23.2.6 Groundwater Infrastructure

This included all dewatering and production bores and monitoring wells as well as removal of any water pipelines and associated pumping infrastructure. The review included for the removal of exposed bore-hole casings and providing suitable plugs and caps and minor rehabilitation works at each of the bore sites as well as decommissioning and removal of pipelines and associated infrastructure off site.

23.2.7 Roads and Tracks

This covers closure and rehabilitation of haul roads, access roads, and tracks across the site. Many of these roads are expected to be required for post closure monitoring purposes. The cost review has assumed that roads on the site will be required, but the footprint of the roads will be narrower to suit the LV traffic expected after closure.

Earthworks included de-compaction, and re-contouring of the road surfaces to re-establish natural drainage across the roads, culvert removal (if any), topsoil haulage and placement were required, and removal of any redundant road safety furnishings.

23.2.8 Post Closure Monitoring

Post-closure monitoring is required to ensure that the agreed completion criteria has been satisfied. The monitoring methodology and schedule is provided in Section 24

23.2.9 Management

During the closure period personnel will be required to manage, supervise and provide technical support. This was allowed for in the review along with other closure obligations during this period. Excluded from the review was corporate staff, stakeholder engagement, tenement holding, tenement rents and shire rates. The following was allowed for;

- Allowance (excluded from the provision) for regional environmental support over the closure and post closure periods (10 years).
- Work over a 79 week period as follows:
- project manager or site coordinator to assume the role of registered manager for the site.
- A senior engineer responsible for contractor management, supervision, design, engineering and alternate registered manager.
- A senior environmental officer responsible for all environmental aspects of the site including QA/QC, monitoring and supervision.
- An administration support responsible for all administration activities including liaison with corporate purchasing, HR, and accounts.
- A safety officer/medic responsible for all safety aspects of the site.
- An allowance for two electrical and two mechanical maintenance personnel to maintain all services during the active closure period.
- An allowance for a closure earthmoving contractor workforce of including supervision, maintenance personnel and operators.
- An allowance for a demolition contractor workforce of 8 personnel including supervision, maintenance and operators spread over two demolition contract of works periods (24 weeks).
- Allowance for light vehicle maintenance costs for 3 vehicles including the site ambulance.
- An estimate for all camp and FIFO costs including power and water supply, catering for all project personnel and contractors, and weekly commute flights.

The review also included technical expertise and consultant support on aspects such as:

- Annual environmental reporting requirements.
- Preparation of the "as-built" and engineering sign-off of final rehabilitated landforms.
- Preparation of the relinquishment reporting requirements at the end of the post closure monitoring period.
- Review and analysis of the ground and surface water monitoring data and preparation of the monitoring reports undertaken biennially.
- Review and analysis of the fauna habitat monitoring data and preparation of the fauna monitoring reports undertaken biennially.
- Review and analysis of the benthic marine monitoring and preparation of the monitoring reports undertaken biennially.

23.2.10 Contingency

For the review a contingency of 10% was applied to allow for any unforeseen risks or events that may be encountered during the execution of closure activities. Based on the cost estimate methodology described above, MGX provides for the costs of closure in its accounts and reports them consistent with the requirements of IFRS. By reviewing the cost estimate annually, the addition of new areas of disturbance, changes in rehabilitation techniques and costs are

incorporated into the closure cost estimate and provision rate. The provision account is preserved for mine closure costs with on-going mining, landforming and rehabilitation costs charged to operating accounts.

23.2.11 Auditing

The closure cost is updated each year to reflect changes from the previous year. The updated closure costing is audited by third-party financial auditors and mine closure specialists. This costing is sanitised, and the closure liability is reported to the market as per ASX requirements.

24 MANAGEMENT OF INFORMATION AND DATA

Closure, environment and community records are maintained by KIO to capture baseline data, mining records, logistical and site procedures within a centralised framework for the effective management of information and data relevant to closure. Figure 136 shows a schematic flow diagram that represents the process and methodology for flows between three tiers, including:

1. Information base, e.g. baseline, logistical data;
2. Closure planning and implementation by domain; and
3. Evaluation (3a) and compliance (3b).

The first tier is fed by existing data, records and procedures of which selected themes (represented by orange boxes) are relevant to the second-tier domain specific closure planning and implementation. The third tier represents the small-scale research; monitoring and trials ran in parallel with large-scale closure works for each domain. The information is currently being used to evaluate progress towards closure goals and is an important stimulus for adaptive management and remediation works by building on the existing information base throughout LOM. Reporting and compliance will be ongoing to demonstrate progress towards closure and that final land-use is in line with the agreed stakeholder standards and completion criteria.

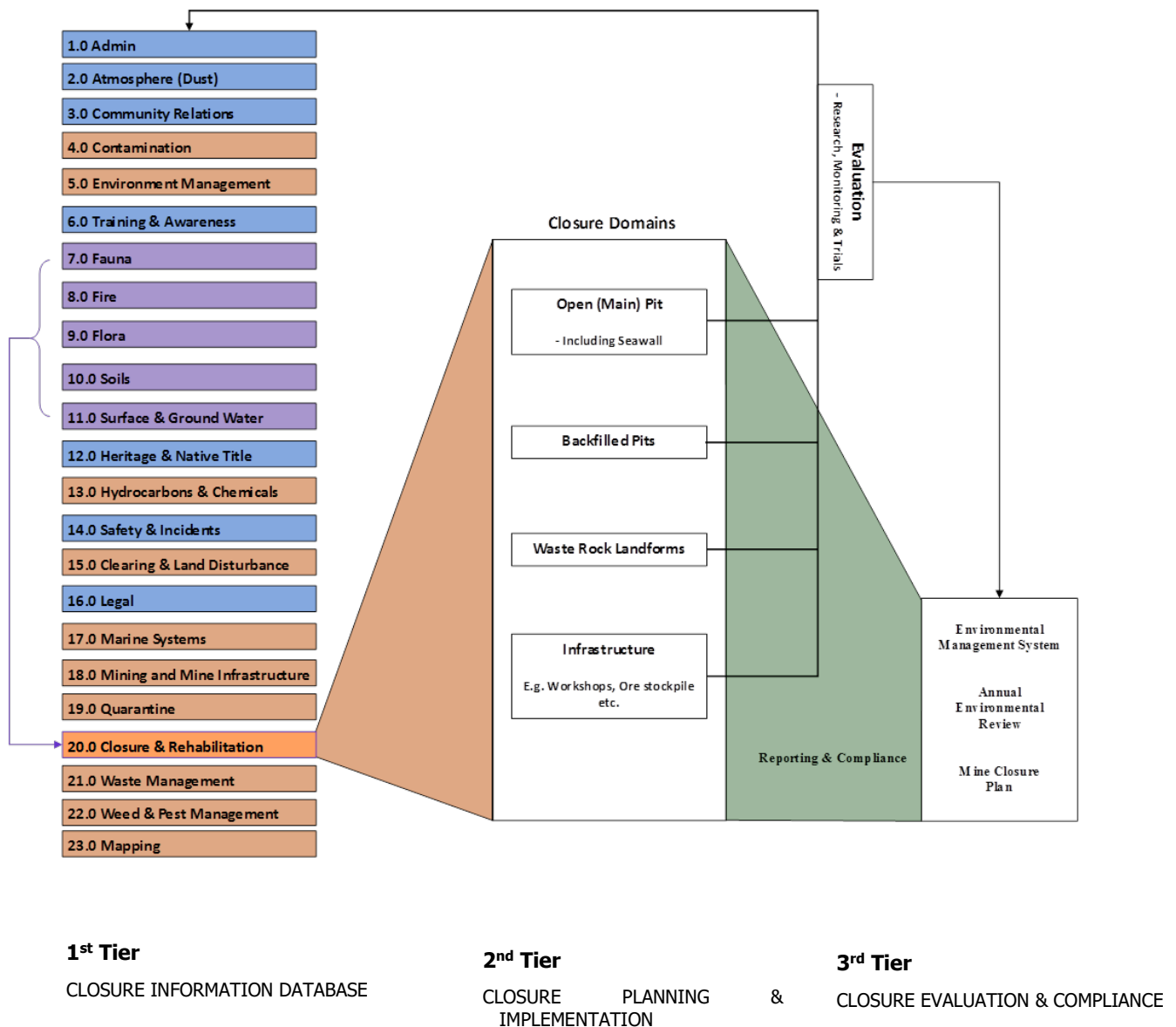


Figure 136: Schematic showing management of information at KIO

25 REVIEWED MINE CLOSURE PLANS

This mine closure plan is the 7th revision of the MCP. The previous revisions are specified in **Table 54**.

Table 54 MCP Revision History

Registration ID	Revision	Document Dated	Comments
NA	1	30-Nov-05	Submitted to EPA to meet Ministerial Statement conditions. Authored by Aztec Resources
NA	2	1-Jul-07	Submitted to EPA to meet Ministerial Statement conditions.
36839	3	28-Aug-12	Submitted as Mount Gibson Iron Limited.
56401	4	14 Sept-15	This is the most recently approved Mine Closure Plan
82735	5	23-Sep-19	Revision 5 was superseded prior to approval.
82735	6	25-May-23	Revision 6 was provided to DMIRS to supersede Revision 5 as part of the same assessment.
This Submission	7	31-Jan-25	Complete overhaul of document as outlined in Table 55

The entire MCP received a holistic update since revision 6. All sections were reviewed to allow for strict compliance with the Statutory Guidelines for Mine Closure Plans (Department of Mines, Industry Regulation and Safety, 2020), readability and to remove any duplication.

The specific wording of the Statutory Guidelines for Mine Closure Plans (Department of Mines, Industry Regulation and Safety, 2020) asks for a revision table indicating how comments were address since the last revision of the mine closure plan. This table has been omitted as KIO has not received comments for review since revision 4 of the MCP. The comments received for revision 4 were implemented in Revision 5.

Table 55: Changes from approved Mine Closure Plan

Section Name	Changes from Revision 6
Project Summary	Minor updates to align with KIO / MGX internal changes since last revision.
Identification of Closure Obligations and Commitments	Minor changes and review of new/revised approvals and addition of revised commitments.
Stakeholder Engagement	Update of engagement register with contemporary information.
Baseline and Closure Data and Analysis	Edited for succinctness and readability. Section numbers revised.
Analysis of Closure Data	Collation of data from across the MCP to provide a single source of analysis data and remove internal duplication
Post Mining Land use	Revised based on updated engagement.
Closure Risks Assessment	Updated with revised KIO/MGX risk assessment process
Closure Outcomes and Completion Criteria	Minor revisions for clarity and remove repetition between completion criteria.
Closure Implementation	Collation of data from across the MCP to provide a single source of analysis data.
Closure Monitoring and Maintenance	Update to improve clarity and remove internal duplication.
Financial Provisioning for closure	Minor updates and edits
Management of Information and Data	Minor updates and edits
Reviewed Mine Closure Plans	New Section

A table documenting how the knowledge gaps identified in the prior revision of the mine closure plan have been addressed, as well as any new gaps identified is presented as **Table 33** in Section 17.6.

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APPENDICES

Appendix A. Closure Obligations Register

1 Legislative Requirements

KIO has identified the general legislative obligations relevant to closure of the Project within **Table 1**.

Table 1: State Legalisation Closure Obligations

Legislation and reference	Requirement relevant to Closure
<i>Mining Act 1978</i> . Part IV (84AA)	A mine closure plan is required to be approved by the Department and reviewed every 3 years, or as specified by the Department.
<i>Environmental Protection Act 1986</i>	Specifies provisions for issuance of Closure Notices.
<i>Mining Act 1978</i> . Part III (1)(20)(3a)	Make safe all holes, pits, trenches and other disturbances on the surface of the land which are likely to endanger the safety of any person or animal.
<i>Mining Act 1978</i> . Part III (1)(20)(3b)	Take all necessary steps to prevent fire and damage to trees or other property.
<i>Mining Regulations 1981</i> . Part V, (6)(97)	Avoid activity that obstructs any public thoroughfare or undermines any road, railway, dam or building in such manner as to endanger the public safety.
<i>Mining Regulations 1981</i> . Part V, (6)(98)	The proponent shall not allow detritus, dirt, sludge, refuse, garbage, mine water or pollutant from the tenement to become an inconvenience to the holder of any other mining tenement or to the public, or in any way injure or obstruct any road or thoroughfare or any land used for agricultural purposes.
<i>Environmental Protection Act 1986</i> . Part V, (49)	Prevent conducting activities that may emit unreasonable emission or transmission of noise, odour or electromagnetic radiation which unreasonably interferes with the health, welfare, convenience, comfort or amenity of any person.
<i>Environmental Protection Act 1986</i> . Part V, (51)	The proponent shall not affect some or all of the native vegetation in an area, including the draining or flooding of land, the burning of vegetation, the grazing of stock, or any other act or activity, that causes: (e) the killing or destruction of; (f) the severing of trunks or stems of; or (g) any other substantial damage to, some or all of the native vegetation in an area without the relevant clearing permit conditions in place.
<i>Environmental Protection Regulations 1987</i> . Part III, (5L)	The proponent shall provide notification of details of any discharge of waste during closure activities.

