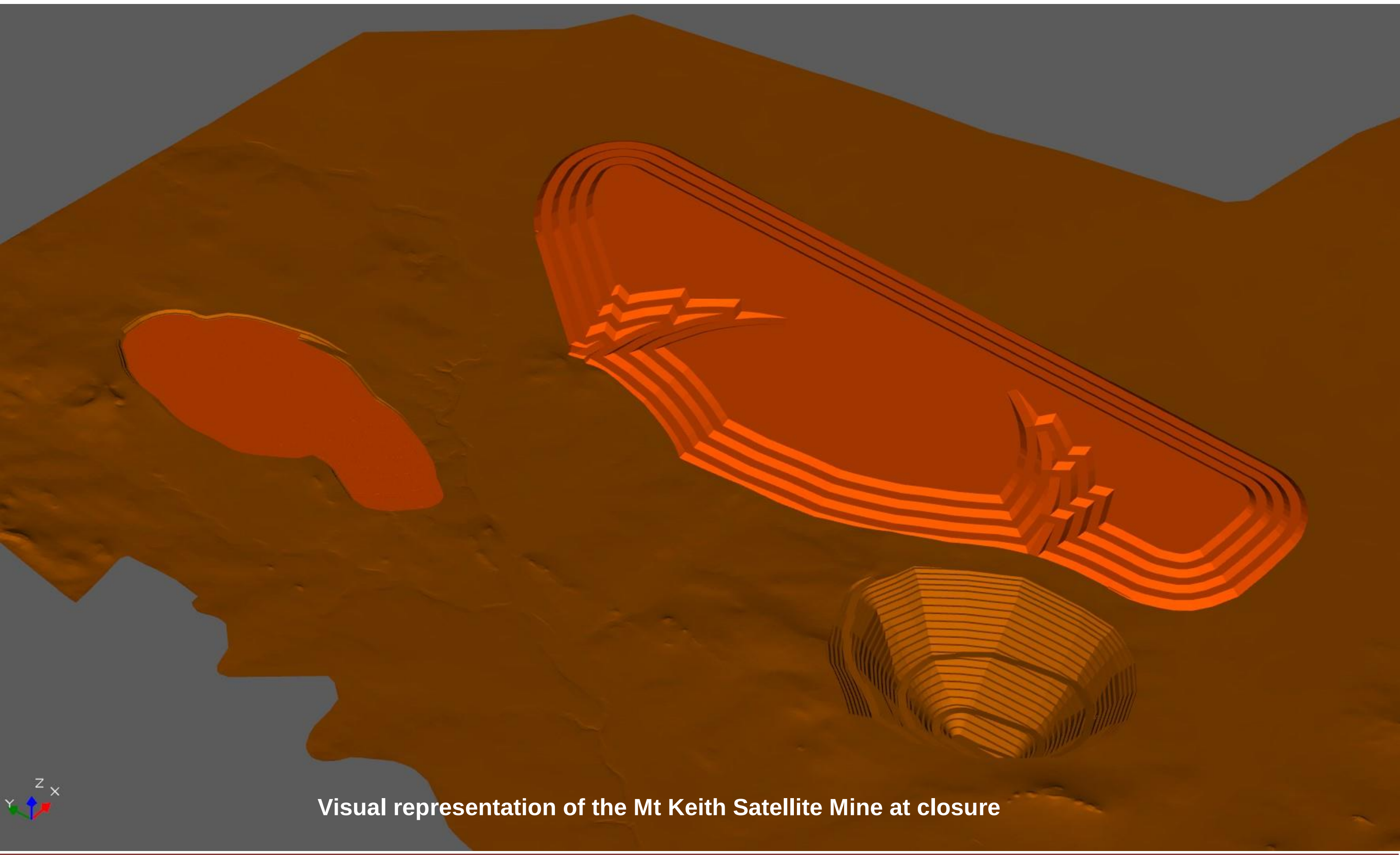
Nickel West

MT KEITH SATELLITE MINE CLOSURE PLAN

JULY 2018



Visual representation of the Mt Keith Satellite Mine at closure

Mine Closure Plan Cover Page

MINE CLOSURE PLAN REQUIREMENT	
Title of Project	Mt Keith Satellite Project
Document Title	Mt Keith Satellite Mine Closure Plan 2018
Document ID Number and Version Number	NiW-MKS-MCP-2018, Version 3.0
Mineral Field Numbers	53 and 36, East Murchison Goldfields
Mineral Tenements:	M36/422, M36/399, M36/288, M36/286, M36/285, M36/246, M36/185, M36/184, M36/183, M36/677, L36/206, M36/658, M53/217 and M53/218
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Checklist

Qu. No.	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
1	Has the Checklist been endorsed by a senior representative within the tenement holder/operating company? (See bottom of Checklist.)	Y	vii (after this Checklist)	N/A			
Public Availability							
2	Are you aware that from 2015 all MCPs will be made publicly available?	Y	N/A	N/A	N/A	N/A	N/A
3	Is there any information in this MCP that should not be publicly available?	N	N/A	N/A	N/A	N/A	N/A
4	If "Yes" to Q3, has confidential information been submitted in a separate document/section?	N/A	N/A	N/A	N/A	N/A	N/A
Cover Page, Table of Contents							
5	Does the MCP cover page include • Project Title • Company Name • Contact Details (including telephone numbers and email addresses) • Document ID and version number • Date of submission (needs to match the date of this checklist).	Y	i	Before this checklist	N/A		

Qu. No.	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
Scope and Purpose							
6	State why the MCP is submitted (as part of a Mining Proposal or a reviewed MCP or to fulfil other legal requirements)	Y	1 to 3	Refer Section 1	N/A		
Project Overview							
7	Does the project summary include: • Land ownership details (include any land management agency responsible for the land / reserve and the purpose for which the land / reserve [including surrounding land] is being managed) • Location of the project; • Comprehensive site plan(s); • Background information on the history and status of the project.	Y	4 to 10	Refer Section 2	N/A		
Legal Obligations and Commitments							
8	Does the MCP include a consolidated summary or register of closure obligations and commitments?	Y	11 to 12, Appx A	Refer Section 3	N/A		
Stakeholder Engagement							
9	Have all stakeholders involved in closure been identified?	Y	13	Refer Section 4	N/A		
10	Does the MCP include a summary or register of historic stakeholder engagement with details on who has been consulted and the outcomes?	Y	13 Appx B	Refer Section 4	N/A		

Qu. No.	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
11	Does the MCP include a stakeholder consultation strategy to be implemented in the future?	Y	13	Refer Section 4	N/A		
Post-mining land use(s) and Closure Objectives							
12	Does the MCP include agreed post-mining land use(s), closure objectives and conceptual landform design diagram?	Y	14 to 19 67 to 82	Refer Sections 5 and 9	N/A		
13	Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?	Y	28 to 64	Refer Section 7	N/A		
14	Has any soil or groundwater contamination that occurred, or is suspected to have occurred, during the operation of the mine, been reported to DER as required under the Contaminated Sites Act 2003?	NA			N/A		
Development of Completion Criteria							
15	Does the MCP include an appropriate set of specific completion criteria and/ closure performance indicators?	Y	20 to 27	Refer Section 6	N/A		
Collection and Analysis of Closure Data							
16	Does the MCP include baseline data (including pre-mining studies and environmental data)?	Y	28 to 64	Refer Section 7	N/A		

Qu. No.	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
17	Has materials characterisation been carried out consistent with applicable standards and guidelines (e.g. GARD Guide)?	Y	47 to 51	Refer Section 7.2	N/A		
18	Does the MCP identify applicable closure learnings from benchmarking against other comparable mine sites?	Y	53 to 64	Refer Section 7.5	N/A		
19	Does the MCP identify all key issues impacting mine closure objectives and outcomes (including potential contamination impacts)?	Y	28 to 64 Appx. C	Refer Sections 7 and 8	N/A		
20	Does the MCP include information relevant to mine closure for each domain or feature?	Y	28 to 87	Refer Sections 7, 8 and 9	N/A		
Identification and Management of Closure Issues							
21	Does the MCP include a gap analysis/risk assessment to determine if further information is required in relation to closure of each domain or feature?	Y	69 to 82	Refer Section 9	N/A		
22	Does the MCP include the process, methodology, and has the rationale been provided to justify identification and management of the issues?	Y	65 to 85	Refer Sections 8 and 9	N/A		
Closure Implementation							
23	Does the MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?	Y	69 to 85	Refer Section 9	N/A		

Qu. No.	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
24	Does the MCP include a closure work program for each domain or feature?	Y	69 to 85	Refer Section 9	N/A		
25	Does the MCP contain site layout plans to clearly show each type of disturbance as defined in Schedule 1 of the MRF Regulations?	Y	8 to 10 69 to 85	Refer Section 9	N/A		
26	Does the MCP contain a schedule of research and trial activities?	Y	69 to 85	Refer Section 9	N/A		
27	Does the MCP contain a schedule of progressive rehabilitation activities?	Y	69 to 85	Refer Section 9	N/A		
28	Does the MCP include details of how unexpected closure and care and maintenance) will be handled?	Y	69 to 85	Refer Section 9	N/A		
29	Does the MCP contain a schedule of decommissioning activities?	Y	69 to 85	Refer Section 9	N/A		
30	Does the MCP contain a schedule of closure performance monitoring and maintenance activities?	Y	85 to 89	Section 10	N/A		
Closure Monitoring and Maintenance							
31	Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?	Y	86 - 91	Section 10	N/A		
Financial Provisioning for Closure							
32	Does the MCP include costing methodology, assumptions and	Y	69 to 85	Refer Sections 9 and 11	N/A		

Qu. No.	Mine Closure Plan (MCP) Checklist	Y/N NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
	financial provision to resource closure implementation and monitoring?		92				
33	Does the MCP include a process for regular review of the financial provision?	Y	92	Section 11	N/A		
Management of Information and Data							
34	Does the MCP contain a description of management strategies including systems, and processes for the retention of mine records?	Y	93	Section 12	N/A		

Corporate Endorsement

I hereby certify that to the best of my knowledge, the information within this Mine Closure Plan and checklist is true and correct and addresses all the requirements of the Guidelines for the Preparation of a Mine Closure Plan approved by the Department of Mines, Industry Regulation and Safety.

Position	Name	Signature	Date
NiW Manager Closure Planning	Carl Bagnall	pp. BRENDAN MAY	11.7.18
General Manager – Northern Operations	Chris Stone		11/7/18.

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1 PURPOSE AND SCOPE

1.1 MCP Purpose

The purpose of this Mine Closure Plan (MCP) is to define the objectives and commitments of BHP Billiton Nickel West Pty Ltd (NiW) in relation to closure of the Mt Keith Satellite Nickel Project (MKS Project), located in the Northern Goldfields of Western Australia (WA) (**Figure 1-1**)

MKS will form part of the NiW Asset, which is 100% owned and operated by BHP Limited (BHP). NiW is a fully integrated mining and processing nickel business with all its operations located within WA, and a head office in Perth.

NiW operations consist of:

- Mount Keith Mine (NMK) (Nickel Mine & Concentrator), 430 kilometres (km) north of Kalgoorlie;
- Leinster Nickel Mine (Nickel Mine & Concentrator) (NLN), 370 km north of Kalgoorlie;
- Cliffs Nickel Mine, 5 km south of NMK;
- Kambalda Nickel Concentrator (NKC), 60 km south of Kalgoorlie;
- Kalgoorlie Nickel Smelter (NKS), 15 km south of Kalgoorlie;
- Kwinana Nickel Refinery (NKW), 40 km south of Perth; and
- Other activities including mineral exploration and support facilities (e.g. mining accommodation villages, airports).

The locations of the NiW operating sites (referred to above) are shown in **Figure 1-1**.

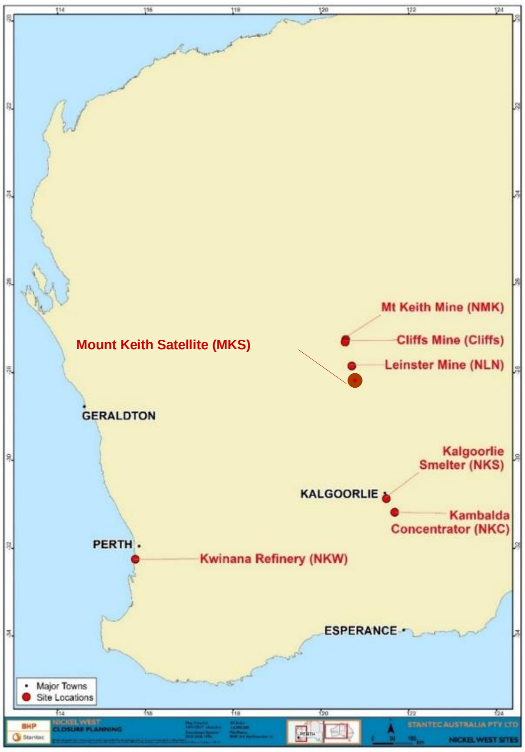

Figure 1-1: NiW Current Site Locations

This document is intended to satisfy statutory obligations that require the submission of a MCP with a Mining Proposal (DMIRS and EPA, 2015).

The MCP, once approved by regulatory authorities, provides NiW the certainty that the commitments made within this MCP - if met by NiW and verified as such to the satisfaction of authorities - are acceptable to the State Government as a basis for complying with statutory obligations and relinquishing mining tenements and residual liabilities.