Legislation and reference	Requirement relevant to Closure
<i>Environmental Protection Regulations 1987</i> . Part VI, (14)	Tyres are to be disposed in accordance with Regulation 14: Tyres may be disposed of by burial under a final soil cover of not less than 500 mm — (a) in batches separated from each other by at least 100 mm of soil and each consisting of not more than 40 cubic metres of tyres reduced to pieces; (b) in batches separated from each other by at least 100 mm of soil and each consisting of not more than 1 000 whole tyres.
<i>Environmental Protection Regulations 1987</i> . Part VIII, (20B)	The proponent shall continue the reporting of monitoring results during the closure period.
<i>Contaminated Sites Act 2003</i> . Part I, Section 11 <i>Contaminated Sites Regulations 2006</i> . Part II (6)	The proponent or individuals are to report known or suspected areas of contaminated sites.
<i>Contaminated Sites Act 2003</i> . Part I, (8)	All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.
<i>Contaminated Sites Act 2003</i> . Part III, (23)	Sites classified as Contaminated - Remediation Required as described under the <i>Contaminated Sites Act 2003</i> are to be remediated.
<i>Mines Safety and Inspection Regulations 1985</i> . Part III, (2)(3.11)	Notification of suspension of mining operations must be in writing and include: the name and location of the mine; the number of the lease, tenement or other interest; the name and address of the principal employer at the mine; what mining operations are to be affected, and whether they are to be commenced, recommenced, abandoned or suspended; and the date on which the mining operations are to be commenced, recommenced, abandoned or suspended (as the case may be). the reason for the suspension and the planned duration of the suspension; whether the closure is total or whether access to underground and/or open pit workings is to be maintained;

Legislation and reference	Requirement relevant to Closure
	if underground and/or open pit access is to be maintained, details of the arrangements that have been made for the provision of regular services and emergency services to ensure the safety of employees engaged in maintaining the mine; the measures that have been taken to prevent unauthorised access or entry to the mine; the precautions that have been taken to protect underground equipment and service installations; and any plans required to be prepared under section 88 of the Act.
<i>Mines Safety and Protection Regulations 1985. Part III, (2)(3.16)</i>	The proponent shall secure the site against inadvertent public access.
<i>Mines Safety and Protection Regulations 1985. Part III, (2)(3.16)</i>	The proponent shall design against mine subsidence.
<i>Mines Safety and Protection Regulations 1985. Part III, (2)(3.16)</i>	All buildings and structures are to be removed or secured and the site left in safe condition.
<i>Mines Safety and Protection Regulations 1985. Part III, (2)(3.16)</i>	The proponent shall remove or properly dispose all hazardous substances from the site.
<i>Mines Safety and Protection Regulations 1985. Part III, (2)(16.35)</i>	After the mine is abandoned, rehabilitation sites are to be inspected and monitored at such intervals and in such a way as is approved by the State mining engineer.
<i>Aboriginal Heritage Act 1978. Part IV</i>	Heritage sites are not to be altered, excavated, damaged, concealed or any portion of the site removed in any way, unless granted via Section 16 or 18 under the <i>Aboriginal Heritage Act 1978</i> .
<i>Soil and Land Conservation Act 1945. Part V (32)</i>	The proponent shall take adequate precautions to prevent or control soil erosion, salinity or flooding; or the destruction, cutting down or injuring of any tree, shrub, grass or any other plant on land where land degradation is occurring or likely to occur.
<i>Dangerous Goods Safety Act 2004. Part II (8)</i>	The proponent has a duty to minimise risk during the handling or transporting of dangerous goods.

Legislation and reference	Requirement relevant to Closure
<i>Dangerous Goods Safety Act 2004</i> . Schedule 1. (cl 6 and 7)	When removing dangerous goods from the site, it must be done so in accordance with schedule 1.
<i>Wildlife Conservation Act 1950</i> (16 and 23F)	A person may not take for any purpose, including mine closure activities, protected fauna or flora without a licence, or rare and endangered flora without the written consent of the Minister.
<i>Health Act 1911</i> .Part IV (2) (87)	The proponent shall ensure (stagnant) pools, ponds, open ditches, and drains do not become offensive to the public or allow these areas to become prejudicial to human health.
<i>Health Act 1911</i> . Part IV (3) (95) <i>Environmental Protection (Controlled Waste) Regulations 2004</i> . Part III	Removal of sewerage systems is to be conducted in accordance with Local Government Law and by a licensed contractor in accordance with the <i>Environmental Protection (Controlled Waste) Regulations 2004</i> .
<i>Environmental Protection (Controlled Waste) Regulations 2004</i>	Disposal of asbestos is to be separated, wrapped and labelled and disposed in accordance with Part III,(6)(44)
<i>Environmental Protection (Controlled Waste) Regulations 2004</i>	The proponent is to treat all products listed in schedule 1 of the <i>Environmental Protection (Controlled Waste) Regulations 2004</i> as a controlled waste.

2 Mining Tenement Conditions

The following Mining Tenements have been granted upon which the Project is implemented; M 04/416, M 04/417 and L 04/29. The conditions of each of these tenements have been reviewed and the conditions relevant to closure included within **Table 1**.

Table 1: Mining Tenement Closure Conditions.

Tenement No.	Condition No.	Tenement Conditions:
L 04/29	1/1	Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.
	3/1	Development and operations, as approved by the Inspector, being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.
	22/1	The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.
	23/1	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.
	24/1	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environment Division, DoIR.
	26/1	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environment Division, DoIR.
	28/3	The Licensee(s) submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, mine site environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: March
	30/2	A Mine Closure Plan is to be submitted in the month and year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMP's website: September 2015.
L 04/68	3/1	All topsoil that may be removed ahead of pipelaying operations to be stockpiled for replacement in accordance with the directions of the Environmental Officer, Department of Mines and Petroleum.

Tenement No.	Condition No.	Tenement Conditions:
M 04/416	12/1	On the completion of the life of mining operations in connection with this licence the holder shall: remove all installations constructed pursuant to this licence; and on such areas cleared of natural growth by the holder or any of its agents, the holder shall plant trees and/or shrubs and/or any other plant as shall conform to the general pattern and type of growth in the area and as directed by the Environmental Officer, Department of Mines and Petroleum and properly maintain same until the Environmental Officer advises regrowth is self supporting; unless the Minister responsible for the Mining Act 1978 orders or consents otherwise.
	2/1	All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.
	3/1	All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, Department of Industry and Resources (DoIR). Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DoIR.
	4/1	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program.
	5/1	Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.
	11/1	At agreed intervals, not greater than 12 monthly, the lessee providing a brief report to the Director, Environment, DoIR outlining the progress of the operation and rehabilitation program and the proposed operations and rehabilitation programs for the next 12 months.
	12/1	Prior to the cessation of the exploration/prospecting activity in the designated area, the lessee notifying the Environmental Officer, DoIR and arranging an inspection as required.
	24/1	Prior to the cessation of exploration activity the lessee notifying the Director, Environment, DoIR and the Regional Manager, CALM and arranging an inspection as required.
	25/1	If in the opinion of the Director, Environment, DoIR the exploration operations are causing any damage to or undue interference with living marine resources or their environment on any part or parts of the lease area, the lessee ceasing exploration on such part or parts within 24 hours of notification from the Director, Environment, DoIR.
	30/1	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later respreading or immediately respread as rehabilitation progresses.

Tenement No.	Condition No.	Tenement Conditions:
M 04/417	31/1	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environment Division, DoIR.
	33/1	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environment Division, DoIR.
	36/3	The Lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, mine site environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: March
	38/2	A Mine Closure Plan is to be submitted in the month and year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMP's website: September 2015.
	41/1	Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability.
	42/1	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.
	2/1	All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe after completion.
	3/1	All costeans and other disturbances to the surface of the land made as a result of exploration, including drill pads, grid lines and access tracks, being backfilled and rehabilitated to the satisfaction of the Environmental Officer, DMP. Backfilling and rehabilitation being required no later than 6 months after excavation unless otherwise approved in writing by the Environmental Officer, DMP.
	4/1	All waste materials, rubbish, plastic sample bags, abandoned equipment and temporary buildings being removed from the mining tenement prior to or at the termination of exploration program.
	5/1	Unless the written approval of the Environmental Officer, DoIR is first obtained, the use of scrapers, graders, bulldozers, backhoes or other mechanised equipment for surface disturbance or the excavation of costeans is prohibited. Following approval, all topsoil being removed ahead of mining operations and separately stockpiled for replacement after backfilling and/or completion of operations.

Tenement No.	Condition No.	Tenement Conditions:
	28/1	All topsoil being removed ahead of all mining operations from sites such as pit areas, waste disposal areas, ore stockpile areas, pipeline, haul roads and new access roads and being stockpiled for later resspreading or immediately resspread as rehabilitation progresses.
	29/1	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Director, Environment Division, DoIR.
	31/1	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the Director, Environment Division, DoIR..
	35/4	The Lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, mine site environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programmes for the next 12 months. This report to be submitted each year in: March
	43/1	At the time of decommissioning the mine site and prior to rehabilitation, a further seawall embankment review report by a geotechnical or engineering specialist shall be submitted to DMP. This report should review the status of the structure, and examine and address the implications with respect to site abandonment and operational issues associated with the proposed closure strategy.
	47/2	A Mine Closure Plan is to be submitted in the month and year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "Guidelines for Preparing Mine Closure Plans" available on DMP's website: September 2015
	50/1	Placement of waste material must be such that the final footprint after rehabilitation will not be impacted upon by pit wall subsidence or be within the zone of pit instability.
	51/1	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.

3 Environmental Management Plan Commitments

The Koolan Island Mine and Port Facility has been formally assessed by the Environmental Protection Authority in accordance with the provisions of the Environmental Protection Act 1986. The specific Environmental commitments relevant to closure of the Project from the Environmental Management Plan (EMP) associated with the conditions of mining tenements are contained within **Table 1**. It should be noted that this plan has recently been reviewed and updated. The revised EMP was submitted and accepted by the EPA in January 2015 for the purpose of meeting compliance with schedule 2 of MS715. Tenement conditions continue to refer to the original EMP and for this reason commitments made in both documents have been identified. **Table 2** identifies the commitments relevant in the updated EMP recently accepted by the EPA.

Table 1: Environmental Management Plan Commitments (mining tenure).

EMP No.	Environmental Management Plan:
EMP 05	Disturbed areas will be rehabilitated as soon as practicable to facilitate fauna habitat restoration
EMP 05	Areas that have been disturbed will be checked for rehabilitation progress on a routine and ongoing basis by the Environmental Officer
EMP 08	Topsoil will be stripped and stockpiled, and vegetation debris, logs and leaf litter will be retained for reuse during rehabilitation. Topsoil will be managed in accordance with EMP-12 Topsoil Management.
	Topsoil and vegetation direct returned or stockpiled for later use.
	Vegetation and topsoil direct return or stockpiled in suitable locations.
EMP 11	The Marine Management Plan will include monitoring programmes for benthic communities and marine water quality, define trigger values for key parameters, and identify marine rehabilitation techniques.
	As a priority, topsoil and cleared vegetation will be directly returned to areas being rehabilitated if possible. If this is not possible, topsoil will be stockpiled for later use.
EMP 12	Topsoil and subsoil will be stockpiled separately and replaced in the correct order during construction and rehabilitation.
	Topsoil and vegetation direct returned or stockpiled for later use.
	Progressive rehabilitation of available areas (EMP-17 Rehabilitation).
	The area disturbed and volume of topsoil stripped will be recorded in R015 Topsoil and Rehabilitation Register by the Environmental Officer.
EMP 13	All haul roads and tracks will be rehabilitated on completion of use.
	Topsoil and vegetation direct returned or stockpiled for later use.
	Progressive rehabilitation of available areas (EMP-17 Rehabilitation).
	Where costeans are dug to determine quality and volume of borrow material, vegetation disturbance will be kept to a minimum and backfilled when no longer required
EMP 14	Topsoil stockpiles will be no higher than 1.5 metres and will be located 2 metres from the borrow pit boundary to allow for battering during rehabilitation.
	Borrow pits will have slopes graded to permit safe passage of animals (maximum incline of 20 %).
	The final pit floor will be free draining.
	Rehabilitation will be undertaken progressively or as soon as possible following pit closure.
	The sides of the pits will be battered to a maximum slope of 3H:1V.