This MCP has been prepared in general accordance with the '*Guidelines for Preparing Mine Closure Plans'* (Version 2, 2015) jointly released by the former Department of Mines and Petroleum (DMP), which is now known as the Department of Mines, Industry Regulation and Safety (DMIRS), and the Environmental Protection Authority (EPA). These statutory guidelines are referred to hereafter in this MCP as the '2015 Guidelines'.

This MCP has also been prepared consistent with relevant BHP requirements, including *Our Requirements for Closure* (2017).

1.2 MCP Scope

The scope of this MCP is to detail the proposed closure solutions and related commitments for the MKS Project areas and associated infrastructure. Specifically, these land disturbances and assets comprise the following features:

- Two open pit mines;
- One waste rock landform (WRL);
- A run-of-mine (ROM) pad;
- Water infrastructure;
- Administration buildings; and
- Haul roads, access roads and hardstand areas.

All ore from the MKS Project will be hauled to, and processed at, NMK. Closure of the processing and administration infrastructure at NMK is covered under the 2017 Closure Plan which is the overarching document for this MCP.

The MCP has emphasis on the basis for and details of capital works program to be completed at mine closure. However, the MCP also describes key trial and related activities pre-closure and the post closure execution monitoring and maintenance program as part of a staged, credible path to relinquishment of mining tenements and residual liabilities.

Once the accompanying mining proposal for MKS (incorporating this MCP) is approved, the relevant commitments stated in this MCP will be incorporated in the site-wide NMK MCP. As part of the NMK MCP, the closure commitments for the MKS mining area (stated in this MKS MCP) will be reviewed over time to ensure they continue to reflect contemporary knowledge, technology, government policy/guidelines and rehabilitation experience. On this basis, the commitments made in this MKS MCP may be amended from time to time as part of revisions made to the NMK MCP which are approved by the DMIRS. The NMK MCP is reviewed triennially by NiW in accordance with the 2015 Guidelines, or at a frequency otherwise specified in statutory approvals or agreed with the DMIRS. The NiW Manager Closure Planning, or delegate, is responsible for coordinating these reviews.

1.3 Identification Phase Study (IPS)

NiW implemented a significant program of closure studies as part of the IPS. As per BHP standards, the IPS is the first stage in the development of a Major Project. Major Projects are developed for investments which are complex and/or requiring significant investment to ensure that the commitment and expenditure of funds is sound.

While the IPS did not specifically address the changes to NMK associated with the MKS Project, the work completed for NMK has informed this MCP, and therefore the conclusions of the study are directly relevant to the MKS Project.

Further details on the IPS, including its importance to contemporary NiW closure designs, are provided in the NMK MCP (BHP, 2017).

1.4 Stakeholder Engagement

NiW considers stakeholder engagement as an integral and essential component of successful mine closure planning. NiW implemented an unprecedented program of engagement with key closure stakeholders as part of the IPS. In total, more than 20 meetings were held with regulatory authorities and other stakeholder groups over the past two years to discuss and seek their input on the development of the IPS program, informing this MCP revision.

The main regulatory authorities engaged by NiW during the IPS has included:

1. DMIRS;
2. DWER;
3. Department of Planning, Lands and Heritage (DPLH), formerly the Department of Lands (DoL);
4. Environmental Protection Authority (EPA);
5. Department of Jobs, Tourism, Science and Innovation (DJTSI); and
6. Department of Biodiversity, Conservation and Attractions (DBCA), formerly the Department of Parks and Wildlife (DPaW)

NiW has maintained regular engagement with the DMIRS since the inception of the IPS program in July 2015. The purpose of this engagement was to involve the DMIRS from the outset in the development of the IPS scope and to seek progressive DMIRS feedback. The feedback from DMIRS has been considered, where relevant, in the development of this MCP.

Further details on the stakeholder engagement program implemented in support of this MCP revision is included in **Section 4**.

2 SITE AND PROJECT SUMMARY

2.1 Site Location

The MKS Project will be an open-cut nickel mining operation situated in the Northeast Goldfields of WA (**Figure 2-1**). The MKS Project is located 700 km northeast of Perth and 410 km north of Kalgoorlie and is situated within the Shire of Leonora Local Government Area (LGA). The nearest population centres are Wiluna, 100 km to the north, and Leinster, 70 km to the south. The Wanjarri Nature Reserve is the nearest gazetted conservation area, located to the east of the MKS Project.

2.2 MKS Overview

The MKS Project will consist of two open pits (Six Mile Well and Goliath), one WRL and associated supporting infrastructure. Ore will be hauled to and processed at the nearby NMK mine site, located 20 km to the north. The MKS Project has a disturbance footprint of 878 hectares (ha) within a development envelope of 1259 ha (see **Table 2-2**). Approximately 9.6 Million tonnes (Mt) will be mined. The open pits will be mined below the water table and dewatering of groundwater will be required during operations. The current plan is for the Six Mile Well open pit to be backfilled during operations.

2.3 Land Ownership and Operations Tenure

The MKS Project is situated within mining tenements issued under the *Mining Act 1978* (WA). These tenements comprise Mining Leases, Miscellaneous Licences and General Purpose Leases. The numbers and locations of these tenements are shown in **Table 2-1** and **Figure 2-2**. These tenements cover a total area of approximately 8,850 hectares (ha), and are held by NiW or its wholly owned subsidiary BHP Billiton Yakabindie Nickel Pty Ltd. The MKS Project and all associated tenements are located within the Murchison region.

Table 2-1: Mining Tenements

Domain	Infrastructure	Tenements
Landforms	WRL	M36/422
	ROM	M36/246
Mine workings	Open Pits	M36/184, M36/185, M36/183
Non-Process Infrastructure	Administration Buildings, Fuel Farm, Dewatering Facility, Bridge Crossings (North and South), Drainage Controls, Unsealed Roads, Haul Road to NMK (20 km), Laydown areas and Topsoil Stockpiles.	M36/285, M36/286, M36/288, M36/399, L36/206, M36/677. M36/658, M53/218, M53/217

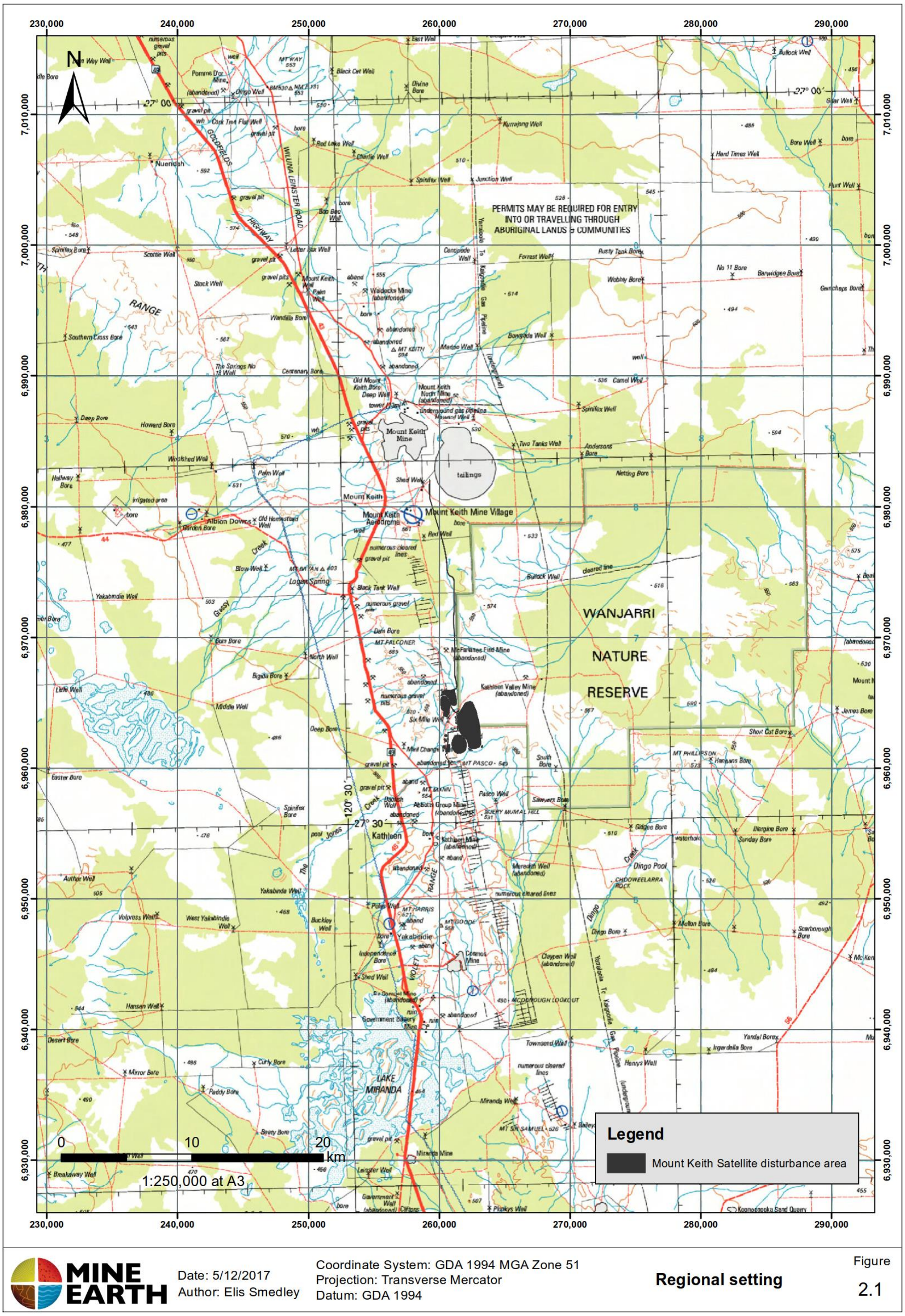

Figure 2-1: Regional Setting

2.4 Pastoral Tenements

In addition to the tenements listed in **Table 2-1,** NiW holds the Yakabindie and Mt Keith Pastoral Leases, which overlap the mining and related tenements. These pastoral leases cover a total area of 250,000 ha and are sub-leased by NiW to a third party (pastoralist).

2.5 Statutory Approvals History

Approval for mining at MKS Project was originally granted under the Yakabindie Nickel Proposal (YNP). The EPA approved the YNP with conditions in December 1990 (Statement 117). Since its original approval the YNP has been subject to six reviews under s46 of the *Environmental Protection Act 1986* (EP Act). These reviews related to changes to the proposal, changes to the conditions of the approval and extensions of the time limit of approval. The YNP was never developed and EPA approval expired on 21 October 2007.

The main differences between the YNP and the MKS Project are:

- The MKS Project has a smaller disturbance footprint;
- The YNP required a section of the Jones Creek to be diverted;
- The YNP incorporated the development of two WRLs; and,
- The YNP included the development of a TSF.

The MKS Project constitutes a substantial revision of the 1990 proposal, and has been referred to the EPA, with the level of assessment was set as “Environmental Review.” This MCP has been developed to support the Environmental Review Document.

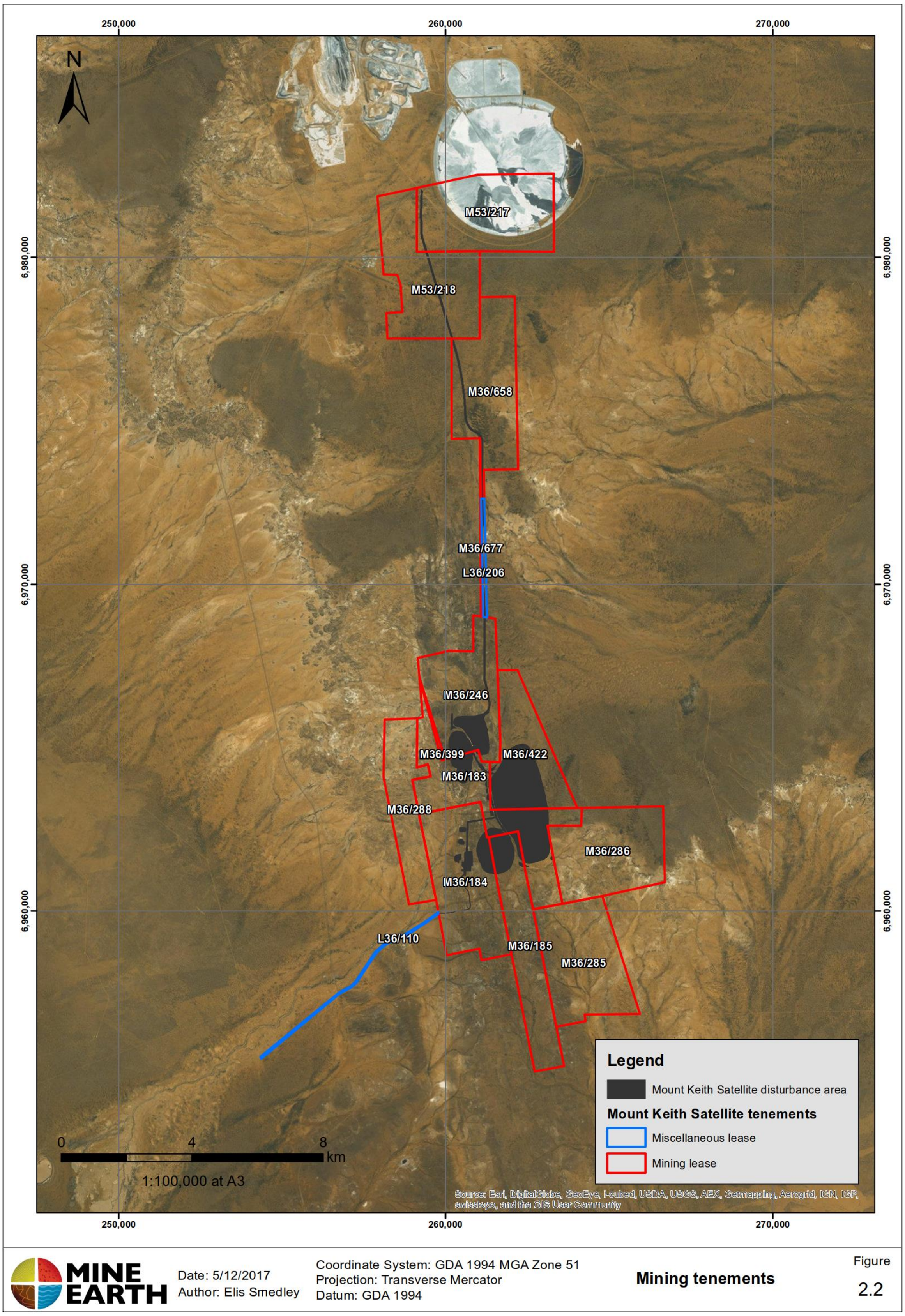

Figure 2-2: Mining Tenements

2.6 Closure Domains

For the purposes of organising closure planning, the closure scope resulting from the MKS Project has been classified into common disturbance types, which are referred to as closure domains (**Figure 2-3**). The definition of closure domains adopted in this MCP is generally consistent with the model presented as Appendix I in the 2015 Guidelines.