EMP No.	Environmental Management Plan:
	Diversion drains and upslope windrows, will be utilised to divert surface water flow from entering the pit causing ponding and erosion. Topsoil will be spread evenly over the pit floor/edges and access track and then ripped on contour to promote runoff infiltrations. Areas will not be driven on after being ripped. Local provenance seed will be broadcast to promote re-vegetation. All available topsoil and vegetation direct returned or stockpiled for later use. Borrow pits progressively rehabilitated as soon as possible following pit closure. All areas disturbed by Aztec will be rehabilitated. Where practicable, disturbed areas will be progressively rehabilitated to ensure that the rate of rehabilitation is similar to the rate of clearing. Long-term visual impact will be minimised by creating landforms which are compatible with the adjacent landscape. Stakeholders will be consulted during the life of mine regarding existing landform / landscape values. Rehabilitation will be undertaken as soon as practicable to facilitate fauna habitat restoration. Habitat niches (including nest boxes) within undisturbed areas will be created and monitored, where feasible and in consultation with DEC, to encourage the relocation and rehabilitation of native fauna. Rehabilitation and closure procedures will include measures to address specific habitat types of listed fauna. Reshaped land will be formed so that it is inherently stable, adequately drained and suitable for the desired long-term use. Where practicable, natural drainage patterns will be reinstated
EMP 17	Compacted surfaces will be ripped to a depth of approximately 300 mm or greater should ground condition and hydrology allow. Cleared vegetation and topsoil will be utilised in rehabilitated areas. Disturbed areas to be recovered with topsoil to a depth of 100 mm. Local provenance seed and plants will be utilised to boost flora density. Management of noxious or environmental weeds in rehabilitated areas will be in accordance with EMP-06 Weed and Pest Management Aztec will monitor and manage rehabilitated areas until such time as criteria for relinquishment are met, in accordance with relevant government agencies. Trial rehabilitation methods will be conducted during the life of mine to ensure future rehabilitation is optimised. Rehabilitation implemented in adherence to the ANZMEC principles for mine rehabilitation. Progressive rehabilitation of disturbed areas. Monitoring of rehabilitated areas at set intervals using standard sampling techniques. The Environmental Officer will routinely inspect rehabilitation areas as per F008 Environmental Inspection Report. Monitoring of each major rehabilitation area will be undertaken systematically at regular intervals 12 months after rehabilitation and again in years 2 and 5. A record of rehabilitation undertaken will be maintained in R015 Topsoil and Rehabilitation Register.
EMP 19	Contaminated soil will be collected and treated onsite at the licensed bioremediation land farm.

EMP No.	Environmental Management Plan:
EMP 25	Waste dumps will be constructed and rehabilitated in accordance with DoIR Guidelines for Mining in Arid Environments (DME, 1996).
	Final waste dumps will not exceed the height of adjacent ridges.
	Waste rock dumps, where practicable, will be constructed with sufficient surface to groundwater table distance (with considerations to hydro conductivity of the geology) to minimise the potential for groundwater contamination.
	Where practicable, areas will be progressively rehabilitated.
	Where practicable, waste dumps will be constructed with a rounded footprint and blended into existing hill slopes.
	Slopes will be graded to allow for the safe passage of animals.
	The boundaries of pits will be fenced or bunded to deter larger animals such as goannas from gaining access.
	Minimal visual impact of waste dumps.
	Progressive rehabilitation of dumps.
	Monitoring of rehabilitation will occur as per EMP-17 Rehabilitation
	Waste dumps located near drainage channels will be monitored and rock armoured if necessary to prevent scouring and erosion.

Table 2: Environmental Management Plan Commitments (MS715)

EMP No.	Environmental Management Plan:
EMP 08	Disturbed areas will be revegetated as soon as possible to facilitate fauna habitat restoration.
EMP 09	All soil resources shall be recovered where practicable and safe to do so without risk to machinery and personnel.
	Topsoil shall be recovered as soon as practicable following vegetation clearance.
	Topsoil shall be stockpiled in discreet cells no higher than 2m and deep ripped.
	Erosion control shall be considered to avoid loss of topsoil during the wet season.
	Weed monitoring and control shall be undertaken throughout the year on stockpiles.
	All available topsoil or vegetation directly returned or stockpiled appropriately for later use.
	A register of topsoil stockpiles will be maintained on site and shall record the stockpile number, the date placed, the source location, the type (topsoil/subsoil) and comments (including rehandling/relocation, seeding etc).
	Signage shall be placed at topsoil stockpiles to indicate the date and source of the material.
	Active stockpiles will be inspected regularly for erosion and weed control.
	Information on the volume of topsoil stripped and stockpiled will be recorded and reported in the annual environment report along with the status of stockpiles.
EMP 11	Waste material handling guidelines will be applied with regard to the management of dispersive, erosive and saline waste rocks.
	Waste dumps shall be designed and constructed in a manner where they do not adversely impact on downstream environments due to disruption of drainage line or loss of erodible material.

EMP No.	Environmental Management Plan:
	Hostile materials such as hyper-saline, fibrous, potentially acid forming and dispersive materials shall be encapsulated where practicable and in consultation with the DMP. Waste Rocks Dumps shall be designed and constructed so that the final landform does not encroach off the mining lease or extend beyond approved ministerial boundaries. Waste Dump Plan will be prepared and approved by the Technical Services Manager and the Mine Manager prior to construction in consultation with the Environment Superintendent. Rehabilitation plans shall be developed consistent with criteria approved in the Koolan Island Mine Closure Plan and in consultation between MGX Mine Planners, Site Technical Services, Site Production and the Environment Superintendent.
EMP 14	Culverts will be placed under roads, embankments and formations to permit free flow of drainage water and to assist in water shedding from the site where applicable. Cleared vegetation and topsoil stockpiles will be kept away from watercourses and in discrete stockpiles to minimise interference to surface flows.
EMP 20	All contaminated and potentially contaminated sites will be identified and recorded on the contaminated sites layer on GIS. The extent of contamination will be assessed; this will be based on evaluation against the National Environmental Protection Measure (NEPM) for the Assessment of Site Contamination. Where evaluation of the investigation levels indicates likelihood of adverse effects on human health or ecological values, a specific health and ecological risk assessment will be conducted based on NEPM investigation levels, DER licence conditions and general provisions of the Environmental Protection Act 1986, and associated Contaminated Site Management guidelines.
EMP 21	Disturbed areas will be deep ripped and progressively rehabilitated, when available, with applicable surface treatments and topsoil, wherever available. Where possible, overburden slopes will be progressively battered, spread with stored topsoil and vegetation (where available) and stabilised to prevent surface water erosion and encourage vegetation establishment. Where possible, topsoil will be respread to a depth of 100mm to encourage revegetation. Where possible dead vegetation recovered during clearing will be scattered on replaced topsoil to encourage biological activity and promote revegetation. Compacted surfaces no longer required post construction will be ripped to promote water infiltration and the catchment of seed and organic matter. Rehabilitated areas will be indicated by signage and rehabilitation records will be maintained. Records will include survey of rehabilitated areas. Rehabilitated areas shall be free draining and erosion resistant. Rehabilitated areas shall have signage placed to control access. Locally provenant seeds shall be used in direct seeding of rehabilitated landforms. Earth windrows will be placed across disused access tracks which cross the contour to reduce the rate of runoff and discourage use. The Environment Superintendent will check areas that have been disturbed for rehabilitation potential on a regular basis.

EMP No.	Environmental Management Plan:
	Site inspections to be undertaken to ensure rehabilitation is completed progressively; in accordance with approved Rehabilitation Plans.
	Landscape Function Analysis or similar will be conducted annually on rehabilitated areas to monitor for rehabilitation success.
	Rehabilitation shall be routinely monitored for weeds and treated where required. Remedial works shall be undertaken to address erosion where practicable.

4 Ministerial Statement 715

The Koolan Island Mine and Port Facility has been formally assessed by the Environmental Protection Authority in accordance with the provisions of Part IV of the *Environmental Protection Act 1986* and approved by the Minister for Environment. MS 715 documents the approval to implement the proposal subject to a number of conditions. The specific conditions relevant to closure of the Project are contained within **Table 1**.

Table 1: Ministerial Statement 715 Closure Conditions.

MS No.	Conditions relevant to Closure
MS 6-1	Prepare a Closure Plan within 12 months following the formal authority issued to the decision-making authorities under section 45(7) of the Environmental Protection Act 1986. The proponent shall prepare a Closure Plan to the requirements of the Minister for the Environment on advice of the Environmental Protection Authority, the Department of Conservation and Land Management and the Department of Industry and Resources.
MS 6-1-1	The Plan shall set out procedures to manage the ground and surface water systems affected by the implementation of the proposal to ensure that there are no long-term impacts.
MS 6-1-2	The Plan shall set out procedures to ensure that the areas in the marine environment impacted by the implementation of the proposal display similar floral, faunal and benthic habitat diversity, health and water quality as surrounding marine ecosystems following rehabilitation.
MS 6-1-3	The Plan shall set out procedures to rehabilitate all areas disturbed by the implementation of the proposal to a standard suitable for the agreed end land use(s), with consideration of the characteristics of the pre-mining ecosystems within Koolan Island (through research and baseline surveys); and incorporation of best practice rehabilitation techniques, including topsoil management, used elsewhere in the mining industry.
MS 6-1-4	The Plan shall set out procedures to identify completion criteria, which ensure that there is adequate rehabilitation of the landforms disturbed during implementation of the proposal and that appropriate species are used in rehabilitation.
MS 6-1-5	The Plan shall set out procedures to monitor rehabilitation to assess the performance of all rehabilitated areas against the completion criteria.
MS 6-1-6	The Plan shall set out procedures to report on the rehabilitation and monitoring results.
MS 6-1-7	The Plan shall set out procedures to identify and manage any contaminated material, soil or sediment caused by or disturbed during the implementation of the proposal.
MS 6-1-8	The Plan shall set out procedures to develop management strategies and/or contingency measures in the event that operational experience and/or monitoring indicate that a closure objective is unlikely to be achieved.
MS 6-2	The proponent shall review and revise the Closure Plan required by condition 6-1 at intervals not exceeding four years.
MS 6-3	The proponent shall implement the Closure Plan required by condition 6.1 and subsequent revisions required by condition 6-2.
MS 6-4	The proponent shall make the Closure Plan required by condition 6-1 and subsequent revisions required by 6-2 publicly available.
MS 7-1	Prior to the commencement of activities which may affect the marine environment, the proponent shall prepare a marine management plan to the requirements of the

MS No.	Conditions relevant to Closure
	minister for the environment on advice of the environmental protection authority, the department of conservation and land management and the department of fisheries. The objectives of this plan are to manage the impacts to the marine environment that arise from the implementation of the proposal to: maintain the ecological integrity and biodiversity of the marine environment avoid impacts that arise from the implementation of the proposal on the coral pool community at the mangrove inlet; and manage project activities to ensure that impacts on marine habitats, communities and biota outside the project footprint are avoided.
MS 8-1	Prior to dewatering or groundwater abstraction, the proponent shall prepare a water management plan to the requirements of the minister for the environment on advice of the environmental protection authority. The objective of this plan is to maintain the quality and quantity of water so that existing and potential environmental values, including ecosystem maintenance are protected.
MS 9-2	Prior to ground disturbing activities in a particular staged area to be cleared, the proponent shall prepare a significant species management plan for conservation-significant flora or fauna species recorded during the staged pre-land clearing surveys required by condition 9-1, to the requirements of the minister for the environment on advice of the EPA, the department of conservation and land management and the western Australian museum. The objective of this plan is to maintain the abundance, diversity, geographic distribution, conservation status and productivity of flora and fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
MS 10-2	In the event that subterranean fauna have been identified, in meeting the requirements of condition 10-1, the proponent shall prepare a subterranean fauna management plan prior to any dewatering or groundwater abstraction, to the requirements of the minister for the environment on advice of the environmental protection authority and the department of conservation and land management. The objective of this plan is to maintain the abundance, diversity, geographic distribution and productivity of subterranean fauna at species and ecosystem levels through the avoidance or management of adverse impacts and through improvements in knowledge.
MS 11-1	Prior to ground disturbing activities, the proponent shall prepare a quarantine management plan to the requirements of the minister for environment on advice of the environmental protection authority, the department of conservation and land management and the department of agriculture. The objectives of this plan are to manage the environmental impacts concerning introduced flora and fauna species that arise from the implementation of the proposal to:

MS No.	Conditions relevant to Closure
	prevent the spread of existing introduced flora and fauna species within Koolan Island and between the Island and the mainland, prevent the further establishment of introduced flora and fauna species on Koolan island as a result of the implementation of the proposal, and control or eradicate introduced flora and fauna species on Koolan island.
MS 13-1	Prior to ground disturbing activities, the proponent shall prepare a contamination management plan to the requirements of the minister for the environment on advice of the environmental protection authority. In this condition, 'contamination', has the same meaning as in section 4 of the contaminated sites act 2003. The objective of this plan is to identify and manage contamination that may be disturbed by the implementation of the proposal to manage the risks to human health and the environment.
Schedule 2 #7	Consult with stakeholders to assess existing landform/landscape values and how these will be affected by the proposal. Note: Stakeholders include but are not restricted to Kimberley Environs, Dambimangari native title claimants, conservation council, wildflower society, local government.