The domains are segregated by mining landforms groups which are generally common in closure objectives, scope and legal obligations.

The MKS closure domains include:

Waste Rock Landforms*:*

- WRL; and
- ROM pad.

Open Pits*:*

- Six Mile-Well Open Pit; and
- Goliath Open Pit.

Non-process Infrastructure*:*

- Administration Buildings;
- Fuel Farm;
- Dewatering Facility;
- Bridge Crossings (North and South);
- Drainage Controls;
- Unsealed Roads;
- Haul Road to NMK (20 km);
- Laydown areas; and
- Topsoil Stockpiles.

A figure showing the mine site layout and assigning all disturbed areas to a closure domain is presented in **Figure 2-3**. Sub-domain details, including the proposed disturbance areas, are provided in **Table 2-2.**

Table 2-2: Group, Domain, Sub-Domain and Planned Disturbance Area for MKS

Group	Domain	Sub-Domains	Planned MKS Disturbance Area (ha)
Landforms	WRL	NA	445
	ROM Pad	NA	
Mine workings	Open pits	Six Mile Well Pit	212
		Goliath Pit	
Infrastructure	Non-Process Infrastructure	Administration Buildings; Fuel Farm; Dewatering Facility;	137

Group	Domain	Sub-Domains	Planned MKS Disturbance Area (ha)
		Bridge Crossings (North and South); Drainage Controls; Unsealed Roads; Laydown areas; and Topsoil Stockpiles.	
		Haul Road to NMK (20 km);	84
Total			878

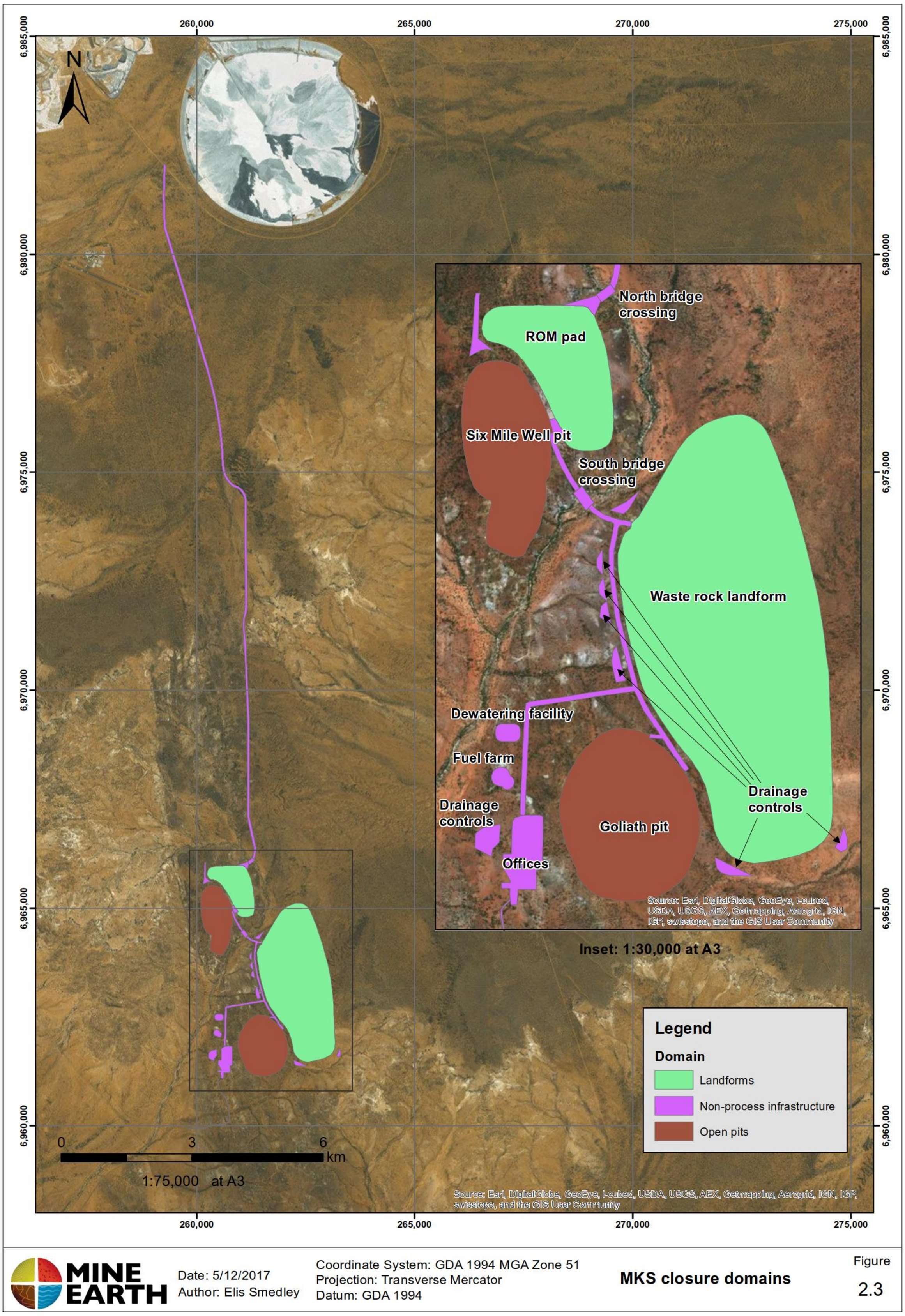

Figure 2-3: MKS closure domains

3 CLOSURE OBLIGATIONS AND COMMITMENTS

Once the MKS Project is approved, NiW will have a range of legal and other obligations which will be applicable to closure. These closure obligations will be predominantly derived from commitments made by NiW in approval applications, conditions imposed by the Minister for the Environment, and tenement conditions. A register of current binding conditions (i.e. tenement conditions) that relate specifically to mine closure and rehabilitation has been developed and is presented in **Appendix A.**

Additional closure obligations will be added to the next iteration of the NMK MCP. Details are provided below in relation to the specific legal and other obligations that inform closure planning at MKS.

3.1 Legislative Obligations

Table 3-1 provides a list of the statutes considered relevant to closure planning for the MKS Project.

Table 3-1: Applicable Legislation

Type	Name
Safety	*Radiation Safety Act 1975 (WA)*
	Occupational Health and Safety Act 1984 (WA)
	Health (Asbestos) Regulations 1992 (WA)
	Dangerous Goods Safety Act 2004 (WA)
	Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007 (WA)
Environment	*Rights in Water and Irrigation Act 1914 (WA)*
	Wildlife Conservation Act 1950 (WA)
	Conservation and Land Management Act 1984 (WA)
	Environmental Protection Act 1986 (WA)
	Environmental Protection Regulations 1987 (WA)
	Environment Protection Regulations 1997 (WA)
	Environmental Protection and Biodiversity Conservation Act 1999 (Cth)
	Environment and Biodiversity Conservation Regulations 2000 (Cth)
	Environmental Protection (Rural Landfill) Regulations 2002 (WA)
	Contaminated Sites Act 2003 (WA)
	Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (WA)
	Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)
	Environmental Protection (Controlled Waste) Regulations 2004 (WA)
	Contaminated Sites Regulations 2006 (WA)
	Biodiversity Conservation Act 2016 (WA)
	Biosecurity and Agriculture Management Act 2007 (WA)
Heritage	*Aboriginal Heritage Act 1972 (WA)*
	Aboriginal Heritage Regulations 1974 (WA)
	Native Title Act 1993 (Cth)
Mining	*Mining Act 1978 (WA)*
	Mining Regulations 1981 (WA)
	Mines Safety and Inspection Act 1994 (WA)

Type	Name
	Mines Safety and Inspection Regulations 1995 (WA)
	Mining Rehabilitation Fund Act 2012 (WA)
	Mining Rehabilitation Fund Regulations 2013 (WA)
Pastoral	*Land Administration Act 1997 (WA)*

Legislative obligations pertaining to closure are primarily general in nature requiring the assessment and management of the potential for adverse impacts to people, heritage, property and the environment. These obligations also require the obtainment of statutory approvals, in some instances, to support planned closure activities. NiW acknowledges its obligations under this legislation and has in place processes to manage for compliance.

3.2 Other Obligations

MKS Project mining tenure is located within the boundary of the Tjiwarl native title determination (WAD228/2011 and WAD302/2015). This determination was made in April 2017 during the latter stages of the IPS development. At the time of finalising this MCP, NiW was in initial discussions with the Tjiwarl People regarding the implications from this determination. NiW is committed to continuing to engage with the Tjiwarl People and will seek to extend these discussions over time and as relevant to include matters relating to closure planning for all relevant NiW operations.

Other obligations arising from the BHP Charter, BHP *Our Requirements for closure*, Government guidelines (including the 2015 Guidelines) and industry standards form the balance of commitments that have been considered in the development of this MCP.

4 STAKEHOLDER ENGAGEMENT

4.1 Overview

NiW considers effective stakeholder engagement to be integral to achieving success in mine closure. Those internal and external stakeholders who have involvement, influence or interest in closure planning and its outcomes will ultimately decide the success, or not, of an implemented closure plan. The early input of key stakeholders, particularly those directly impacted or which have the most influence on the acceptability of the MCP is crucial to ensuring a clear, credible and efficient path to site closure and tenement and land relinquishment.

Stakeholder engagement undertaken specifically for the MKS Project has related to obtaining Project approval. Currently the extent of this engagement has been the presentation of the Environmental Scoping Document (ESD) by the EPA to various stakeholders from the Department of Biodiversity Conservation and Attractions (DBCA), the DMIRS, the Department of Planning, Lands and Heritage (DPLH) and the Department of Water and Environmental Regulation (DWER). Most of the feedback received to date has related to Project approvals – some closure issues were raised and these are presented in **Appendix B.** Extensive stakeholder engagement related to closure planning was undertaken during the IPS that was only recently completed for the revised 2018 NMK MCP. The NMK MCP's scope and consistency in key commitments makes the stakeholder engagement conducted for the IPS relevant to the Project.

Extensive stakeholder engagement was undertaken during the IPS, which is directly relevant to closure planning for the MKS Project. The outcomes of relevant IPS stakeholder engagement is also presented in this section and **Appendix B.** The External Stakeholder Meetings Register (2015 to 2017), provides a record of all the meetings that were held between NiW and external stakeholders during the IPS. In total, over 20 meetings were held over a two-year period.

4.2 Next MCP Revision

The next revision and update of the NMK site MCP (scheduled for March 2021) will incorporate relevant commitments from this MKS Project MCP. To inform this next NMK MCP revision, engagement on progressive closure planning will be maintained with the key stakeholders NiW consulted with during the IPS. It is also expected that engagement on closure matters with the local indigenous Tjiwarl People will have commenced during this time.

Active engagement with the NiW workforce will be maintained and post-IPS this will emphasise the planning and implementation of progressive activities pre-closure. These activities may include rehabilitation, field trials and operational improvements that build upon the IPS findings to further reduce closure risks, uncertainties and liabilities.

Table 4-1: External Engagement Schedule

Stakeholder	Proposed Engagement Frequency
DMIRS	Bi-annual (or as required)
DWER	Annual (or as required)
DPLH	Annual (or as required)
EPA	Annual (or as required)
Pastoral Lessees	Annual (or as required)
Traditional Owners - Tjiwarl	Annual (or as required)

Should the expected closure date significantly alter before the next NMK MCP revision, then the scope and cadence of the stakeholder engagement strategy for closure will be reviewed, to ensure that it remains appropriate for the circumstances.

5 POST MINING LAND-USE/S AND CLOSURE OBJECTIVES

This section discusses the post-mining land-uses and closure objectives (consistent with those land-uses) for the MKS Project. The proposed post mining land-use/s and closure objectives are consistent with that proposed in the NMK MCP (BHP 2017a).

NiW considers final land-uses and closure objectives as critical parameters in the framing of closure planning. In particular, they frame the development of appropriate closure performance criteria (**Section 6**) and the establishment of a reliable, finite and achievable path to relinquishment of mining tenements and residual liabilities.