5 Management Plans

MS715 requires a range of management plans to be developed and implemented. The management plans set overall objectives which are relevant to mine closure outcomes and there are a number of obligations made within these plans which are specific mine closure obligations which are summarised in **Table 1**.

Table 1: Management Plan obligations relevant to closure.

Management Plan	Obligation relevant to Closure
Quarantine Management Plan	Progressive rehabilitation will be undertaken to minimise the time between disturbance and rehabilitation Local provenant, weed free seed will be used for rehabilitation
Significant Fauna Species Management Plan	Topsoil stripped (where terrain permits), stripping avoided during or immediately following heavy rains, or in very dry, windy conditions. Direct return of topsoil where possible. If topsoil stockpiling required, stockpiles not to exceed a height of 2 metres to maintain aeration and biological activity, stockpiles clearly marked topsoil, with areas of known weed infestation stockpiled separately.
Significant Flora Species Management Plan	Topsoil stripped (where terrain permits), stripping avoided during or immediately following heavy rains, or in very dry, windy conditions. Direct return of topsoil where possible. If topsoil stockpiling required, stockpiles not to exceed a height of 2 metres to maintain aeration and biological activity, stockpiles clearly marked topsoil, with areas of known weed infestation stockpiled separately. Progressive rehabilitation will be undertaken to minimise the time between disturbance and rehabilitation, use local provenant seed for rehabilitation Conduct rehabilitation trials for priority species
Stygofauna Management Plan	Monitor stygofauna abundance and species richness, annually following the wet season (approximately may/june) from the year prior to proposed dewatering or if monitoring conducted as per the water management plan indicates a declining trend in water levels or quality that may be detrimental to stygofauna until operations cease, water levels return or no impact to habitat is established. In either of these cases an appropriate monitoring regime will be determined in consultation with the OEPA. Remedial actions will be investigated and implemented where there are occurrences of significantly elevated levels of nutrients, heavy metals or pollution contaminants using the WA water quality guidelines for fresh waters - EPA 1993.
Northern Quoll Management Plan	Conduct progressive rehabilitation using local provenance seed to minimise the time between disturbance and rehabilitation Vegetation is collected with top soil, when and where available. This mixture of top soil and vegetation is stored until required and then respread on rehabilitation areas When available felled timber will be used in rehabilitation where practical (not mulched)

6 Mining Proposals

The Koolan Island Mine and Port Facility has been formally assessed by the Department of Mining and Petroleum in accordance with the provisions of the mining tenement conditions M 04/416, M 04/417, L 04/29. The specific mining proposal commitments relevant to closure of the Project are contained within **Table 1**.

Table 1: Mining Proposal Commitments

Mining Proposal	Condition No.	Conditions relevant to Closure
Environmental Referral Document (MP 5194)	1	Maintain the abundance, species diversity, geographic distribution and productivity of vegetation communities – Implement Quarantine Management Plan and Significant Flora Management Plan.
	7	Maintain the general abundance and diversity of species and maintain the general abundance, species diversity and geographical distribution of terrestrial fauna – Implement Significant Fauna Species Management Plan and Northern Quoll Management Plan.
	8	Maintain the abundance, species diversity, geographic distribution of subterranean fauna – Implement Subterranean Fauna Management Plan.
	9	Maintain the abundance, species diversity, geographic distribution of marine fauna – Implement Marine Management Plan.
	11	Maintain the quantity of groundwater so that existing and potential uses, including ecosystem maintenance are protected – Implement Water Management Plan.
	12	Ensure no net loss of Benthic Primary Producer Habitat (BPPH) and where possible to generate a net gain in BPPH and or their associated BPP communities – Implement Marine Management Plan.
	13	Manage and mitigate impacts to landscape values and maintain the integrity, ecological functions and environmental values of soil and landform – Implement Mine Closure Plan.
	14	To identify contamination, assess any associated risks to the environment and / or human health and remediate where necessary – Implement Contamination Management Plan.
Mining of Main & Mullet Pits below the water table (MP 31828)	15	Maintain or improve the quality of groundwater to ensure that existing and potential uses, including ecosystem maintenance are protected, consistent with the Australian and New Zealand Water Quality Guidelines (ANZECC, 2000) – Implement Water Management Plan.
	1	Upon completion of mining activity a rehabilitation program will be implemented and include respreading of vegetation and topsoil material and deep ripping the area along the contours.
	2	The rehabilitation area will be inspected periodically and any remedial works identified will be implemented immediately.
	3	The rehabilitation area will be reported within the Annual Environmental Report.
	6	Vegetation and topsoil will be cleared prior to the commencement of clearing activities, flagged for protection and strategically located to prevent erosion.

Mining Proposal	Condition No.	Conditions relevant to Closure
Additional Infrastructure & Clearing (MP 31899)	1	Upon completion of mining activity a rehabilitation program will be implemented and include respreading of vegetation and topsoil material and deep ripping the area along the contours.
	2	The rehabilitation area will be inspected periodically and any remedial works identified will be implemented immediately.
	3	Rehabilitation will be reported within the Annual Environmental Report.
	6	Vegetation and topsoil will be cleared prior to the commencement of clearing activities unless impractical or unsafe such as on cliff faces. The top soil will be stockpiled, signposted for protection and strategically located to prevent erosion.
Acacia East Pit cutback (MP 34572)	1	Upon completion of mining activity a rehabilitation program will be implemented which will include respreading of vegetation and topsoil material and deep ripping along the contours.
	2	The rehabilitated area will be inspected periodically and any remedial earth works identified will be implemented immediately.
	3	Rehabilitation works will be reported within the Annual Environmental Report.
	4	Stormwater at Mullet Pit post-closure will be controlled by specifically placed drainage channels that will allow control of the discharge waters and reduction of turbidity levels to < 20 mg/L TSS.
	7	Vegetation and topsoil will be cleared prior to the commencement of clearing activities, stockpiled adjacent to the area to ensure material is respread over the same area, flagged for protection with flagging only removed upon commencement of rehabilitation and strategically located to prevent erosion.
Construction of Bioremediation Facility & Emergency Response Training Area (MP 47723)	21	On completion of bioremediation of contaminated soils and removal of the remediated soil, the natural ground surface beneath the hydrocarbon contaminated area will need to be validated by sampling and analysis to ensure that no leaching of hydrocarbons into <i>in situ</i> soils has occurred.
Environmental Referral Document (MP 5194)	12	Develop and implement a Marine Management Plan that includes monitoring programs, management actions to be implemented if triggers are exceeded, and marine rehabilitation techniques.
	13	Consult with stakeholders to assess existing landform/landscape values, how these will be affected by the proposal and during the preparation of any required management plans required by the conditions. Consult with stakeholders during the life of the mine. During the life of the project the traditional owners and relevant stakeholders will be invited to an annual presentation, to be held in Derby. The presentation will report on activities in the past 12 months and how these compare to the EMP as a result of the work undertaken.

Additional commitment language identified during the review of the mining proposals relevant to closure of the Project has been provided in **Table 6.2**.

Table 6.2: Additional Mining Proposal Commitment Language

Mining Proposal.	Conditions relevant to Closure
Optimisation of Waste Rock Placement (MP 53093)	Caution will be taken with material which is known to be erodible and this will either be encapsulated within the waste dump or where it's purposefully placed on an engineered flat area, which will serve to effectively prevent dispersive and erodible materials from being lost off site.
	Where possible, flat areas will be maximised to increase surface stability and further encourage the sustainable growth of vegetation post mining. Trials will be undertaken to inform the most effective design for the materials utilised.
	Rehabilitation of the Anomaly areas will adopt the following commitments and relevant actions: incorporation of the area into closure planning and monitoring programs, primary earthworks to create post mining landforms that are geotechnically stable, respreading topsoil onto final shaped slopes, deep ripping along contours in revegetation areas to assist with retention of water and establishment of vegetation, placement of large boulders and logs to assist with soil stability and the creation of habit, and periodic inspection of the area to check: the occurrence and extent of any erosion, coverage of vegetation and its growth, remedial works to fix any identified issues; and reporting rehabilitation data in Annual Environmental Report and under Mine Rehabilitation Fund.
Acacia East Pit cutback (MP34572)	The final WRL surface will be contoured through a range of slopes with a maximum slope of approximately 20 degrees. The final surface will contain specified drainage channels to control storm water and ensure turbid water above the approved level (as per the approved Mining Proposal 31828) is not discharged to the external environment.
Construction of Bioremediation Facility & Emergency Response Training Area (MP 47723)	Prior to commissioning, baseline soil samples of the clay / silt liner will be taken to measure hydrocarbon and glycols.
	The management of the facility at closure will be as discussed in Section 4.8 and Table 2, number 21. Such that on completion of bioremediation and removal of the remediated soil, the natural ground surface beneath the hydrocarbon contaminated area will need to be validated by sampling and analysis to ensure that no leaching of hydrocarbons has occurred into the in-situ soils. Sampling and analysis shall be conducted as per ' <i>Development of sampling and analysis programs (DoE, 2001)</i> ' with laboratory results initially compared to <i>Assessment levels for soil, sediment and water – version 3 (DEP 2003)</i> .
Construction of Landfill Trenches (MP 40234)	A minimum of 15cm of soil cover will be used when progressively filling the trenches. As each trench will be surveyed, the records will be available for use when reviewing and updating the mine closure and rehabilitation plan. This will ensure that in areas where landfill trenches have been excavated and subsequently filled with waste materials, a suitable amount of cover material can be placed over the former landfill trenches. The amount of cover material will be dependent on the requirements of the mine closure plan. The height of the cover material will be at least 1 m.

Mining Proposal.	Conditions relevant to Closure
Project Infrastructure NOI (MP 5312)	All trenches will be surveyed to ensure that a record of its location is maintained and to prevent the landfill trench areas from being used for other purposes which will affect closure outcomes.
	No landfill trenches will be located in areas of potential contamination as identified by the Koolan Island Contamination Management Plan.
	Topsoil, where available, will be salvaged and managed according to procedures in the approved Environmental Management Plan. The more competent, stable material will be placed on the outer extremities of the waste dump to assist in stability.
	The waste dumps will be constructed in 20 m lifts. An initial slope angle of 37 degrees (the natural rill angle) will be applied to each lift; this will be battered down to an angle of 20 degrees before any rehabilitation is applied. Waste Dumps will be rehabilitated to a self-sustaining system. This will involve land-forming, topsoil spreading and if required, seeding with provenance species. During the LOM, rehabilitation trials will be conducted in consultation with DoIR to determine appropriate closure criteria and rehabilitation techniques.
Scree Stripping M04/416 (MP 23857)	All project infrastructure will be removed from the island and the cleared land rehabilitated.
	All vegetation and any topsoil encountered will be stockpiled adjacent to the area and respread over the clearing immediately upon completion of Scree Stripping activities.
	Rehabilitation of the drainage sump will only occur after all other areas have been rehabilitated to ensure surface drainage is contained within the cleared area for the entire duration of the activity.
Ship Loading Facility (MP 5261A)	Upon completion of the Scree Stripping activity a rehabilitation program will be implemented and include resspreading of vegetation and topsoil material and deep ripping the area along the contours. The rehabilitated area will be inspected periodically and any remedial works identified will be implemented immediately. Rehabilitation of this area will be reported within the Annual Environmental Report.
Phase 1 dewatering and seawall construction (MP 5601)	All infrastructure associated with the ship loading facility will be removed from the island and the marine environment rehabilitated as described in the Marine Management Plan
Environmental Referral Document (MP 5194)	All project infrastructures will be removed from the Island and cleared land rehabilitated.
	Waste dumps will be designed to a flat crest and will be no higher than the general terrain.
	Rehabilitation will be undertaken using seed collected from Koolan Island.
	Vegetation, debris, logs and rocks will be returned to areas which have been disturbed as they assist in rehabilitation by providing microhabitats for recolonising fauna.

Mining Proposal.	Conditions relevant to Closure
	The primary management strategy involved in addressing clearing of vegetation and fauna habitats on Koolan Island will be an ongoing rehabilitation programme. The aim of the programme will be to rehabilitate disturbed areas to an array of vegetation types and fauna habitats that reflect the pre-disturbance state as closely as possible in order to create a stable long-term environment.
	All disturbed areas including waste dumps, disused access tracks and other work areas will be rehabilitated. Rehabilitation will occur progressively where possible and also following the removal of all structures and equipment upon decommissioning.
	All drill holes will be temporarily capped on completion of drilling and permanently capped as soon as possible. Drill holes will be regularly monitored to ensure the cap remains in place. Where drill holes are no longer required they will be completely infilled so as to remove the potential threat to fauna.
	Upon completion of construction, areas no longer required will be contoured and slopes stabilised and revegetated.
	Overburden will be stored and rehabilitated and waste dumps will be constructed and rehabilitated in accordance the DoIR (i.e. Slopes of no greater than 20 degrees with benches every 7-10m of vertical height to ensure final landforms are geotechnically stable, not prone to erosion and are able to be successfully rehabilitated) as well as the soil characteristics, rainfall, drainage and topography of the landform.
	Rehabilitation trials will be conducted throughout the life of mine, in consultation with DoIR, to determine appropriate rehabilitation techniques for the area.
	Aztec will consult with all stakeholders and interested parties throughout the life of the project.

The Environmental Referral Document (MP 5194) summarised what was considered to be the management actions for mine closure at the time the document was submitted. There are various commitments and obligations within this summary and these presented below in Table 3.

Table 3: Environmental Referral Document (MP 5194) Summary of Management Actions for Mine Closure

Aspect	Objective(s)	Management Actions
Consultation	Enable all stakeholders to have their interests considered during the mine closure process.	The aim of the closure plan is to provide a strategic framework for the closure of Aztec's Iron Ore Project by providing a basis for consultation with regulators and identified stakeholders regarding the post-mining land uses of the project area and the development of agreed completion criteria.
Legal Obligations	Ensure that the closure of Aztec's Iron Ore Project meets all legal requirements a review was undertaken to identify legislation and guidelines applicable to mine closure.	As part of the review of the Mine Closure Plan during the project life legislation and other requirements will be reviewed to identify any new requirements.
Completion Criteria	Establish a set of indicators which will demonstrate the successful completion of the closure process and facilitate the release of the mining operator from further environmental obligations.	Aztec will consult with all stakeholders and interested parties throughout the life of the project to develop agreed completion criteria.
Decommissioning	Remove or dispose of infrastructure associated with Aztec's Iron Ore Project; and dispose of waste material appropriately.	During the decommissioning phase of the project all infrastructure that cannot be used by another land user will be removed, including concrete footings, and the disturbed areas rehabilitated. Steel will be stored until the mine is decommissioned and shipped off the island for recycling. The dismantling of infrastructure will generate scrap and waste materials that will be disposed in the following manner: Steel will be stored until the mine is decommissioned and shipped off the island for recycling; Inert material that is not reusable (such as concrete, building rubble) will be buried in the landfill site; and Hazardous materials, such as asbestos, will be removed from the island and disposed of in accordance with appropriate governing regulations. Left over fuel, oils and chemicals will be removed from site and returned to the supplier. Waste oils, fuels and chemical

Aspect	Objective(s)	Management Actions
		will be removed from site and disposed of at an appropriate waste facility or reused where possible.
Contaminated Sites	A process is developed with the DoE for the management of any areas identified as contaminated by BHP's previous activities. No areas disturbed by Aztec to be classed as a contaminated site as per the Contaminated Sites Act 2003.	To ensure that the site is not classed as contaminated due to Aztec's operation, investigations will be undertaken as part of closure to determine whether contamination exists. A Contaminated Sites Assessment process will be undertaken as per the DoE Contaminated Sites Guidelines which incorporates the following: Investigation: determine the nature and extent of any soil and/or groundwater contamination, Assessment: evaluate the risks of any identified contamination to human health or the environment, Action Plan: develop and document an operations plan and implementation schedule which addresses all necessary activities including disposal of contaminated material, monitoring and criteria for completion, Consultation: discuss all aspects of the program and obtain agreement from DEP (as the responsible regulatory agency), together with other agencies as appropriate, Implementation: undertake all aspects of the program in compliance with the documented plan and any relevant standards such as Australian Standard 4482.1 – 1997 related to the sampling and investigation of contaminated soils, Validation: undertake monitoring and/or testing, using appropriate, recognised methods, to demonstrate reduction of contamination to an acceptable levels using an independent consultant; and Closure: Obtain regulatory signoff that the remediation process has been effective and the site is no longer contaminated.
Development of Final Landforms	Post mining landforms are geotechnically stable and respond to erosion agents in a similar manner to naturally occurring landforms composed of similar rock types. Landforms are compatible with the adjacent	Reshaping of landforms will be undertaken to: Prepare landforms and disturbed areas to acceptable standards prior to the implementation of revegetation procedures,

Aspect	Objective(s)	Management Actions
	landscape. Runoff from surface waters within and running off the site have similar quality to runoff from undisturbed sites.	Ensure post mining landforms are geotechnically stable and respond to erosion agents in a similar manner to naturally occurring landforms composed of similar rock types, Minimise long-term visual impact by creating landforms which are compatible with the adjacent landscape, Reinstate, where practicable, natural drainage patterns, Ensure runoff from surface waters within and running off the site have similar quality to runoff from undisturbed sites, and Batter free-standing waste dump slopes to an angle of 20 ° or less.
Rehabilitation	All areas disturbed by Aztec's operation will be rehabilitated. Species native to Koolan Island will only be used in the rehabilitation. Rehabilitation will be undertaken as soon as practicable to facilitate fauna habitat restoration. Rehabilitated areas to achieve: A floristic richness of 50 % of pre-disturbance, and A Total Cover Index exceeding 25 % after 4 years.	Rehabilitation will consist of: Where available, topsoil will be utilised to provide a foundation into which native vegetation will be planted and/or seeded. Topsoil will be applied at a minimum of 100 mm, Vegetation debris, logs and leaf litter from the clearing of areas will be spread over rehabilitated areas to provide fauna habitat, Ripping on contour is required to relieve compaction and improve water infiltration. Deep ripping to a depth of 1m will be undertaken where the soil or waste material is of low permeability. In areas where the soil or waste material is of high permeability cultivation on contour will be undertaken. On steep slopes this may require terracing or benching. All ripping, terracing or benching will be surveyed to ensure that they are on contour, Direct seeding and/or planting will be undertaken to encourage vegetation growth to stabilise surfaces and aid the integration of landforms into the surrounding landscape. Seeding and/or planting will be undertaken prior to the wet season as soon as possible after earthworks using seed and plants native to Koolan Island, Where necessary, fertilizer will be applied to offset the loss of nutrients and soil microbiota associated with loss of topsoil, and Rehabilitation and closure procedures will include measures to address specific habitat types of listed fauna.

Aspect	Objective(s)	Management Actions
Mine Pits	As far as practicable, ensure the pit void and walls are structurally stable. Ensure public safety by restricting access to the remaining pit.	Geotechnical investigations will be undertaken to determine the structural integrity of the mine pit walls. An abandonment bund wall will be constructed around the perimeter of open pit voids greater than 5 m in depth. The bund wall will be constructed outside the area designated as being susceptible to wall collapse. The location and design of the abandonment bund will be in accordance with procedures detailed in "Safety Bund Walls around Abandoned Open Pit Mines". Hand seeding will be undertaken where access is available to improve long term stability, particularly in erosion material.
Seawall	To remove the seawall to below the low water level to reinstate the natural tidal movement of the area.	The removal of the seawall will be designed to minimise the impact to coastal habitats and allow for re-establishment of marine biota on disturbed areas.
Waste Dumps	To ensure that the profile of the waste rock dump final structure is safe, stable, blends into the surrounding landscape and not prone to erosion. The waste rock and slope gradients will be capable of withstanding the intense rainfall events of the wet season. A sufficient cover of vegetation will be established to minimise erosion resulting from the impact of severe rains on dry soils.	The waste dumps will require extensive earthworks and subsequent seeding and revegetation to ensure they are stable and blend into the surrounding landscaped. Waste Dumps will be designed to ensure that the profile of the final structure is safe, stable and not prone to erosion. Dumps will be designed so that after rehabilitation they blend into the surrounding landscape. Adequate drainage control will be implemented to ensure that erosion does not occur. Outslopes will be designed at less than 20 ° or lower if required for geotechnical reasons. The tops of the waste dumps will be designed to contain run-off so as not to cause erosion on the sides of the dumps. Dump surface will be covered with clean fill and if available, soil to a depth of 100 mm. Both the tops and the side of the waste dump will be contour ripped to encourage infiltration of rainfall. Waste dumps will be seeded or planted with local species.
Borrow Pits	To ensure that the profile of borrow pits final structure is safe, stable, blends into the surrounding landscape and not prone to erosion. A sufficient cover of vegetation will be established to minimise erosion resulting	Borrow pits will be progressively rehabilitated as soon as possible following pit closure. The sides of the pits will be battered to a maximum slope of 20 °. If required, diversion drains and upslope windrows, will be utilized to divert surface water flow from entering the pit causing ponding and erosion. Pits will be rehabilitated as per the strategy detailed in Section 9 of the Closure Plan.

Aspect	Objective(s)	Management Actions
	from the impact of severe rains on dry soils.	
Dewatering	All infrastructure associated with dewatering is removed. Impact on the marine environment from dewatering operations is minimised.	All infrastructure associated with dewatering will be removed and disposed of appropriately.
Haulage & Ore handling	All infrastructure associated with haulage and ore handling is removed. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	All infrastructure associated with haul roads and ore handling will be removed. Haul roads, ROM pad and stockpile and other disturbed area will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.
Ore Processing	All infrastructure associated with ore processing is removed. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	All infrastructure associated with ore processing will be removed. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.
Ship Loader	All infrastructure associated with ship loading is removed. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated. Disturbed marine areas recolonised by marine flora and fauna.	All infrastructure associated with the ship loader, including any structures in the ocean will be removed. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated. Marine areas will be left to naturally recolonise.
Wharf and Jetty	All infrastructure associated with wharf and jetty is removed unless wharf and jetty are left for use by local communities and shire.	All infrastructure associated with the wharf and jetty, including any structures in the ocean will be removed. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated. Marine areas will be left to naturally recolonise.
Power Station	All infrastructure associated with the power station is removed. The area is investigated to determine if any contamination is present and if so remediation strategies are developed and agreed with the DoE.	All infrastructure associated with power station will be removed. Once the infrastructure is removed an investigation for contamination will be undertaken. If soil or water contamination is identified a remediation plan will be developed and agreed with the DoE. Disturbed areas will be reshaped to ensure they blend into the surrounding

Aspect	Objective(s)	Management Actions
	Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	landscape and to control rainfall run-off. Areas will then be rehabilitated.
Fuel & Bulk Storage Facilities	All infrastructure associated with fuel and bulk storage facilities is removed. Storage areas are investigated to determine if any contamination is present and if so remediation strategies are developed and agreed with the DoE. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	All infrastructure associated with fuel and bulk storage facilities will be removed. Once the infrastructure is removed an investigation for contamination will be undertaken. If soil or water contamination is identified a remediation plan will be developed and agreed with the DoE. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.
Workshops	All infrastructure associated with the workshop is removed. Workshop areas and the wash-down bay are investigated to determine if any contamination is present and if so remediation strategies are developed and agreed with the DoE. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	All infrastructure associated with workshops will be removed. Once the infrastructure is removed an investigation for contamination will be undertaken. If soil or water contamination is identified a remediation plan will be developed and agreed with the DoE. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.
Explosive Storage	All infrastructure associated with the explosive storage is removed. Explosive storage areas are investigated to determine if any contamination is present and if so remediation strategies are developed and agreed with the DoE. Disturbed areas are reshaped to blend into the landscape	All infrastructure associated with explosive storage will be removed. Once the infrastructure is removed an investigation for contamination will be undertaken. If soil or water contamination is identified a remediation plan will be developed and agreed with the DoE. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.

Aspect	Objective(s)	Management Actions
	and manage drainage and rehabilitated.	
Landfill	All infrastructure associated with the landfill is removed. The site is compacted and stable. Landfill site is investigated to determine if any contamination of soil and groundwater present and if so remediation strategies are developed and agreed with the DoE. Landfill site is capped by a cover of low permeable material to a depth of 300 mm. Landfill area is reshaped to blend into the landscape and manage drainage and rehabilitated.	All infrastructure associated with landfill site will be removed. Once the infrastructure is removed an investigation for contamination will be undertaken. If soil or water contamination is identified a remediation plan will be developed and agreed with the DoE. DoE Karratha has advised that there is not a requirement to undertake testing for landfill gases. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.
Bioremediation Facility	All infrastructure associated with the Bioremediation Facility is removed. Bioremediation Facility is investigated to determine if any contamination of soil and if required groundwater, is present and if so remediation strategies are developed and agreed with the DoE. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	Closure of the bioremediation landfarm will not be undertaken until all areas where contamination may occur have been investigated and remediated to agreed levels with the DoE. On completion of bioremediation, the remediated soil will be removed and utilised in rehabilitation of disturbed area. Sampling of the natural ground surface beneath the bioremediation facility will be undertaken to determine if any contamination is present. Groundwater monitoring may be required if impacted material has leached into underlying soils and the potential exists for groundwater contamination. Once the bioremediation landfarm area has been investigated and any contamination remediated, infrastructure associated with bioremediation landfarm will be removed and the area reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.
Accommodation	If not required by another party, all infrastructure associated with the accommodation facility will be removed. Areas where sewerage and grey water were managed will be investigated to determine if any	All infrastructure associated with accommodation facility will be removed, if not required by another party. Once the infrastructure is removed an investigation for contamination in the areas where sewerage and grey water were managed will be undertaken. If soil or water contamination is identified a remediation plan will be developed and agreed with the DoE. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.