5.1 Post Mining Land-Use/s

5.1.1 Assessment Inputs

During the IPS, the following inputs were considered in review and selection of post-mining land-uses for NMK. Consistent with these findings these inputs were utilised for the selection of post-mining land-uses for the MKS Project:

1. Land-Use Objectives;
2. Stakeholder Feedback;
3. Statutory obligations (See **Section 3**); and
4. Results from the Pastoral Land-Use Assessment.

With the exception of Statutory Obligations (see **Section 3**), each of these assessment inputs is further discussed below.

5.1.1.1 Land-Use Objectives

Achievable post-mining land-uses agreed with key stakeholders is a fundamental closure consideration. During the IPS, NiW invested in targeted studies and stakeholder engagement to identify suitable land-uses that were:

- Acceptable to key stakeholders;
- Relevant and compatible with the local environment;
- Realistic and achievable to deliver the target outcomes;
- Minimal in maintenance to aid the long-term viability of the land-use;
- Diverse and adaptive, and which do not sterilise potential for future mining;
- Ecologically sustainable in the context of the local and regional environment; and
- Resilient to changes in environmental conditions, including predicted changes in climate.

In evaluating and selecting post-mining land-use/s, NiW has considered their value and suitability at the local (site) and landscape scales. This was done primarily in response to stakeholder feedback received during the IPS, including from the DPLH and local pastoralists, which encouraged NiW to consider striking more balance (than, based on feedback and IPS Study team experience, was typical within the mining industry at closure) between the gains made within the mining tenement boundaries versus those which could be achieved in the immediate surrounds to deliver more viable, sustainable post-mining land-uses. This was particularly sought where a superior nett benefit to land-uses could be delivered to aid their economic, social and environmental sustainability post-closure.

This assessment approach was considered consistent with the closure principles identified in Section 3.1 of the 2015 Guidelines, which states:

> *"Post-mining land-uses should … include consideration of opportunities to improve management outcomes of the wider environmental setting and landscape, and possibilities for multiple land uses."*

In relation to the determination of the mix of final land-use, Section 4.8.1 of the 2015 Guidelines recognises that land-use/s should be regularly reviewed to ensure their continued feasibility, efficacy and acceptability to stakeholders:

> *"DMP and EPA acknowledge that end land uses may change over time. Agreed end land-use(s) may change in iterations of Mine Closure Plans as more information is acquired through progressive rehabilitation and continued stakeholder engagement."*

NiW has endeavoured in the revision of this MCP to be consistent with this expectation to ensure post mining land-uses are relevant, desirable and achievable, and informed by contemporary stakeholder feedback, site experience, industry case studies, Government policy and regulations and the IPS technical assessments and findings.

5.1.1.2 Stakeholder Feedback

The preferences of key stakeholders with experience in dealing first-hand with the challenges associated with land-use in the northern Goldfields and/or who are likely to inherit/manage rehabilitated lands post-relinquishment (e.g. DPLH, local pastoralists) are critical inputs in the land-use assessment conducted during the IPS.

As discussed in **Section 4**, NiW implemented a targeted program of stakeholder engagement during the IPS. This was done, in part, to materially advance the understanding of what was acceptable to key stakeholders as a mix of end land-use. The engagement on land-use primarily targeted the DPLH, the DMIRS and experienced pastoralists.

The predominant stakeholder feedback throughout IPS did not encourage a cattle grazing land-use on the heavily altered mining rehabilitated landforms (WRLs and final voids), recognising the inherent limitations and challenges in this landscape. Instead, stakeholder preferences were generally to exclude cattle from these domains and pursue a passive native vegetation outcome to soften the landscape aesthetic and increase local biodiversity

Many of the stakeholders, particularly those pastoral, stated a clear preference for NiW to consider alternative measures that could more reliably, cost-efficiently and sustainably improve land capability and grazing viability of the pastoral leases beyond the mine gate.

Importantly, stakeholders were also keen for NiW to ensure that the rehabilitated site did not adversely impact (e.g. from dust, erosion, contamination of stock bores, etc.) the pastoral quality or use of the surrounding lands.

5.1.1.3 Pastoral Land-Use Assessment

As part of the IPS, NiW conducted a pastoral land-use assessment using specialist, experienced pastoralists (Blood, 2017). This assessment was identified in response to early stakeholder feedback during the IPS that suggested a pastoral end land-use was not desirable nor considered feasible by key stakeholders for mine rehabilitated landscapes. Instead, there was a clear preference from stakeholders for an assessment to be conducted of what could be done, at a wider scale, to better improve the long-term viability post-closure of pastoralism in the locale.

Accordingly, NiW in consultation with the pastoralist consultants and the DPLH identified a pastoral improvement approach, which aims to exceed pre-mining grazing capability (stocking rate) in the area of the NiW mines and immediate surrounds. This option, and its ultimate scope, will be subject to further discussions with the DPLH as part of future updates of the MCP. The selected option will also be incorporated, along with other initiatives, in the development of a Rangeland Management Plan (or equivalent). The Rangeland Management Plan will be the document that incorporates all of the commitments made by NiW as part of achieving a suite of closure outcomes acceptable to the DPLH for relinquishment of tenure. The scope and commitments made within the Rangeland Management Plan will be determined in consultation with and to the satisfaction of the DPLH prior to the start of closure execution.

Details in relation to the scope and key findings from this pastoral land-use assessment is provided in the NMK MCP (BHP 2017a).

5.1.2 Selected Post-Mining Land-Uses

From the evaluation of inputs described above in section 5.1.1, **Table 5-1** identifies the post-mining land-uses proposed for the MKS Project area.

Table 5-1: MKS Post-Mining Land-Uses

Domain	Land-Use	Description
WRL	Self-Sustaining Native Vegetation (to support local biodiversity and improved post-mining aesthetics)	• Will support self-sustaining native vegetation (i.e. native vegetation species, which can survive in local conditions with nil to minimal maintenance or other intervention, will be predominant). • The land-use objective is to maintain local biodiversity whilst improving/softening the visual aesthetics of mine rehabilitation. • Grazing will be discouraged (from perimeter fencing of the landform) to reduce potential for grazing impacts to undermine core stability and revegetation/biodiversity outcomes. Use of native species unpalatable to stock will be considered in the adopted seed mix. • This land-use will not inhibit or adversely impact the pastoral activity in surrounding non-mined areas. • Funding provisions will be made for maintenance of fencing and other key features for a finite period beyond the post-closure monitoring phase to support a successful relinquishment process for mining tenements and residual liabilities.
Open Pit	Historic Mining (to preserve mining history and support potential resumption of mining or alternate uses)	• Mining void and immediate area will be made safe and stable with access for people and stock discouraged through fencing / bunds (e.g. at top of pit access ramps, abandonment bund) and rehabilitation of former access roads. • The final void will be left to serve as a pit lake, which could be dewatered to support any future resumption of mining. • This land-use will not inhibit or adversely impact the pastoral activity in surrounding non-mined areas.

Domain	Land-Use	Description
Non-Process Infrastructure	Self-Sustaining Native Vegetation (to support low intensity cattle grazing)	• As above. Additionally, it may, where feasible and sought by key stakeholders, support a transition to low intensity pastoral grazing over time. If the pastoral benefit is more limited than was envisaged for some areas, this will be considered in the justification or not of continuing to pursue a grazing outcome over time particularly where alternate benefits are evident (e.g. biodiversity). • It is anticipated that larger Non-Process Infrastructure areas will be initially fenced to enable vegetation to establish and develop until it is able to support limited grazing where this is deemed feasible as an extension to surrounding pastoral lands.

As discussed in **Section 5.1.1.3**, NiW proposes to implement an option that will help improve cattle stocking rates in the mining tenements and immediate surrounds. These works form part of the suite of closure commitments to deliver a mix of realistic, feasible and sustainable post-mining land-uses that are desired by key stakeholders.

The target post mining land-uses identified in **Table 5-1** will be subject to review over time to ensure their continued relevance and feasibility and agreement with key stakeholders. Any proposed changes to these land-uses will be discussed with the DMIRS and other relevant parties prior to their inclusion in future MCP revisions.

5.2 Closure Objectives

Realistic and achievable closure objectives have been developed, which are consistent with the post-mining land-uses (Section 5.1). These will be refined in further iterations of the MCP.

Closure objectives have been developed at the site (broad) and key domain (specific) levels, see **Table 5-2**. The Domain Objectives are grouped according to the Site Objective tenets **-** safe, stable, non-polluting and agreed land-use. Compliance with legal and other (e.g. BHP) obligations is a primary requirement of the Site Objective.

Table 5-2: Closure Objectives

SITE Objective
Deliver safe, stable and non-polluting outcomes and agreed post-mining land-uses[1] that comply with legal and other obligations and achieve mining tenement relinquishment[2] and a “walk away” solution[3] for NiW
[1] “*Safe, stable and non-polluting outcomes”* are defined as: - *“Safe” includes the protection of people from harm primarily but also gives consideration to stock and native fauna;* - *“Stable” encompasses erosional and geotechnical stability, and* - *“Non-polluting” is both geochemical and geophysical and considers sources, pathways and sensitive receptors to qualify risk.* [2] *“Mining tenement relinquishment” is defined as a state when agreed completion criteria have been met, government “sign-off” achieved, all obligations under the Mining Act 1978 removed, and the proponent has been released from all forms of security. This is consistent with the definition of “relinquishment” provided in the DMIRS / EPA “Guidelines for Preparing Mine Closure Plans May 2015”.* [3] *“Walk away solution” is defined as a state when mining tenement relinquishment has been achieved and NiW has been able to reliably discharge to the State Government or other third party its residual liabilities related to the site. At this time, the site shall either no longer require management, or if further management is required or can be reasonably expected then NiW shall make adequate provision so that the required management can be undertaken with no unacceptable outcome to the third party which inherits the site.*
DOMAIN Objectives
All Domains
Safe • Materials harmful to human health will be encapsulated or remediated. • Final landforms and land-use/s will not pose unacceptable risks to people or fauna. • Infrastructure will be removed unless agreed to by regulators and post-relinquishment land owners/managers.
Stable • Final landforms will be geotechnically stable. • Erosion stability will be achieved by controlling surface run-off and low stability materials.
Non-Polluting • Seepage will not harm sensitive groundwater receptors. • Surface water run-off will not harm the surrounding environment. • Materials harmful to the environment will be encapsulated or remediated.
Agreed Land-Use • The post-mining land-use/s will be agreed with key stakeholders. • The final landforms will not adversely impact surrounding pastoral land-use. • Revegetated areas will support self-sustaining vegetation dominated by native species. • Revegetation of rehabilitation areas and other initiatives will seek to maintain local biodiversity.

6 CLOSURE PERFORMANCE CRITERIA

Post-mining land-uses (**Section 5.1**) and closure objectives (**Section 5.2**) provide the basis for developing closure performance criteria (completion criteria).

Performance criteria must be realistic, risk-based and fit-for-purpose for the site conditions. They must be SMART (ANZMEC/MCA, 2000) - Specific, Measurable, Achievable, Relevant and Time-bound. Criteria should aim to be simple to measure and interpret, and not be ambiguous and complex to decipher creating paralysis and/or uncertainty from analysis. Performance criteria should relate the direction of effort and investment to risk. This means emphasising those aspects of closure performance that if not met could have major consequences, and limiting the focus on other aspects which do not carry this significance. For the latter, these aspects (e.g. complex measurements of often speculative ecological function) can often establish or restore over time with limited intervention provided the right landform engineering and other fundamentals are in place.

For each closure objective, performance criteria have been developed to verify the practical attainment of each objective. The closure objectives and performance criteria together comprise the framework for measuring closure success. This framework is intended to provide the basis for relinquishment of mining tenements and residual liabilities once it can be demonstrated that the performance criteria have been met to the satisfaction of regulatory authorities and arrangements for future management and maintenance have of the closed site have been agreed to by the subsequent owners or land managers (e.g. State Government as represented by the DPLH or other agency).

NiW recognises the requirement of Section 2.8 of the 2015 Guidelines which states:

"Where relinquishment requires the transfer or return of ownership or management of infrastructure and/or land to other parties, the tenement holder(s) will be required to demonstrate that these parties have been involved in the process and understand their responsibilities and liabilities associated with the transfer. Any transfer of residual liability to the subsequent owners or land managers, including management of contaminated sites, must be clearly communicated, agreed to and documented, to the satisfaction of the relevant regulators."

Consistent with this requirement, NiW initiated engagement with the DPLH to seek their input on what may constitute acceptable outcomes to them at closure to enable a successful transfer of rehabilitated mine-sites to the State Government as the relevant owner and manager of these lands. Details of this engagement is included in **Section 4, Section 5.1** and **Appendix B**.

6.1 Criteria Development

Performance criteria have been developed for all phases of closure planning and delivery, including:

1) **Pre-Execution** (pre-construction) - detailed design phase (e.g. DPS);
2) **Execution** (construction) - implementation of closure / rehabilitation activities; and
3) **Post-Execution** (post-construction) - period of monitoring until tenement / liability relinquishment.

This approach puts increased focus on measuring early indicators of closure performance during design and construction and less on lagging, reactive indicators in post-construction. It also recognises that the greatest opportunity to influence closure is during the planning phase and to a lesser extent the construction phase as the ability to effectively alter closure outcomes after this time is diminished.

The development of performance criteria was informed by industry benchmarking (**Section 7.5.2**) and a series of workshops conducted during the IPS that were attended by experienced closure specialists to examine the challenges faced by industry and regulators alike in developing a reliable and achievable path to relinquishment. From these reviews, and taking into account feedback on this topic from the DMIRS and the DPLH, NiW identified the root causes and lessons learned from current and past experiences within the WA mining industry (and more widely). Some of the key observations, and the NiW responses to them, have included:

1. ***Engage key stakeholders early*** - Start early with engagement, particularly with those important to ultimately accepting closure performance and enabling relinquishment of mining tenements and residual liabilities.