Aspect	Objective(s)	Management Actions
	contamination of soil and if required groundwater, is present and if so remediation strategies are developed and agreed with the DoE. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	
Administration Offices	If not required by another party, all infrastructure associated with the administration offices will be removed. Disturbed areas are reshaped to blend into the landscape and manage drainage and rehabilitated.	All infrastructure associated with administration offices will be removed, if not required by another party. There will be no storage or use of chemicals within the office areas and hence the site will not need to be investigated for contamination. Disturbed areas will be reshaped to ensure they blend into the surrounding landscape and to control rainfall run-off. Areas will then be rehabilitated.
Public Access and Safety Aspects	To ensure that disturbed areas are left stable and free of infrastructure and waste. To restrict access to areas that cannot be made safe through rehabilitative techniques.	Signs clearly stating the risk to public safety and prohibiting unauthorised public access will be erected around the site, particularly in areas near open pits. On cessation of mining all roads leading to the pits will be closed. Additional safety bunds will be constructed to minimise the potential risk to the public safety of inadvertent access to abandoned open pits.
Records Management and Reporting Schedules	To provide clear, detailed and comprehensive information on all aspects of the mines operating and closure history.	Records of the history of the site following closure will be preserved to facilitate future land use planning. Reporting procedures will be established to ensure that results of all trials and actions including remediation works and monitoring are properly recorded, referenced, and available for long-term reference. Prior to relinquishment or surrender of tenure, records of the site development will be submitted to the Responsible Authority. The types of records required by the Responsible Authority will include the following: Geological records, including drilling data; Plans and surveys of surface facilities; Mining and production records;

Aspect	Objective(s)	Management Actions
		Locations, quantities and qualities of stored waste dumps; Location, quantities and types of waste disposed in the landfill; Site specific surveys or studies; and Mine Closure Plan
Monitoring	To provide feedback on: final landform stability; marine environment recolonisation and water quality; surface and groundwater quality; public safety issues; and rehabilitation and revegetation programs. identify potential and actual impacts in order that remedial work can be implemented.	The implementation of a monitoring programme is crucial in recording the success or otherwise of the completion criteria, as well as validating agreed criteria for relinquishment (Chamber of Minerals and Energy, 1999). Monitoring will address the following areas: Biological (flora and fauna); Marine environment; Surface and groundwater; Public safety; and Landform stability. In summary the monitoring proposed is as follows: Annual assessment of rehabilitated areas to monitor the re-establishment of vegetation on all areas disturbed by mining activities i.e. waste dumps, stockpiles, pit walls, infrastructure area, haul and access roads etc, Annual assessment of surface and groundwater quality to ensure water quality in disturbed areas is similar to that in undisturbed areas, Once off assessment of the stability of final landforms by a suitable qualified engineer. Monitoring will then be undertaken as per the stability assessment recommendations, Annual assessment of rehabilitated coastal habitats to monitor the re-establishment of marine biota and water quality in areas disturbed by the seawall and ship loader, Assessment of identified aboriginal heritage site on closure of the sites to ensure they have not been disturbed, Assessment of weeds and pests on closure of the site to identify if any new outbreaks have occurred due to Aztec's operations,

Aspect	Objective(s)	Management Actions
		Assessment of flora and fauna on closure of the site to identify if any impacts have occurred due to Aztec's operations, and Monitoring of all safety bunds, fencing and signage on an annual basis to ensure that all public safety aspects are adequately addressed. Monitoring will identify the need for remedial work at an early stage. Monitoring plans will be developed in consultation with the appropriate regulatory agency and will include agreed actions should monitoring identify issues that could lead to agreed completion criteria not being met. Monitoring will be undertaken by Aztec until the agreed completion criteria have been met.

Appendix B. Stakeholder Engagement Register

ID	Date and Time	Event Type	Topics	Summary	Stakeholder Comments	Team Response	Stakeholders
26	12/12/2024 15:37	Email	Environment:Emissions;Environment:Waterways;Environment:Approval / Government application;Environment:Closure	DEMIRS inspected Kollan Island and created several required actions. These actions included minor surface water management and erosion controls. These actions were completed and a report showing the actions and results was presented to DEMIRS.	I have identified some areas of interest for the upcoming inspection; we are happy to view these areas in any order that suits. Can you confirm access to each of these areas and whether you think there will be sufficient time? * Sea wall. * Waste segregation and encapsulation of the saline marine sediment from Main Pit at WD2. * Areas of rehabilitation to review progress over time: Barra Limb, Scree, Rehab Bay 4 and WRD4 Spur (of additional interest at this location is the re-established drainage). * Areas of new rehabilitation on WD4 (Pindan Creek) and WRD5; both noted as undertaken during the 2022-2023 AER reporting period. * Slope trials on WRD1 to review progress overtime. * Areas of erosion on waste landforms and any implemented remediation measures. Photographs provided in the latest AER submission show erosion occurring on WRD1 and WD4 (see below). The previous DMIRS inspection noted drainage points cut into windrows/crest bunds on WRD4 and WD1 leading to erosion (report attached for reference). * Discharge point on WD2 (photo below from AER) * Additional areas (if any) that you would like to discuss with Demelza and myself whilst onsite. We are being picked up from the Koolan jetty at 7am on Friday 16 th ; are you able to confirm that someone is available to transport Demelza and myself from the village to the jetty at this time? Thank you Corinne		Corinne Chambers, Jake.Devenny@mgx.com.au, Emma.Porter@mgx.com.au, Stephanie.Marjanovich@mgx.com.au, Jai.Thomas@mgx.com.au, Troy.Collie@mgx.com.au, Demelza Dravnieks
25	12/12/2024 15:36	Email	Environment:Emissions;Environment:Closure;Environment:Operational	FW: Discharge point on WD2 MGX provided updated imagery of erosion features on several waste dumps to help inform their inspection preparation. These were received with thanks.	The area you are interested in at WD2 is provided below along with the Mining Proposal boundary shown in red. This image was captured in September 2022. If you would like an updated image, I can organise the surveyors to take some today if they have capacity?		Corinne Chambers, Emma.Porter@mgx.com.au, Demelza Dravnieks
24	12/12/2024 15:35	Email	Environment:Emissions;Project/Design: Design Impacts;Project/Design:Works Timing;Environment:Closure;Environment:Operational	FW: Pindan Progress Report A report outlining the performance of the Pindan catchment was provided and was received by DEMIRS.	As discussed please find last year's Pindan Catchment progress report. We will issue a new report this year based on the work in the last 12 months and the wet season's impact.		ce0c390aa6b04edda25840b016d07916@mgx.com.au, Corinne Chambers
23	12/12/2024 15:34	Email	Environment:Emissions;Environment:Waterways;Project/Design:Design Impacts;Project/Design:Works Timing;Environment:Closure;Environment:Operational	FW: Pindan Progress Report	Hi Corinne, We haven't booked the trip for O'Kane yet. But we have already done drone capture and started the photo monitoring assessment. I'm not 100% on the exact plan (the site guys will run that), but we would expect to have it in the next month or two so we can complete the next tranche of works before the next wet. Cheers Jacob King Senior Closure Specialist From: CHAMBERS, Corinne <Corinne.CHAMBERS@dmirs.wa.gov.au> Sent: Thursday, June 22, 2023 2:20 PM To: Jacob King <Jacob.King@mgx.com.au> Subject: FW: Pindan Progress Report Apologies, I just re-read your initial email stating that there will be a follow up report; what is the timeframe on the report? Thank you Corinne Chambers Senior Environmental Officer Sent: Thursday, 22 June 2023 2:13 PM To: Jacob King <Jacob.King@mgx.com.au> Subject: RE: Pindan Progress Report		Corinne Chambers, ce0c390aa6b04edda25840b016d07916@mgx.com.au

22	12/12/2024 15:34	Meeting	Environment:Closure;Environment: Operational	FW: Seed prices - indicative costs. DAC is considering commencing a wholesale seed business to support KIO revegetation efforts. KIO supports this endeavour and is providing advice and available resources to help business outcomes.	From: Economic Development <EDM@dambi.org.au> Sent: Thursday, 12 December 2024 3:32 PM To: Mark Brown <Mark.Brown@mgx.com.au> Cc: Jacob King <Jacob.King@mgx.com.au>; Jake Devenny <Jake.Devenny@mgx.com.au>; Jodi Humphries <kiadmin@dambi.org.au> Subject: RE: Seed prices - indicative costs. Hi Mark, I hope you are well. I am hoping to perhaps catch up with you early in the new year. I will be in Perth the second week of January if you are around. I am hoping to talk more about the Seed Collection and DAC moving into a position where it can facilitate that operation. I will require more clarity on the species and what sub species we will be looking at, annual and project targets, harvest schedule and to speak more in-depth about other areas of the operation. If you have any time please let me know and I am happy to meet with you in the Perth MGX office. Kind regards From: Mark Brown <Mark.Brown@mgx.com.au> Sent: Thursday, 15 August 2024 9:12 AM To: Economic Development <EDM@dambi.org.au>		Jodie Humphries, Jess Forrest, Jake.Devenny@mgx.com.au
28	17/10/2024 15:40	Meeting	Environment:Closure	MGX/KIO held its first "Closure Workshop" that included personel from across the business. This was to provide an update regarding the status of closure.		Create an integrated closure team to progress closure studies, engineering, and associated activities. The team will meet monthly and present advancements to the executive leadership team quarterly.	
29	15/08/2024 15:42	Email	Cultural Heritage:Indigenous Heritage;Environment:Native Flora;Environment:Closure	Discussions around the potential for DAC to form a subsidiary seed collection business to sell seed to MGX for Closure.	This is something that is being investigated but will take some time to formulate.	Provided information about other suppliers that could provide partnerships and several grant/funding opportunities to supplement the business.	Jodie Humphries, Jess Forrest
27	11/06/2024 15:37	Meeting	Cultural Heritage:Indigenous Heritage;Environment:Closure	"MGX presented an update regarding the required approvals and ongoing closure planning efforts. Discussion of the potential to transfer infrastructure and the requirement for DAC to obtain appropriate tenure."	DAC are looking at a way to have resources available to review applications prior to the submission. Ensure that any new areas are suitably surveyed for heritage as well as flora/fauna. There is a reluctance to DAC to allow mining west of current disturbance.	MGX will provide documents for a set review period (TBC) prior to submission / release. All areas not previously heritage cleared will be surveyed prior to disturbance. Other than for the purposes of rehabilitation of WD1 there will be no new mining west of WD1.	
19	1/03/2024 15:10	Site visit	Cultural Heritage:Indigenous Heritage;Property:Land Use;Social:Economic Impacts;Social:Employment;Social:Social Infrastructure and Services;Environment:Closure	DAC / Tourism Council of WA.	Options will be progressed over time.		
21	23/07/2023 15:24	Meeting	Project/Design:Approvals;Property:Land Use;Property:Value;Environment:Closure	Discussion about the unconditional performance bond on M04/417. MGX presented a scope of work to satisfy the requirements of the bond and allow for its release. MGX presented a proposal that based on the wording and the circa 5 years, plus confirmation from DMIRS geotechnical engineers that the long term stability, e.g. during operations, had been proved. MGX then would do further study and buttressing work as part of the ongoing closure effort.	DEMIRS has differently defined "long term" to consider closure and therefore would not release the bond without the additional closure works being completed. DMIRS does not think there is sufficient evidence to release the bond.	While MGX does not agree that when the bond was applied that "Long term" considered closure the position is understood.	Matt Boardman, Corinne Chambers
20	11/07/2023 15:13	Email	Cultural Heritage:Indigenous Heritage;Environment:Closure	MGX provided a copy of the Mine Closure Plan - Rev 6 to DAC and their consultant CDM Smith for an independent review.	There were some minor queries about materials characterisation. CDM Smith concluded that the MCP was suitable for its intended purpose.	MGX provided additional reporting (which was not available at the time of rev 6 publication)	
18	25/05/2023 11:58	Approval / Government application	Environment:Closure	Revision 6 of the MCP was submitted to DEMIRS for formal review			
17	23/09/2019 14:26	Approval / Government application	Environment:Closure	Revision 5 of the MCP was submitted to DEMIRS for formal review			
16	1/01/2019 14:15	Meeting	Project/Design:Approvals;Project/Design: Cost/Funding;Property:Land Use;Environment:Closure	Dialogue with Department of Transport / Kimberley Ports Authority ("Kim Davis (DoT, Manager Regional Facilities Marine & Harbours) Reece Waldock (Chair of KPA)")	* Retain barge ramp/landing/ laydown (after requisite remediation as required). Consider the potential of any future bulk material outloading; otherwise remove the shiploader and potentially the jetty/wharves in the absence of future bulk products; possibly retain the abutment/jetty/small craft berth area on the barge ramp reclaim given there may be future regional use (DBCA; DAC; tourism etc). * Interest for KPA representatives to visit the Island in 2019 to discuss future use post closure, after KPA appoints its new CEO.	* KIO will liaise with DOT/KPA in relation to its regional interests in retention of the industrial assets (jetty/shiploader). It is understood that KPA will ascend responsibility and rights from 2020 more completely for DoT. * KIO in Q1 2020 will lodge an options assessment examining the viability of retention of jetty/wharves and shiploader atop the jetty. Submit to DOT, KPA, DAC and DMIRS for comments. * KPA plans to attend site in latter 2019, after appointment of its new CEO.	