   NiW Response: Completed. DMIRS and DPLH were actively engaged by NiW during the IPS as the two agencies expected to principally decide acceptance of closure outcomes and relinquishment of mining tenements and residual liabilities. See **Section 4** and **Appendix C**.

2. ***Measure more earlier, and less later*** - Prescribe more criteria in the design and execution phases (when repairs to issues can often be more readily and effectively achieved and at far less cost) and less in post-execution (when site closure knowledge/experience has often 'moved on', most closure funds are already spent and it is too late to repair a latent design issue leading to inadequate, 'band aid' solutions).

   NiW Response: Completed. Performance criteria span pre-execution, execution and post-execution phases of closure, and seek to strike both continuity and balance in criteria across each of these phases. See **Table 6-1**.

3. ***Simplify criteria with a risk-based focus*** - Simplify performance criteria with relevant, measurable and achievable criteria; prioritise criteria development according to risk severity (i.e. if the consequences of poor performance are major then give this more emphasis in criteria, and vice versa); and avoid experimental criteria that cannot be relied upon, is inconclusive or won't reach a consensus in qualified opinion.

   NiW Response: Completed. Proposed criteria have attempted to improve focus on criteria that can be readily measured and objectively and which put focus on the landform fundamentals and less on complex details. See **Table 6-1**.

4. ***Develop a progressive sign off process with authorities*** - Seek a progressive assessment and sign-off process by regulatory authorities, with approval tollgates before proceeding from closure design to execution to post-execution to progressively reduce process uncertainty and latent risks.

   NiW Response: Completed. Progressive sign-offs from an independent auditor and the DMIRS is proposed. See **Section 6.2**.

Closure performance criteria will be subject to periodic review pre-closure to ensure their continued relevance and efficacy. These reviews will be informed by results from progressive rehabilitation, field trials and technical studies and relevant changes in stakeholder expectations. Any proposed changes will be documented in MCP revisions.

6.2 Performance Criteria

The closure performance criteria proposed for MKS are identified in **Table 6-1**.

Note, the compliance of closure activities with relevant legal and other obligations will be assessed as part of the pre-execution Quality Assurance (QA) audits. These audits will review the efficacy of the detailed designs prior to their execution.

A key feature of closure performance measurement will be appointment of an Independent Closure Auditor (ICA) of suitable qualifications and experience to review the integrity of work completed throughout closure planning and delivery. Whilst not a statutory appointment, it is intended that the ICA would act in a capacity akin to the CSA role under the *Contaminated Sites Act 2003* (WA), with their appointment approved by the DMIRS. Additional information on how the appointment and role of the ICA would function is described in the 2018 NMK MCP.

Table 6-1: Closure Completion Criteria

Closure Objectives		Closure Performance Criteria			Measurement
		Pre-Execution (DPS)	Execution	Post-Execution	
Safety	Materials harmful to human health will be encapsulated or remediated	- An inert cover will be applied over all exposed deleterious materials (e.g. contaminated soil, PAF waste rock, hazardous wastes)	Covers are constructed per detailed design specifications approved by regulatory authorities	No exposed material harmful to human health is observed	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the Basis of Design (BoD) and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations. This will include a validation assessment report from the CSA for components that relate to contaminated sites remediation. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. This will include a validation assessment report from the CSA for components that relate to contaminated sites remediation.
	Final landforms and land-use/s will not pose unacceptable risks to people or fauna.	- Rehabilitated (embankment) slopes will be no greater than 20°. - Stock proof fencing of the WRLs and open pit. - Construction of an abandonment bund around the open pit. - Construction of bunds at the top of pit access ramps. - Access roads will be closed and rehabilitated when they are no longer required to mitigate access.	Final landforms are constructed per detailed design specifications approved by regulatory authorities.	No unacceptable safety risks from final landforms and land-use are identified post-execution.	- (Pre-Execution) Independent Quality Assurance (QA) audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field
	Infrastructure will be removed unless agreed to by regulators and post-mining land owners/managers.	- Above ground infrastructure will be removed unless otherwise agreed. - Below ground infrastructure will be removed, decommissioned or buried up to 0.5 m below ground level (bgl).	Site infrastructure is removed per detailed design specifications approved by regulatory authorities.	No infrastructure remaining post-execution unless agreed to	- (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field - (Execution) Sign-off obtained from the relevant DMIRS Safety Inspector - (Execution) Transfer of liability agreements, as per DPLH or other third party requirements, are approved.
Stability	Final landforms will be geotechnically stable.	- WRL designs to achieve a minimum post closure FoS of 1.3 under static conditions.	Final landforms are constructed per detailed design specifications approved by regulatory authorities.	No WRL material is within the ZoI.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field

Closure Objectives		Closure Performance Criteria: Pre-Execution (DPS)	Execution	Post-Execution	Measurement
	Erosion stability will be achieved by controlling surface run-off and low stability materials.	- WRL top surface designs will retain incidental rainfall from a critical duration PMP event. - WRL berm designs will retain incidental rainfall from a critical duration 1:1,000 year ARI rainfall event. - Surface water diversion structures will mitigate erosion risk to critical landform features. - A rock cover will be applied to all exposed tailings. - WRL embankment surfaces will consist of durable rock. - WRL embankment slopes will be no greater than 20º.	Final landforms are constructed per detailed design specifications approved by regulatory authorities.	Surface erosion is within predicted rates or the assimilative capacity of landforms.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications. - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. - (Post-Execution) Site technical audits and reports by suitably qualified person/s at 5 years and 10 years post-execution to verify the predicted rates of erosion are being achieved or are within the assimilative capacity of landforms (note, auditing will be maintained minimum 5 yearly thereafter if this has not been demonstrated within 10 years).
Non-Polluting	Seepage will not harm sensitive groundwater receptors.	- Modelling at NMK confirms that the pit lake in the final void will not cause harm post-closure to sensitive groundwater receptors including active stock bores. - Contaminated soil exceeding remediation criteria, protective of sensitive groundwater receptors and agreed with a CSA and DMIRS, will be removed up to 0.5 m bgl.	Rehabilitation and remediation works are completed per detailed design specifications approved by regulatory authorities.	Local groundwater quality is within predicted quality ranges with no harm to sensitive receptors evident.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations. This will include a validation assessment report from the CSA for components that relate to contaminated sites remediation. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications. - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. This will include a validation assessment report from the CSA for components that relate to contaminated sites remediation. - (Post-Execution) Site technical audits and reports by suitably qualified person/s at 5 years and 10 years post-execution to verify no harm is caused to sensitive groundwater receptors (note, auditing will be maintained minimum 5 yearly thereafter if this has not been demonstrated within 10 years).
	Surface water run-off will not harm the surrounding environment.	- WRL top surface designs will retain incidental rainfall from a critical duration PMP event. - WRL berm designs will retain incidental rainfall from a critical duration 1:1,000 year ARI rainfall event. - Contaminated soil exceeding remediation criteria, protective of sensitive groundwater receptors and agreed with a CSA and DMIRS, will be removed up to 0.5 m bgl.	Final landforms are constructed per detailed design specifications approved by regulatory authorities.	Surface erosion is within predicted rates or the assimilative capacity of landforms.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications. - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. - (Post-Execution) Site technical audits and reports by suitably qualified person/s at 5 years and 10 years post-execution to verify the predicted rates of erosion are being achieved and to verify that surface water / runoff does not harm the surrounding environment (note, auditing will be maintained minimum 5 yearly thereafter if this has not been demonstrated within 10 years).

Closure Objectives		Closure Performance Criteria – Pre-Execution (DPS)	Execution	Post-Execution	Measurement
	Materials harmful to the environment will be encapsulated or remediated.	- An inert cover will be applied over all exposed deleterious materials (e.g. contaminated soil, PAF waste rock, hazardous wastes). - Contaminated soil exceeding remediation criteria, protective of sensitive groundwater receptors and agreed with a CSA and DMIRS, will be removed up to 0.5 m bgl.	Covers are constructed per detailed design specifications approved by regulatory authorities.	No exposed material harmful to the environment is observed.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations. This will include a validation assessment report from the CSA for components that relate to contaminated sites remediation. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications. - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. This will include a validation assessment report from the CSA for components that relate to contaminated sites remediation.
Agreed Land-Use	The post-mining land-uses will be agreed with key stakeholders.	- Agreement with key stakeholders is obtained for the post-mining land-uses (or in the event of inconsistency in views between some stakeholders the DMIRS is supportive of proposed land-uses).	Landforms to support agreed land-uses are constructed per detailed design specifications approved by regulatory authorities.	Post-mining land-uses approved by regulatory authorities are achieved over time.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations and agreed land-use. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications. - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. - (Post-Execution) Site land-use assessments and reports by suitably qualified person/s at 5 years and 10 years post-execution to confirm that the predicted land characteristics to support the proposed land-uses are in place or with time would support the proposed end land-uses (note, auditing will be maintained minimum 5 yearly thereafter if this has not been demonstrated within 10 years).
	The final landforms will not adversely impact surrounding pastoral land-use.	- Final landforms will be designed protective of active stock water bores in surrounding areas. - Final landforms will be designed protective of surface water run-off quality to surrounding areas. - WRLs and the open pit will be fenced to exclude stock (cattle). - Pastoral improvement opportunities for surrounding areas will be adopted to increase the benefits from closure to local pastoralism.	Closure activities are completed per detailed design specifications approved by regulatory authorities.	No adverse impacts from final landforms to the pastoral land-use on surrounding lands is observed.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations and causing no adverse impact on surrounding pastoral land-use. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications. - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. - (Post-Execution) Land-use assessments and reports by suitably qualified person/s at 5 years and 10 years post-execution to confirm that no adverse impact from the final landforms to surrounding pastoral activities is taking place (note, auditing will be maintained minimum 5 yearly thereafter if this has not been demonstrated within 10 years).

Closure Objectives		Closure Performance Criteria			Measurement
		Pre-Execution (DPS)	Execution	Post-Execution	
	Revegetated areas will support self-sustaining vegetation dominated by native species.	- Seed mixes for revegetated areas will include representative taxa from local vegetation communities. - Seed mixes will be optimised from rehabilitation trials conducted during operations.	Rehabilitation activities are completed per detailed design specifications approved by regulatory authorities.	- Weeds will not compromise the target diversity and density of native perennial vegetation species. Unless otherwise agreed with DMIRS (and for reasons that may include the introduction and spread of weeds in the local region outside of the control of NiW), the targets will be based on objectives that achieve rehabilitation areas where weed presence and density is comparable to pre-mining analogue sites. - Nil to minimal maintenance of rehabilitated areas for weeds and to maintain plant vigour is required beyond the establishment of perennial species.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations and the revegetation specification - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. - (Post-Execution) Rehabilitation assessments conducted post wet season (end of summer) and reports by suitably qualified person/s on an annual basis for three years post-execution then at 5 years and 10 years post-execution to confirm revegetated areas are low in weed density (achieving prescribed targets agreed with the DMIRS), self-sustaining (i.e. require minimal to nil maintenance) and are not providing an ongoing source of weed invasion for adjacent areas of environmental sensitivity, including the Nature Reserve, PEC and significant flora. Auditing will be maintained minimum 5 yearly until performance objectives are achieved if not demonstrated within the initial 10 years.

Closure Objectives		Closure Performance Criteria: Pre-Execution (DPS)	Execution	Post-Execution	Measurement
	Revegetation of rehabilitation areas and other initiatives will seek to maintain local biodiversity.	- Seed mixes for revegetated areas will include representative taxa from local vegetation communities. - Seed mixes will be optimised from rehabilitation trials conducted at NiW nearby sites.	Rehabilitation activities are completed per detailed design specifications approved by regulatory authorities.	- Establishment of key structural vegetation species, diversity and cover trending toward appropriate analogue sites. Analogue sites are to be agreed with the DMIRS. - Revegetation in rehabilitation areas demonstrates viability through propagule development and seedling recruitment as demonstrated by observed and recorded evidence of reproduction, for mature plants (e.g. fruit, seed or flowers) and native perennial seedlings (second generation), or as otherwise agreed with the DMIRS.	- (Pre-Execution) Independent QA audit* and report to verify that the detailed design is consistent with the BoD and other stated criteria and will achieve the closure objectives, including compliance with relevant legal obligations and maintaining local biodiversity. - (Execution) As-Constructed Report by the contractor to verify compliance of completed works in accordance with the approved design specifications. - (Execution) Independent QA audit* and report to verify that the findings of the As-Constructed Report are accurate and consistent with observations/evidence in the field. - (Post-Execution) Rehabilitation assessments conducted post wet season (end of summer) and reports by suitably qualified person/s on an annual basis for three years post-execution then at 5 years and 10 years post-execution to confirm revegetated areas generally represent the perennial plant cover and diversity found in the site locale. Auditing will be maintained minimum 5 yearly until performance objectives are achieved if not demonstrated within the initial 10 years.

** Audits will be undertaken by a suitably experienced person/s whose appointment, including qualifications/experience, are acceptable to the DMIRS.*

7 TECHNICAL KNOWLEDGE BASE

Relevant, accurate, reliable data underpins effective closure planning. Both contemporary and historical data are important to accurately characterise closure risks. Site data is essential to ensure local conditions are well understood and to inform the development of fit-for-purpose solutions. Predicted changes in climate are also important to ensure rehabilitated landforms and other closure features are compatible with anticipated future conditions.