11	1/01/2018 12:00	Meeting	Cultural Heritage:Indigenous Heritage;Property:Land Use;Environment:Closure	Post mining land use discussed. Also discussed status of MCP and rehabilitation trials and closure options which have been in progress and are working towards determining a final WRL design and rehabilitation process. In 2018, KIO had developed a position paper which it submitted to both DAC and DMIRS on the closure of the Seawall-Main Pit mining domain.	In June 2019, the options for Seawall-Main Pit closure described in the report were discussed at quarterly Coexistence Deed meeting in Derby. DAC were receptive to the suggested preferred option and appreciated the need for further investigation for determining the final trench conveyance design to transfer water and retain the seawall intact.	Further meetings to discuss closure in greater detail and these will continue to be held quarterly through the life of KIO project, including attendance by General manager – Koolan Island operations and Chief Operating Officer MGX.	Environment Branch Department of Energy, Mines, Industry Regulation and Safety, Dambimangari Aboriginal Corporation
10	1/01/2018 11:33	Meeting	Cultural Heritage:Indigenous Heritage;Environment:Closure	Collaborative meetings with Traditional Owners (Dambimangari) as required by Co Existence Deed.	No key concerns raised. Post mining end land use of the Dambimangari utilising the Island as a base for their marine park (water) and landside tourism activities remains a key possibility. Other commercial and passive use activities raised and being considered. This will be addressed as per the co-existence deed in this phase of mining activity occurs.	As of 2019, DAC members were supportive of the retention of seawall and reflooding of Main Pit at closure, in order that it returns natural values and water quality to the disused mining area and allows potential for some access into the lake that forms.	Dambimangari Aboriginal Corporation
14	1/01/2017 12:11	Meeting	Cultural Heritage:Indigenous Heritage;Property:Land Use;Social:Economic Impacts;Social:Social Infrastructure and Services;Environment:Closure	"Annual Stakeholder Consultation sessions with individual groups in Broome. Each group was presented information as a general update regarding the site. Closure specific information was in relation to the status of the MCP, the intent to hand back the Island to the Dambimangari and the rehabilitation trials which have been in progress "	Department of Fisheries asked if Koolan Island would be handed back to the Traditional Owners.	Yes, the Island will be available for the Traditional Owners and they have the opportunity to request what infrastructure may be left for business opportunities. This will be resolved and negotiated as per the requirements of the co-existence deed.	
13	1/01/2017 12:09	Meeting	General/Engagement:Community Investment;Social:Economic Impacts;Social:Social Infrastructure and Services;Environment:Closure	Presentation partly covered closure planning. Update provided on MCP status, intent to hand the Island back to Dambimangari and rehabilitation trials which have been in progress.	Question raised as to whether passion vine was a problem for Koolan also.	Yes. MGX is looking to support further research being conducted by CSIRO and DBCA with the aim of developing a biological control for the weed.	
12	1/01/2017 12:07	Meeting	General/Engagement:Community Investment;Social:Economic Impacts;Social:Social Infrastructure and Services;Environment:Closure	Annual stakeholder consultation session held in Derby. Advertised to local population in Derby and open for all to attend.	Question raised as to whether passion vine was a problem for Koolan also.	Yes. MGX is looking to support further research being conducted by CSIRO and DBCA with the aim of developing a biological control for the weed.	
9	1/09/2015 11:27	Approval / Government application	Environment:Approval / Government application;Environment:Closure	Version 4 MCP submitted to DMP	Comments from DMIRS in April 2017 including:	This MCP version (version 5) aims to respond and progress the previous DMIRS comments.	Environment Branch Department of Energy, Mines, Industry Regulation and Safety
8	1/08/2015 11:23	Approval / Government application	Property:Land Use;Environment:Closure	DAC made a crown lease application for land at the east end of Koolan Island including the Cultural Centre and access tracks to the mine camp.	KIO were and remain supportive of the DAC applications under Land Administration Act.	KIO remains supportive of DAC holding its own tenure for access in certain areas of the mining leases during operations and then more widely on Koolan during post closure.	Land Use Planning Department of Planning, Lands and Heritage, Dambimangari Aboriginal Corporation
15	1/07/2015 13:36	Meeting	General/Engagement:Information Request;Project/Design:Design Impacts;Social:Public Safety;Environment:Closure	DMP – Resources Safety Division - DMP (Jim Boucat and Jay Ranasooriya)– Abandonment bund locations and geotech stability management of Main Pit for post end land use (see Section 8.1.1 and Figure 8 4).	* DMP has a guideline and any deviation must be demonstrated as better or equivalent. In such instances, technical expertise may be required. The technical experts on such matters will need to liaise with the DMP. The actual post end land use which will develop over time will influence the management of post closure pit safety. If the proposed management method is not infinite, the post land users will need to take responsibility. * Utilise competent, fresh draining quartzite for abandonment bund construction, of there is plenty available in the form of quartzite. * Present the concept in the MCP. Agreement on the methodology won't be reached at this stage, but will develop over time as the MCP develops. Remain in contact with the DMP safety division on these matters.	* Conceptual abandonment bund locations presented in this MCP. * Will continue liaising with Safety division on these matters.	
7	1/09/2014 11:12	Approval / Government application	Property:Land Use;Environment:Closure	Commencement of process with Department of Lands to assist in tenure assignment and certain infrastructure to traditional owners.	This is new ground, but there are processes in place to facilitate the requirements. It is good that DMP and KIO are considering this issue early in the life of the Project. Traditional owners will need to determine what infrastructure will remain and tenure requirements, and then work with the department of lands through regulatory requirements.	KIO remains supportive of DAC holding its own tenure for access in certain areas of the mining leases during operations and then more widely on Koolan during post closure.	Land Use Planning Department of Planning, Lands and Heritage
6	1/08/2012 10:59	Approval / Government application	Environment:Approval / Government application;Environment:Closure	Version 3 MCP submitted to DMP	The MCP (version 4) aimed to address DMP comments.	DMP Reg ID 56401 MCP version 4 approval with comments	Environment Branch Department of Energy, Mines, Industry Regulation and Safety

Appendix C. Technical Study Reports

The technical reports will be attached separate to this report, below is an index of attached documents:

- C1. Soilwater Consultants. (2014c). Investigation of WRL Materials and Design at Koolan Island. 30 January 2014.
- C2. MBS Environmental. (2023). Koolan Island Iron Ore Project Waste Characterisation.
- C3. Coffey. (2019). Preliminary Geotechnical Review of Proposed Airfield Landform.
- C4. Coffey. (2016). Main Pit Stage 1 Seawall Remediation.
- C5. Coffey. (2017). Main Pit Stage 1 Seawall, Koolan Island Operations Remediation Design Report.
- C6. Soilwater Consultants. (2014d). Koolan Island Waste Rock Landform Hydrological Investigation. 24 July 2014.
- C7. Rockwater. (2021). Koolan Island Mine Review of Groundwater monitoring Network.
- C8. AECOM. (2022). Koolan Island Annual Weed Assessment
- C9. Animal Plant Mineral. (2020, August). Koolan Island Project Ecosystem Functionality Analysis.
- C10. .Mount Gibson Iron. (2023). Northern Quoll Monitoring Survey 2023.
- C11. Bennelongia Environmental Consultants. (2023). Stygofauna sampling at the Koolan Island Ore Project.
- C12. MScience. (2023). Koolan Island- Coral Pool Benthic Habitat Assessment, July 2022.
- C13. Jacobs Group (Australia) Pty Limited. (2019). *Koolan Island Coral Rehabilitation Plan*.
- C14. Hydrobiology. (2024). Memorandum - KOOLAN ISLAND ARTIFICIAL REEF STRUCTURE GROWTH 2020-2024.
- C15. AECOM. (2023). Koolan Island Landscape Function Analysis 2023.
- C16. Hydrobiology. (2024a). *Vegetation Rehabilitation Analysis: Koolan Island (2013-2024)*. Unpublished report prepared for Mount Gibson Iron.

Appendix D. Risk Assessment

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
All of mine	Storage, stockpiling, or use of mineral materials	Non-benign materials exposed to air and water	Acid and metalliferous drainage	Unlikely	Moderate	Low	Regular sulphur assays of ore and mineral waste materials	Rare	Moderate	Low	
All of mine	Revegetation	Insufficient supply of suitable growth media	Loss of ecosystem functioning Loss of fauna habitat Erosion and instability of landform surfaces Reduced amenity	Likely	Minor	Medium	Stockpiling topsoil Maintain materials balance Revegetation trials Surface treatment trials Rehabilitation monitoring Remediation when trend analysis indicates moving away from outcomes	Possible	Minor	Medium	3 / 4
All of mine	Revegetation	Erosion of growth media prior to establishment of revegetation	Loss of ecosystem functioning Loss of fauna habitat	Likely	Minor	Medium	Stockpiling topsoil Maintain materials balance Revegetation trials Surface treatment trials Rehabilitation monitoring Remediation when trend analysis indicates moving away from outcomes	Possible	Minor	Medium	3 / 4
All of mine	Revegetation	Insufficient seed supply	Failure to revegetate rehabilitation	Possible	Minor	Medium	Shade house trials to identify revegetation seed mix tailored to landform conditions	Unlikely	Minor	Low	
All of mine	Revegetation	Loss of topsoil seed viability	Insufficient medium to facilitate seed germination	Possible	Minor	Medium	Seed collection program Identification of alternative seed supplies (e.g. Buccaneer Archipelago, Dampier Peninsula) Progressive rehabilitation Manual reseedling	Unlikely	Minor	Low	
All of mine	Revegetation	Loss of stored seed viability	Seed fails to germinate	Likely	Minor	Medium	Progressive seed collection and usage Climate-controlled seed storage	Unlikely	Minor	Low	

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
All of mine	Revegetation	Compaction of growth media	Seed fails to germinate	Likely	Minor	Medium	Ripping growth media on contour prior to revegetation	Unlikely	Minor	Low	
All of mine	Revegetation	Bushfire	Reduces the quality of rehabilitation	Possible	Minor	Medium	Burn trial plot to understand rebound after fire Maintain firebreaks Emergency response procedures	Unlikely	Minor	Low	
All of mine	Weed control	Weeds further infest disturbed and / or rehabilitated areas	Revegetation failure Reduced amenity	Likely	Moderate	High	Annual weed monitoring Weed management program	Unlikely	Minor	Low	
Open pits	Main Pit 'lake'	Tidal Fluctuation of Pit Water Levels	Erosion of Main Pit walls	Likely	Moderate	High	Geotechnical analysis of rising groundwater and fluctuating sea water levels pit wall stability prior to closure.	Possible	Moderate	Medium	2
Open pits	Main Pit 'lake'	Seawater intrusion into aquifers	Increased salinity of southern syncline groundwater	Rare	Moderate	Low	N / A	Rare	Moderate	Low	
Open pits	Surface water management	Ponding of Water against abandonment	Scouring of Abandonment Bunds	Possible	Moderate	Medium	Surface flow analysis and floodplain mapping may be undertaken following establishment of the abandonment bund location. Reshape land surface to divert water away from Main Pit abandonment bund if required Construct quartzite channels through abandonment bunds to direct flows from catchments adjacent to Main Pit.	Unlikely	Moderate	Medium	2

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Open pits	Pit voids	Open pits visible	Reduced visual amenity	Likely	Minor	Medium	Flood Main Pit Conduct visual amenity assessment when designing abandonment bunds.	Unlikely	Minor	Low	
Waste rock landforms	Engineered landform slope stability	Landforms erode, slump and / or collapse	Erosion of landform slopes Revegetation failure	Possible	Major	High	Geotechnical modelling to determine stability of the batter slopes under various rainfall and water content scenarios (SWC, 2014e). Modelling indicates berm overtopping unlikely Upper WRL surfaces sloped inwards Correct use of waste rock material when completing outer surfaces Batters at < 20°. Barramundi and East Pit backfill batters separated by (≈ 5 – 10 m) berms. Batters constructed competent coarse waste rock (e.g. quartzite) Berms have upper layer of growth material sourced from mined siltstone Surface treatment trials	Unlikely	Moderate	Medium	2
Waste rock landforms	Waste rock landforms	Engineered landform slope stability	Tunnelling and sinkhole development on berms	Possible	Moderate	Medium	Depth of focused siltstone placement is not deep enough with respect to the overall lift height to affect berm stability, as material below the upper portion of the berm will consist of waste rock material with much reduced potential for tunnelling development	Unlikely	Moderate	Medium	2

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Waste rock landforms	Waste rock landforms	Engineered landform slope stability	Decreased marine water and benthic habitat quality	Possible	Moderate	Medium	Surface flow analysis on the design and 'as-built' Mullet Backfill land surfaces Void volume of 280,000 m ³ Marine Monitoring Program	Unlikely	Moderate	Medium	2
Open Voids	Abandonment Bunds	Erosion of safety features	Scouring of Abandonment Bunds by Ponding of Water against Bunds	Possible	Minor	Medium	Use of erosion resistant material with sufficient space to allow water flow through the bund. Positioning the bunds at high points to avoid surface run-off Surface flow analysis and mapping may be undertaken to determine if surface water is expected to pond against Abandonment Bunds. In areas where ponding is identified, the land surface or abandonment bund placement will be reviewed to divert water away from the bund.	Unlikely	Minor	Low	

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Waste rock landforms	Landform design	Visual amenity of the WRLs is not congruent with the surrounding land surface	Reduced visual amenity	Likely	Moderate	High	Mullet Pit landform face in line with natural fall of the pit crest Barramundi and East Pit landform faces follow local slopes or existing WRL forms to integrate with surrounding surfaces. Batter heights and berm widths are likely to vary across the surface of the backfilled pits for a more natural appearance. Backfilled pits have the potential to support a woodland ecosystem that will improve the visual amenity values of the rehabilitated areas for visitors to the island. Location and outer surface design of WRLs designed to integrate with the surrounding landscape. Revegetation species specifically matched to the capabilities of the soil profile Monitoring of surface treatment trials and progressively rehabilitated areas	Unlikely	Moderate	Medium	3 / 4

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Waste rock landforms	Landform construction	Outer surface of WRLs not constructed according to the design	Erosion of landform slopes Revegetation failure Tunnelling and sinkhole development on berms Decreased marine water and benthic habitat quality Reduced visual amenity	Possible	Major	High	Monitoring of rehabilitated land surfaces against design specifications Inspection of completed landform surface waste rock material types by site environment personnel Actions taken where necessary to rectify any non-compliances.	Unlikely	Major	Medium	3
Waste rock landforms	Landform construction	Operational complexity to reconstruct the Backfilled Soil Profile	Landform doesn't adequately balance surface stability and growth requirements of the revegetation	Possible	Moderate	Medium	Discussions with earthmoving operators will be undertaken prior to construction and shaping of the outer surface of the waste dump so that all personnel are aware of the need for adhering to the designs.	Unlikely	Moderate	Medium	3
Waste rock landforms	Landform construction	WD1 spur may expand beyond approved disturbance and tenement boundaries if battered to 20°.	Direct impact on flora and vegetation Unapproved disturbance (regulatory non-conformance)	Likely	Minor	Medium	Concave surface directs surface water away from outer batters, mitigating the potential for erosion and avoiding surface runoff to the outer batters Appropriate use of dozers and / or other plant and equipment to reshape the constructed landform (i.e. cutting and filling) within tenement and approved disturbance boundaries.	Unlikely	Minor	Low	

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Misc. Mine Infrastructure	Rehabilitated and reshaped land surfaces	Uncontrolled surface water flow Ponding of rainfall on compacted clay liner underlying bioremediation facility Ponding on the Concrete Pad underlying the Processing Plant	Scouring and erosion of landform surfaces Revegetation failure Excessive Erosion and Gullyng Tunnelling and Sinkhole Development	Possible	Moderate	Medium	Removal of above ground infrastructure to ground level Reshaping of disturbance areas Compacted surfaces ripped to ≈ 800 mm A surface water flow analysis for all rehabilitated and reshaped land surfaces Clay liner punctured in several locations Compacted surfaces ripped to ≈ 800 mm Compacted clay liner underlying bioremediation facilities will be left in place, the facilities filled in, and land surfaces reshaped according to the surface water flow analysis.	Unlikely	Minor	Low	
Misc. Mine Infrastructure	Landform construction	Rehabilitated land surface not constructed according to the design	Revegetation failure Weed infestation Erosion of landform slopes Reduced visual amenity	Possible	Minor	Medium	Monitoring of rehabilitated land surfaces against design specifications Inspection of completed landform surface waste rock material types by site environment personnel Actions taken where necessary to rectify any non-compliances	Unlikely	Minor	Low	

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Misc. Mine Infrastructure	Landform construction	Soil conditions inadequate for re-establishment and growth of vegetation	Revegetation failure Weed infestation Erosion of landform slopes Reduced visual amenity Do not meet expectation of stakeholders	Possible	Moderate	Medium	Removal of all above ground infrastructure to ground level and reshaping of the disturbance areas. Natural disturbance surfaces deep ripped to ≈ 800 mm Concrete pads underlying processing plant and logistical support areas will be left in place or fragmented, depending on machinery capabilities, and covered with stable soil to sufficient depth for revegetation. Rehabilitated pads and processing plant area seeded with the revegetation species mix	Unlikely	Moderate	Medium	3
Ore stockpile area (OSA) and processing plant	Rehabilitated and reshaped land surfaces	Slumping and collapse of the batter walls	Erosion of landform slopes Revegetation failure Excessive Erosion and Gullyng Tunnelling and Sinkhole Development	Rare	Moderate	Low	OSA constructed primarily from competent, fresh, stable, non-erosive, waste rock to support heavy mine vehicles Competent nature of OSA rock will limit the extent and severity of erosion and gullyng. Tunnelling and sinkhole development unlikely to occur due to engineered competent nature of the structure.	Rare	Moderate	Low	

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Ore stockpile area (OSA) and processing plant	Rehabilitated and reshaped land surfaces	Uncontrolled surface flows and / Ponding of rainfall on compacted clay liner underlying OSA	Scouring and erosion of rehabilitated areas Sediment loss into surrounding environment	Possible	Minor	Medium	Competent, permeable waste rock used to construct the pads Deep ripping of upper surface, perimeter bunding around the edge and shaping upper surface into a concave shape	Unlikely	Minor	Low	
Ore stockpile area and processing plant	Landform construction	Rehabilitated land surface not constructed according to the design	Revegetation failure Weed infestation Erosion of landform slopes Reduced visual amenity	Possible	Minor	Medium	Monitoring of rehabilitated land surfaces against design specifications Inspection of completed landform surface waste rock material types by site environment personnel Actions taken where necessary to rectify any non-compliances	Unlikely	Minor	Low	
Landfill	Rehabilitated and reshaped land surfaces	Uncontrolled surface water flow	Scouring and erosion of rehabilitated areas Erosion of landform surfaces Revegetation failure Excessive Erosion and Gullyng Sediment loss into surrounding environment Tunnelling and Sinkhole Development	Possible	Moderate	Medium	Removal of above ground infrastructure to ground level Compacted soil cap profiled to direct surface flows away from the landfill Surface water flow over the cap will be analysed to ensure it is constructed as designed to direct surface water flows away from the landfill cells. Marine monitoring program	Unlikely	Moderate	Medium	2

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Landfill	Rehabilitated and reshaped land surfaces	Landfill inadequately drains or consolidates before the deposition of new (fresh) material.	Scouring and erosion of rehabilitated areas Erosion of landform surfaces Revegetation failure Excessive Erosion and Gullyng Sediment loss into surrounding environment Tunnelling and Sinkhole Development	Possible	Minor	Medium	All layers will be compacted prior to deposition of new material to reduce the risk of this occurring.	Unlikely	Minor	Low	
Seawall	Seawall construction	Scouring and erosion of engineered seawall section	Displacement of engineered seawall rocks fines Reshaping of engineered seawall	Almost certain	Minor	Low	The slope of the upper seawall section slope is steeper than the seawall toe, the upper section and toe being separated by a berm. The lower portion of the seawall is likely to be relatively stable, while the upper section will predictably continue to erode until a stable profile is reached	Almost certain	Minor	Low	

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Seawall	Seawall construction	Uncontrolled and excessive rock and sediment loss into surrounding environment	Reduced marine water quality (increased turbidity) Reduced benthic habitat quality (sedimentation) Reduced benthic ecosystem functioning (reduced coral cover)	Likely	Moderate	High	Coral Rehabilitation Plan Once a stable seawall profile has developed, rock deposited from the seawall will form a new sea bed surface. As the rate of seawall erosion equilibrates with the local natural rate, so too will turbidity levels and sedimentation rates, which are functions of erosion. The return to natural conditions will allow benthic species to establish on the new sea floor. Regeneration will continue to be monitored in accordance with the marine monitoring plan	Possible	Moderate	Medium	2
Seawall	Constructing decommissioning cut	Decommissioning cut impacts marine environment	Reduced marine water quality (increased turbidity) Reduced benthic habitat quality (sedimentation) Reduced benthic ecosystem functioning (reduced coral cover)	Possible	Moderate	Medium	Coral Rehabilitation Plan Marine monitoring program in accordance with the approved marine management plan (Marine management plan will be updated prior to closure to incorporate post-closure triennial monitoring of the existing marine monitoring sites	Unlikely	Moderate	Medium	3

Domain or Sub-Domain	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
				Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Seawall	Constructing decommissioning cut	Decommissioning cut not constructed according to the design	Marine ecosystem fails to establish in Main Pit lake	Possible	Moderate	Medium	Monitoring program implemented to ensure decommissioning cut is constructed in accordance with design specifications Inspection of completed cut by site environment personnel to ensure that it is located and oriented correctly, utilising the correct material types Actions taken where necessary to rectify any non-compliances.	Unlikely	Moderate	Medium	2 / 3
Main Pit	Main Pit re-inundation	Main Pit 'Lake' Water Quality Unsuitable for Environmental Values	Main pit water quality is not consistent with post mining land uses.	Possible	Moderate	Medium	Hydrodynamic modelling of decommissioning cut configurations indicates complete mixing of upper layer in 12 – 14 days with preferred single cut Construction of a second cut to be investigated if future pit lake use includes aquaculture or other activities Marine management plan will be updated prior to closure to incorporate post-closure triennial monitoring of the main pit lake marine environment Where monitoring indicates the potential for adverse effects, remedial measures will be implemented	Unlikely	Moderate	Medium	3

Risks Regulated by other agencies.

Domain or Sub-Domain	Regulating Agency	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Landfill	DWER	Landform construction	Soil Conditions are Inadequate for Re-establishment and Growth of Vegetation	Revegetation failure Weed infestation Erosion of landform slopes Reduced visual amenity	Possible	Moderate	Medium	Cap comprised of ≤ 1 m compacted clean clay fill, overlain by ≤ 150 mm locally sourced topsoil Topsoil manually seeded with local provenance seed mix Ongoing monitoring of progressive rehabilitation	Unlikely	Moderate	Medium	
Landfill	DWER	Waste disposal to landfill	Leaching of contaminants into Soil or Groundwater	Soil contamination	Possible	Moderate	Medium	The landfill has been constructed and managed as a Class II landfill in accordance with Licence (L8148/2006/4)	Unlikely	Moderate	Medium	
Landfill	DWER	Waste disposal to landfill	Leaching of contaminants into Soil or Groundwater	Groundwater Contamination	Rare	Moderate	Low	Groundwater monitoring program will continue post-mine closure	Rare	Moderate	Low	
Fuel facilities	DWER	Chemical storage and use	Spill of fuel or other bulk chemicals	Groundwater contamination	Rare	Moderate	Low	Groundwater monitoring program Groundwater contamination investigation if soil impacts identified at depth Remediate groundwater in accordance with contamination management plan	Rare	Minor	Low	

Domain or Sub-Domain	Regulating Agency	Aspect	Hazard	Impact	Inherent Risk			Risk Treatment	Residual Risk			Closure Outcome
					Likelihood	Consequence	Risk		Likelihood	Consequence	Risk	
Bioremediation Facility	DWER	Chemical storage and use	Spill of fuel or other bulk chemicals	Soil contamination	Possible	Moderate	Medium	Contaminated sites assessment at bioremediation facilities, processing plant, ore stockpile area, power plant and dewatering sites following decommissioning. Remediate soil in accordance with contamination management plan	Unlikely	Minor	Low	
Sitewide	DWER	Chemical storage and use	Spill of fuel or other bulk chemicals use and storage across the site leading to contaminated land	Land Contamination	Likely	Moderate	High	Groundwater monitoring program Groundwater contamination investigation if soil impacts identified at depth Remediate groundwater in accordance with contamination management plan Assess, remediate and report as per the requirements of the <i>Contaminated Sites Act</i> 2003	Unlikely	insignificant	Low	