The following sections provide a summary of the key information collected during the specific baseline studies (related to the MKS project) and data collected during the IPS, which informed the development of this MCP.

7.1 Baseline Data

7.1.1 Climate

- **Semi-arid region where average evaporation exceeds rainfall by 12 times**
- **Long-term average annual rainfall is approximately 260 mm**
- **Climate change is predicted to increase the frequency / intensity of extreme rainfall and drought events**

The MKS site lies within a semi-arid region, which experiences cool winters and hot summers. The Bureau of Meteorology (BoM) data for Leinster airport shows the mean monthly range in daily minimum temperature is 6 to 23°Celsius (°C) and in maximum temperature is 19 to 37°C (**Figure 7-1**). Wind strengths are generally moderate, averaging between 16 to 21 km per hour (km/h) throughout the year, and are typically easterly to north-easterly (BoM, 2017).

High temperatures and low humidity throughout much of the year produce an average yearly pan evaporation rate of more than 3,200 millimetres (mm) at Leinster. Average evaporation exceeds average rainfall in all months of the year. The long-term average annual rainfall is approximately 260 mm, although substantial variation occurs. Mean monthly rainfall peaks during the summer months between January and March (up to 40 mm), and is lowest in spring (**Figure 7-1**).

Although intense rainfall can occur at any time of year, most of the rainfall in the area is associated with two distinct patterns:

- Summer - Intensive rainfall can occur due to tropical lows, or localised thunderstorms associated with tropical weather patterns in the north of WA; and
- Winter - Variable intensity rainfall related to westerly frontal systems associated with temperate rainfall patterns in the south of WA.

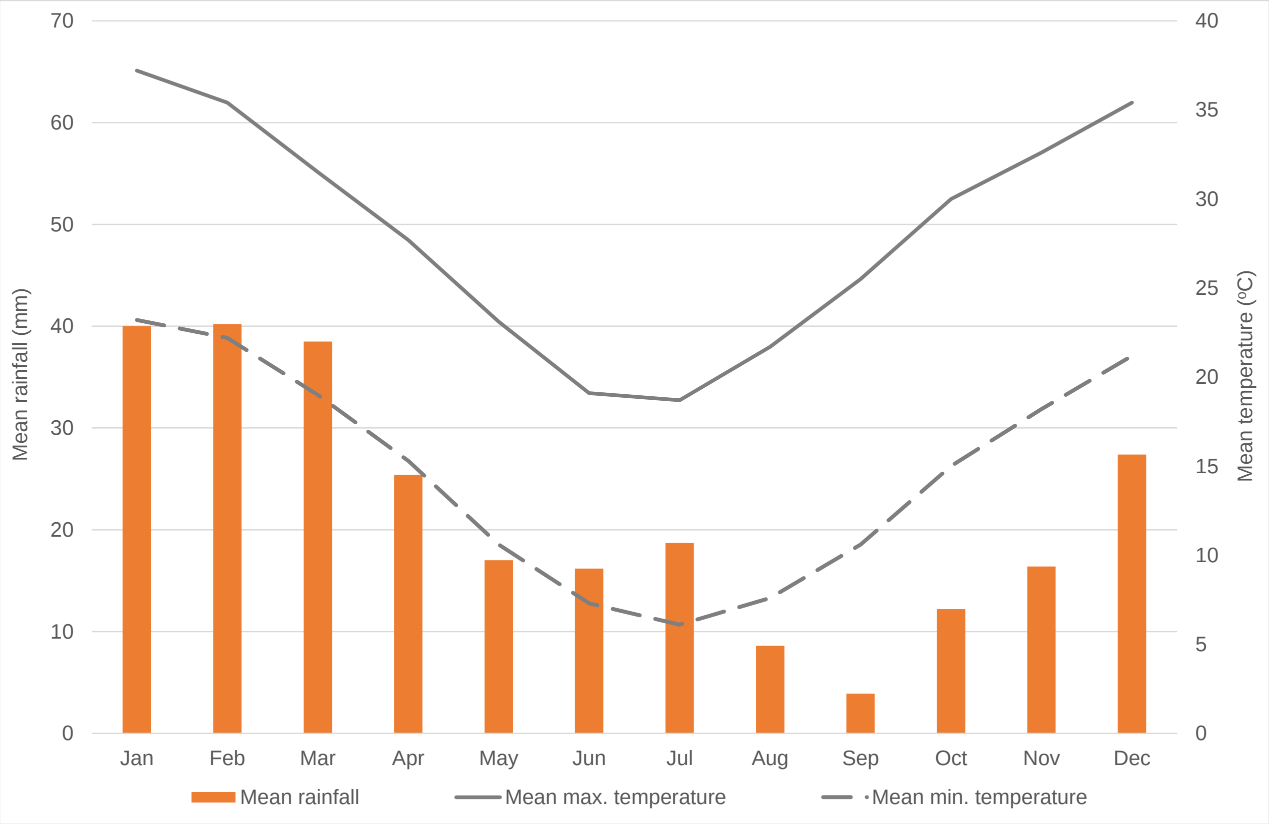

Figure 7-1: Mean climate statistics for Leinster airport (Source: BoM 2017)

The frequency analysis of rainfall data is an important part of hydrological design procedures. Analysis of rainfall data from single stations is often unreliable and may not provide temporally or spatially consistent data to use for design purposes. Instead, a set of accurate, consistent intensity-frequency-duration (IFD) design rainfall data has been derived for the whole of Australia by the BoM. The design IFD data for the MKS site per annual exceedance probability (AEP) event is presented in **Table 7-1**.

Table 7-1: IFD design rainfall intensity (mm)

Duration	Design Rainfall Depth (mm) per AEP event					
	50%	20%	10%	5%	2%	1%
5 min	4.65	7.37	9.48	11.8	15.2	18.1
10 min	7.2	11.4	14.7	18.2	23.2	27.5
15 min	8.88	14.1	18.1	22.4	28.7	33.9
30 min	11.9	18.9	24.3	30.1	38.7	46
1 hour	15.2	24	30.8	38.1	49.3	58.9
2 hour	18.9	29.7	38	47.1	60.9	72.9
3 hour	21.5	33.6	43	53.3	68.6	81.8
6 hour	27	42	53.6	66.1	84.2	99.6
12 hour	34.2	53.1	67.5	82.7	104	122
24 hour	42.9	66.7	84.3	103	129	151
48 hour	51.8	80.7	102	123	156	184
72 hour	56.3	87.6	110	133	171	203

Due to the arid climate, conservative design criteria are required for closure planning, including the capacity or rehabilitated areas to withstand severe weather conditions such as high intensity, short-duration rainfall events.

Predicted changes in climate is also an important factor to consider in closure planning. For the MKS Project, the general forecast changes in climate include:

- Increased seasonal rainfall variation;
- Mean temperature increase; and
- Shifting rainfall patterns, frequency, intensity and runoff.

Climate change is expected to influence existing regional vegetation, run-off volumes, wind and water erosion and sediment transport, revegetation of rehabilitated landforms, design capacity of surface water features and feasible land-use.

7.1.2 Physical Environment

A summary of the key features of the physical environment of the MKS Project is presented below.

7.1.2.1 Biological Environment

- **Wanjarri Nature Reserve is the main ecological receptor in the region**
- **Priority flora and fauna species have been identified within the MKS Project area**
- **The MKS Project area is situated in the Violet Ranges vegetation complexes Priority 1 Priority Ecological Community**
- **No fauna species of conservation significant have been reported within the MKS Project area**

Biogeographical Context

The MKS Project is in the Murchison Bioregion, as defined by the Interim Biogeographical Regionalisation for Australia (IBRA) classification system (Thackway, 1995).

The Wanjarri Nature Reserve is the closest conservation area and the nearest Environmentally Sensitive Area (CALM, 1996) to the MKS Project (

Figure 7-3), with its western boundary located on the eastern margin of the tenements. The Wanjarri Nature Reserve is 53,000 ha in size and recognised as a Class A Nature Reserve (

Figure 7-3). It is the only reserve in the northern part of the eastern Goldfields and has significant conservation, research, scientific, historical and cultural values (Cowan, 2001). There are no Nationally Important Wetlands (DoE, 2015) or Ramsar wetlands near the MKS Project.

There are no Threatened Ecological Communities (TEC) near the MKS Project, however, there are several Priority Ecological Communities (PEC) in the region. The MKS Project lies centrally within the Priority 1, Violet Ranges PEC (Perseverance Greenstone Belt) and the disturbance footprint represents 5.87% of the currently mapped PEC (Western Botanical, 2017).

Within the Murchison Bioregion, the MKS Project is in the Eastern Murchison subregion (MUR01), (**Figure 7-2**), which covers an area of 7,847,996 ha. This subregion comprises extensive areas of elevated red/red-brown desert sand plains with minimal dune development, breakaway complexes, and internal drainage and salt lake systems associated with the occluded palaeodrainage system. The Murchison Bioregion generally has rich flora and fauna, with most species also widespread through adjacent bioregions (Cowan 2001).

Flora

Regional Flora and Vegetation Communities

Vegetation within the Eastern Murchison subregion is dominated by low mulga woodlands (*Acacia aneura* complex) on plains, reduced to scrub on hills, with a tree steppe of *Eucalyptus and Triodia* on sandplains. Saltbush (*Atriplex*) shrublands occur on calcareous soils and saline areas are characterised by low samphire (*Tecticornia*) shrublands (Beard 1990; Thackway and Cresswell 1995). Numerous priority flora is known from the subregion (Cowan 2001).

Local Flora and Vegetation Communities

Multiple baseline flora and vegetation assessments have been completed within the MKS Project area between 1990 and 2011. These assessments were consolidated by Western Botanical in 2017; and a total of 393 species from 140 genera and 51 families have been reported in the MKS Project area over that time (Western Botanical, 2017). Most taxa recorded were common, widespread in distribution and representative of the flora of the region. Dominant genera included *Acacia, Eremophila, Maireana, Senna, Sida* and *Eragrostis*.

Vegetation condition outside the areas directly impacted by exploration and track maintenance are described as being in Pristine condition with little evidence of pastoral activities. Areas having been disturbed in previous exploration works are regarded as being in Excellent condition while completely cleared areas were recorded as Completely Degraded (Western Botanical, 2017).

The MKS Project is situated within the Violet Ranges (Perseverance Greenstone Belt) vegetation complexes (banded ironstone formation) Priority 1 PEC. The proposed Project disturbance footprint represents 1131 ha or 5.87 % of the Violet Ranges PEC (Western Botanical, 2017).

A total of 38 vegetation associations (**Table 7-2**) were mapped across the Project area and these were further categorised into six sub-units (**Figure 7-2**), according to the underlying geology (Western Botanical, 2017).

Table 7-2: Vegetation associations within the MKS Project area

Vegetation association code	Vegetation Association Name	Area (ha)	% of Project area
Basalt geology (Fresh Rock)			
BaMAS Complex	Basalt, mixed *Acacia* species Shrubland Complex	182.9	3.37
BaAdS	Basalt, *Acacia* aff. *doreta* Shrubland	19.4	0.36
BaAxS	Basalt, *Acacia* aff. *xanthocarpa* Shrubland	83.2	1.54
BaAbS	Basalt, *Acacia burkittii* Shrubland	11.9	0.22
BaCdS	Basalt, *Calytrix desolata* low Shrubland	22.7	0.42
Carbonate Soils, derived from Weathered Basalt			
GHPS	Weathered Basalt, *Hakea leucoptera* subsp. *sericipes* - *Eremophila pantonii* Shrubland	233.2	4.30
SSS	Stony *Senna* Shrubland	127.7	2.36
EGPW	Weathered Basalt, *Eucalyptus gypsophila* – *Eremophila pantonii* Woodland	11.9	0.22

Vegetation association code	Vegetation Association Name	Area (ha)	% of Project area
Limonitic Landforms			
SILS	Stony Ironstone Low Shrubland	27.2	0.50
SIMS	Stony Ironstone Mulga Shrubland	412.3	7.60
USBS	Upland Small Bluebush Shrubland	92.9	1.71
Archaean granite geology			
BrCP Complex	Breakaway Chenopod Plain Complex	12.2	0.23
BrCP - TectS	Breakaway Chenopod Plain Complex – *Tecticornia* shrubland	0.6	0.01
BrCP-FRAN	Breakaway Chenopod Plain Complex - *Frankenia* shrubland	8.5	0.16
BrGP	Breakaway Grassy Plain	18.7	0.34
BrX-FOL	Archaean Granite Breakaway Footslope	15.7	0.29
BrX-P	Archaean Granite Breakaway Plateaux	30.8	0.57
GrEx	Granite, Exfoliating granite outcrops	62.4	1.15
GrMS	Granitic Mulga Shrubland	990.0	18.26
GrMS – BRX Complex	Granite Mulga Shrubland - Granite Breakaway Plateaux Complex	48.3	0.89
SAES	Stony *Acacia Eremophila* Shrubland	484.3	8.93
Sandplain Landforms			
MUWA	Mulga - Wanderrie Grassland	2.8	0.05
SAMU	Sandplain Mulga Spinifex Shrubland	172.0	3.17
SAWS	Sandplain, *Acacia* species Spinifex Shrubland	11.9	0.22
WABS	Wanderrie Bank Grassy Shrublands	182.2	3.36
WABS – SAMU Complex	Wanderrie Bank Grassy Shrublands / Sandplain Mulga Spinifex Shrubland Complex	153.9	2.84
SAMA	Sandplain, Mallee, *Acacia* species Spinifex Shrubland	13.3	0.24
Colluvial and Alluvial landforms			
DRMS	Drainage Line Mulga Shrubland	381.5	7.04
GRMU	Groved Mulga Woodland	65.2	1.20
HMCS	Mulga Shrubland with scattered low Chenopod Shrubs	24.0	0.44
HPMS	Hardpan Mulga Shrubland	323.3	5.96
MMS	Mulga over *Maireana triptera* Shrubland	330.0	6.09
SMS	Stony Mulga Shrubland	763.8	14.09

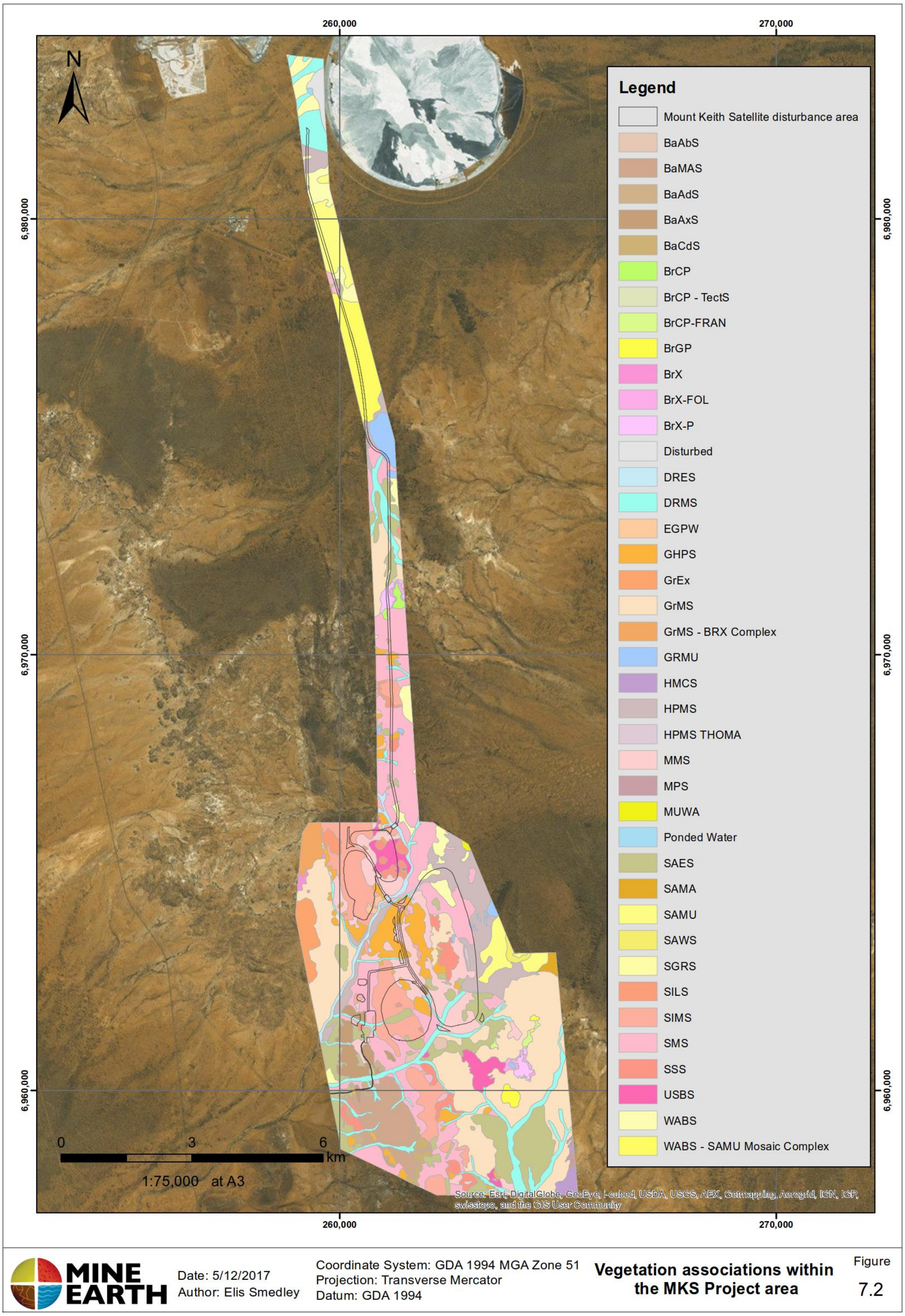

Figure 7-2: Vegetation associations within the MKS Project area

Flora of Conservation Significance

A total of 12 Priority Flora species were encountered during flora surveys including one Priority 1, eight Priority 3 and three Priority 4 species (**Table 7-3**). Small proportions of the overall local population of *Hybanthus floribundus* subsp. *Chloroxanthus* (P3), *Hemigenia exilis* (P4), *Grevillea inconspicua* (P4) and *Thryptomene* sp. Leinster (P3) will be impacted by the development of the mine voids and WRL while *Thryptomene* sp. Leinster (P3) and *Verticordia jamiesonii* (P3) will be impacted by the development of the haul road (Western Botanical, 2017).

Table 7-3: Priority Flora from within the MKS Project Area

Species	Priority Code
Anacampseros sp. Eremaean (F. Hort, J. Hort & J. Shanks 3248*)*	Priority 1
Aristida aff. jerichoensis var. *subspinulifera*	Priority 3
Hibiscus krichauffianus	Priority 3
Sida picklesiana	Priority 3
Thryptomene sp. Leinster (BJ Lepschi & LA Craven 4362)	Priority 3
Tribulus adelacanthus	Priority 3
Verticordia jamiesonii	Priority 3
Hybanthus floribundus subsp. *chloroxanthus*	Priority 3
Eremophila pungens	Priority 4
Grevillea inconspicua	Priority 4
Gunniopsis propinqua	Priority 4
*Hemigenia exilis**	Priority 4

Note: Priority codes refer to Western Australian flora species listed at the State level under the *Wildlife Conservation Act 1950*.

Fauna

Regional Fauna

Fauna within the Eastern Murchison subregion is known to be rich and diverse, and characterised by low levels of endemism. In the north-eastern Goldfields, 36 mammals, 178 birds, 93 reptiles and 11 amphibians have been recorded over the last 25 years (Murphy, 1994).

Across the subregion, rare vertebrate fauna species include; great desert skink (*Egernia kintorei*), malleefowl (*Leipoa ocellata*), Alexandra's parrot (*Polytelis alexandrae*) and mulgara (*Dasycercus blythi*). Calcrete aquifers in the northern part of the subregion are also known to support a wide range of subterranean aquatic fauna and short-range endemics (Cowan 2001).

Local Fauna

Multiple terrestrial fauna studies have been undertaken within the MKS Project area since 2005. Cumulatively a total of 135 vertebrate species, including 17 mammals, 77 birds, 38 reptiles and three frogs have been recorded (Biota, 2017).

Eight fauna habitats have been identified within the MKS Project area (Biota, 2017):

- Hills and Slopes, Sclerophyll Shrublands;
- Undulating Plains, Sclerophyll Shrublands;
- Drainage tract – Mulga;
- Undulating Plains - Grass Dominated;
- Undulating Plains – Chenopod Shrublands;
- Areas of Internal Drainage – Mulga;
- Drainage Line; and
- Hills and Slopes, Chenopod Shrublands.

Two landscape features intersected by the MKS Project area were identified has having elevated value as habitat for conservation significant species:

1. The breakaway feature (an extension of the Barr Smith Range) associated with both the Hills and Slopes, Sclerophyll Shrublands habitat (BRX – Breakaway Plateaux Mulga Shrublands vegetation type) and the Undulating Plains – Chenopod Shrublands habitat (BCP – Breakaway Chenopod Plains vegetation type) is considered to be potential habitat for the Black-footed Rock-wallaby and Long-tailed Dunnart; and
2. The isolated groved mulga (GRMU) within the Areas of Internal Drainage – Mulga habitat is the best example of this vegetation type locally. It is considered locally significant in the context of vertebrate fauna, predominantly avifauna. Although occurring within the MKS Project Area boundary, the transport corridor has been aligned to avoid impact to this habitat.

Fauna of Conservation Significance

No species of conservation significance have been recorded in the MKS Project area although, the Brush-tailed Mulgara (Priority 4) was recorded within 500 m of the boundary. Additional targeted surveys for both the Night Parrot (*Wildlife Conservation Act 1950* [WC Act] Schedule 1, *Environment Protection and Biodiversity Conservation Act 1999* [EPBC Act] Endangered) and Black-footed Rock-wallaby (WC Act Schedule 2, EPBC Act Endangered) were also conducted during 2017. While no evidence of the Night Parrot was recorded, the Black-footed Rock-wallaby was sighted 13.5 km north west of the MKS Project area (Biota, 2017).

Exotic Species

A total of six weed species have been recorded across the MKS Project area, in small isolated populations including (Western Botanical, 2017):

- *Rumex vesicarius* (Ruby Dock);
- *Cenchrus ciliaris* (Buffel Grass);
- *Cenchrus setiger* (Birdwood Grass);
- *Bidens bipinnata* (Tick Weed);
- *Lysimachia arvensis* (Pimpernel); and
- *Mesembryanthemum nodiflorum* (Slender Iceplant).

Several feral animal species have been found locally. Wild dogs (*Canis familiaris*) have been recorded, and are an issue for pastoralism in the region. Goats (*Capra hircus*) and rabbits (*Oryctolagus cuniculus*) are known from the area may impact revegetation establishment and success in rehabilitation areas. The presence of feral cats (*Felis catus)* and foxes (*Vulpes vulpes*) may impact native fauna and potential future recruitment.

Stygofauna

Subterranean fauna was assessed at the MKS Project during 2017 (Stantec, 2017a). Ten taxa from four higher level taxonomic groups (Amphipoda, Bathynellacea, Oligochaeta, and Ostracoda) have been collected.

Stygofauna assemblages were found to be sparsely distributed, reflecting the network of habitable regolith, alluvial and fractured groundwater systems present, that appear to be closely associated with Jones Creek and its tributaries (Stantec, 2017a).

During the assessment, two stygobitic species, *Atopobathynella* sp. OES11 and *Gomphodella* sp. IK2, were only recorded from within the proposed Six Mile Well groundwater drawdown impact areas. However, both taxa had distributions that regionally extend beyond the impact zones. The remaining eight species recorded were not of conservation concern as they were collected from non-impacted areas and are likely to possess broader distributions (Stantec, 2017a).

7.1.2.2 Surrounding Land-Use

The dominant land-use surrounding the MKS Project is *"low-quality and extensive livestock grazing"* (Cowan, 2001). Other surrounding land-uses and zones include Unallocated Crown Land (UCL), Crown reserves, conservation (Wanjarri Nature Reserve) and mining (nickel and gold) (
Figure 7-3).

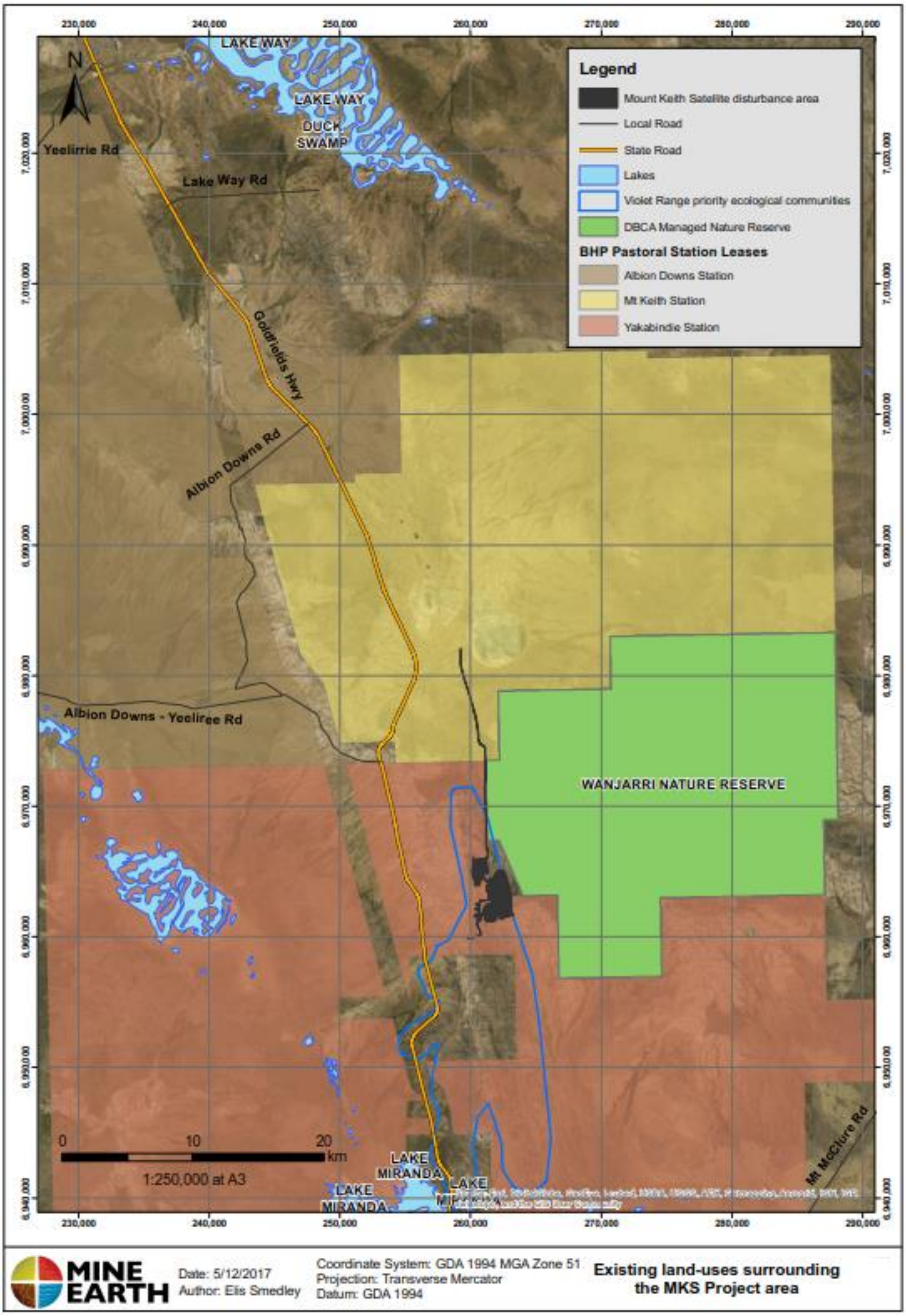

Figure 7-3: Existing Land-Uses Surrounding the MKS Project area

7.1.2.3 Geology

The geology at the Project is typical of Yilgarn Craton archaean greenstone belts, consisting of a faulted and folded, NNW-striking layered sequence of high grade metamorphic sediments, volcanics and felsic intrusives (BHP, 2017).

Nickel sulphide mineralisation at the deposits is associated with lozenges of adcumulate ultramafic or dunite cores (BHP, 2017) mantled by peridotite. Each lens is located at the intersection between steeply-dipping synvolcanic faults that act as conduits for extrusive lava (Perring, 2016). The mineralisation at both the Six Mile and Goliath deposits consist of multiple stacked lenses of disseminated Fe-Ni-Cu sulphides [principally pentlandite, violarite and pyrrhotite (Porter Geoconsultancy, 2017)]. Komatiitic flows and dacitic intrusives comprise the rocks surrounding these ultramafic cores (**Figure 7-4** and **Figure 7-5**).

The extents of the ultramafic cores within each deposit are 1400 m x 200 m at Six Mile Well, and 1000 m x 200 m at Goliath North (at the surface) (Porter Geoconsultancy, 2017).

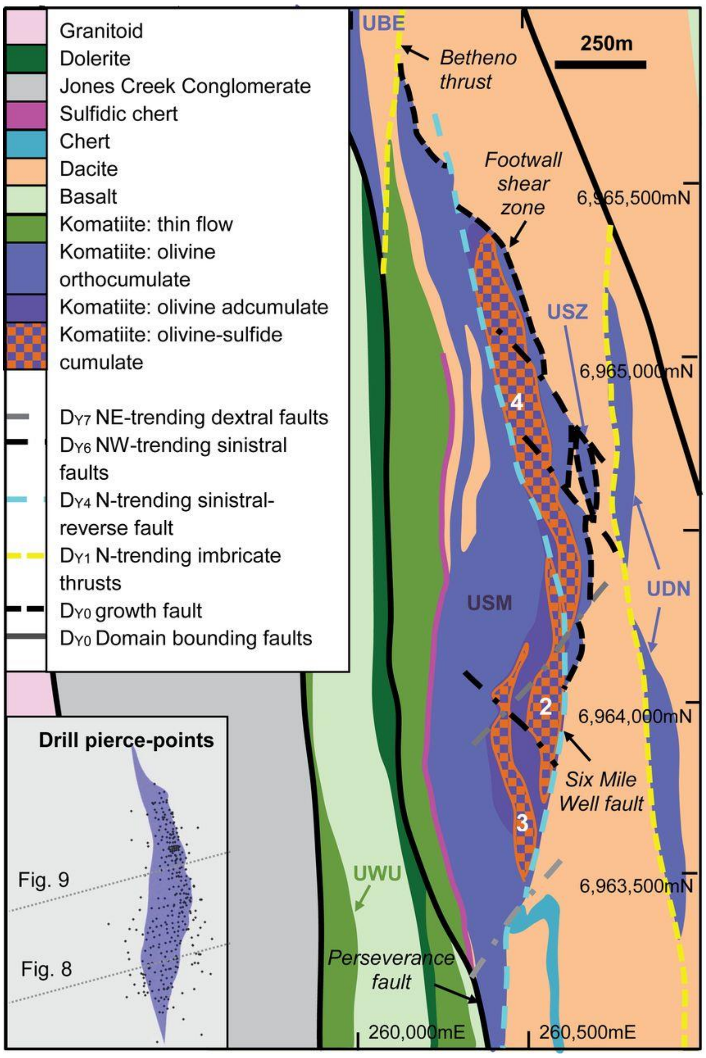

Figure 7-4: Geology of the Six Mile Well deposit (Porter Geoconsultancy, 2017)

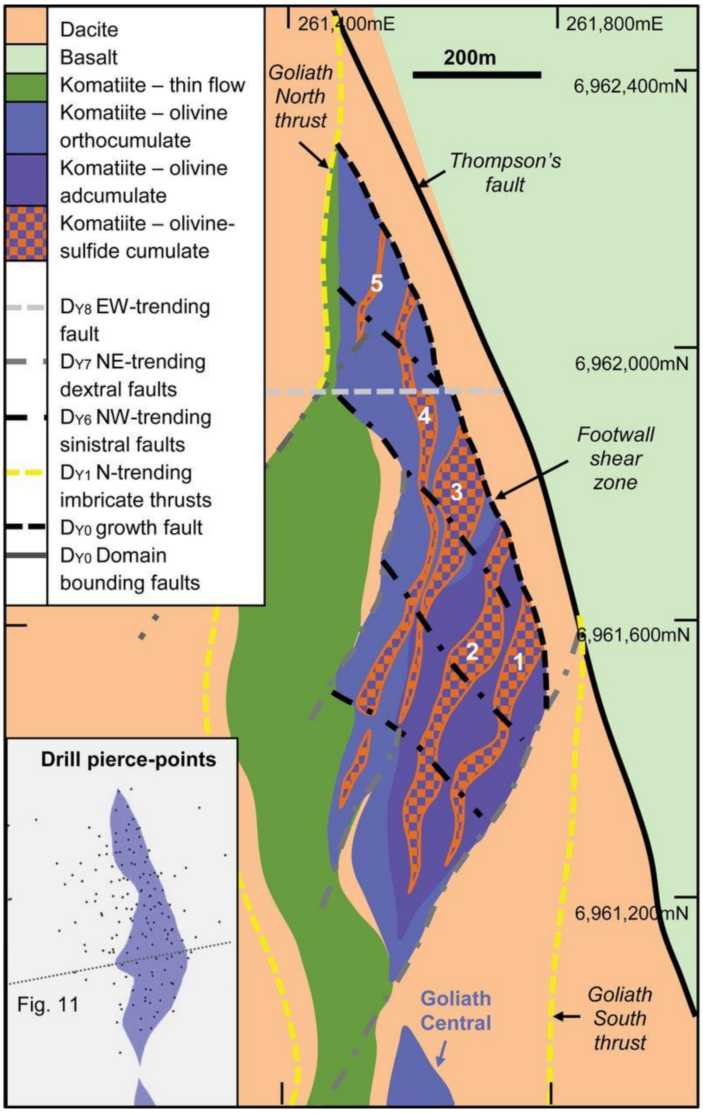

Figure 7-5: Geology of the Goliath deposit (Porter Geoconsultancy, 2017)

7.1.2.4 Surface Hydrology

- **The MKS Project is situated within the Jones Creek upper catchment**
- **The Jones Creek is incised into the Barr-Smith Range; the upper slopes of the valley are steep and rocky. The Creek is a freshwater system that rapidly dries to form a series of disconnected pools**
- **Short ephemeral creeks drain down the sides of the Barr-Smith Range and flood out onto the sedimentary deposits on the lower slopes of the valley**
- **A risk-based approach adapted from ANCOLD Guidelines has provided the basis for developing BoD criteria**

The MKS Project is situated within the Jones Creek upper catchment (**Figure 7-6**). Jones Creek is a lateral tributary stream which drains to the southwest and terminates into a large floodplain area which contains numerous clay plans (MWES, 2017). Beyond this, the system drains into the major regional valley which contains Lake Miranda (MWH, 2016).

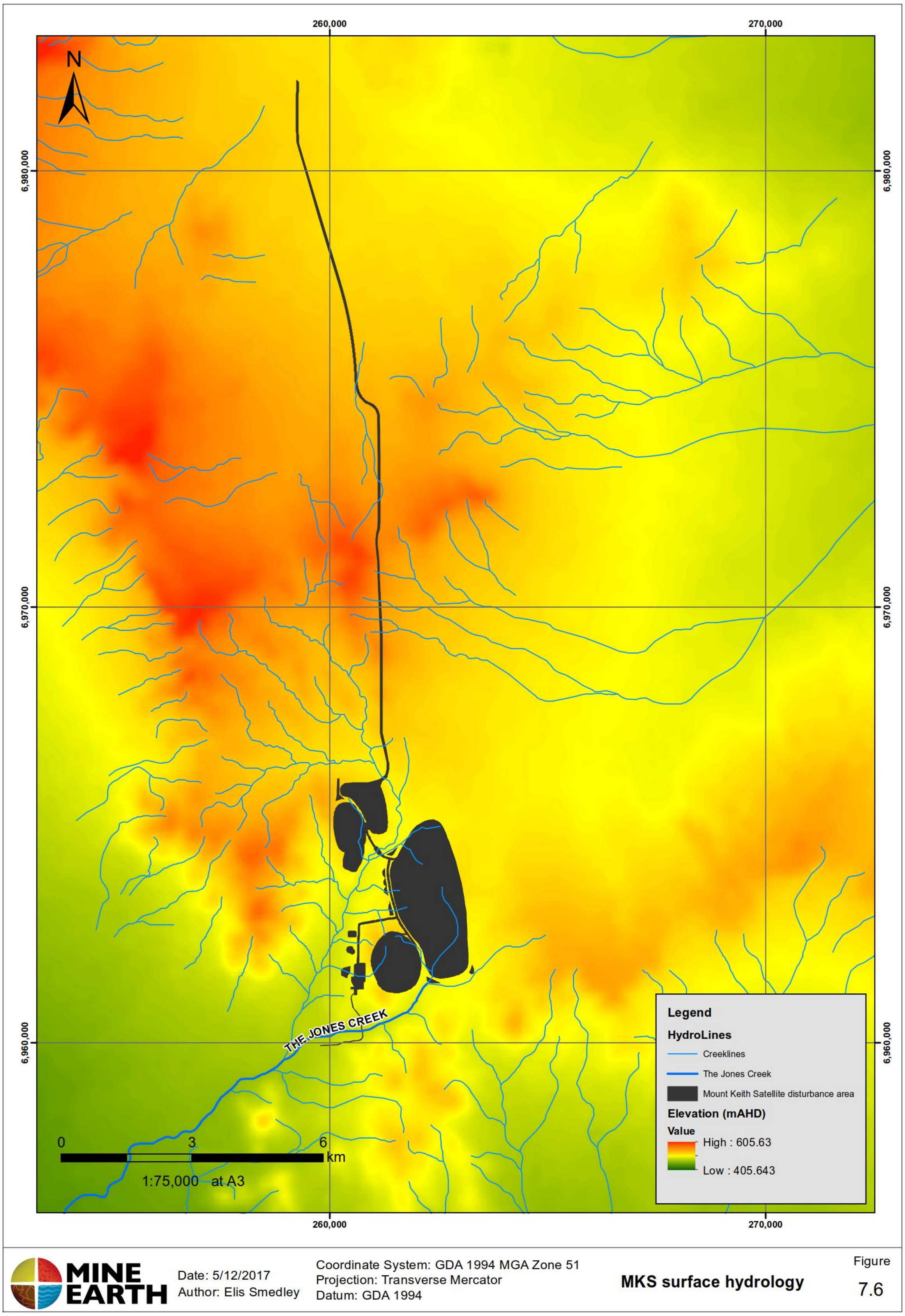

Figure 7-6: MKS hydrology

The Jones Creek is incised into the Barr-Smith Range. The upper slopes of the valley are relatively steep, rocky and sparsely vegetated. Short ephemeral creeks drain down the sides of the Barr-Smith Range and flood out onto the sedimentary deposits on the lower slopes of the valley (MWES, 2017).

During large flood events water movement is rapid, due to the steep nature of the ranges and the rocky nature of the substrates. Typically, Jones Creek flows once or twice a year, in response to moderate or high intensity rainfall of 25 mm or more. In the terminal claypans, depths of over two metres have been recorded following intensive rainfall (MWES, 2017)l.

Jones Creek is a freshwater system that after significant rainfall, rapidly dries to form a series of disconnected pools. Due to the temporal nature of the creek, water quality is highly variable. In contrast, on filling, the Jones Creek terminal clay-pan sustains a fresh-brackish water ecosystem for several months (MWES, 2017) (MWH, 2016).

WRL

Modelling for a 1 in 1000 year peak flooding event indicated that approximately 500 m of the WRL toe will be located inside the Jones Creek floodplain and will be subject to rare and brief inundation; with the potential risk of erosion along the WRL toe (**Figure 7-7**). It was recommended that the risk could be moderated by the following on closure (MWES, 2017):

- The exposed WRL toe (~500 m) be rock armoured to minimum elevation of 529 mRL and
- Drainage from the northeast of the WRL be routed around the north end of the WRL to the main creek in a controlled way.

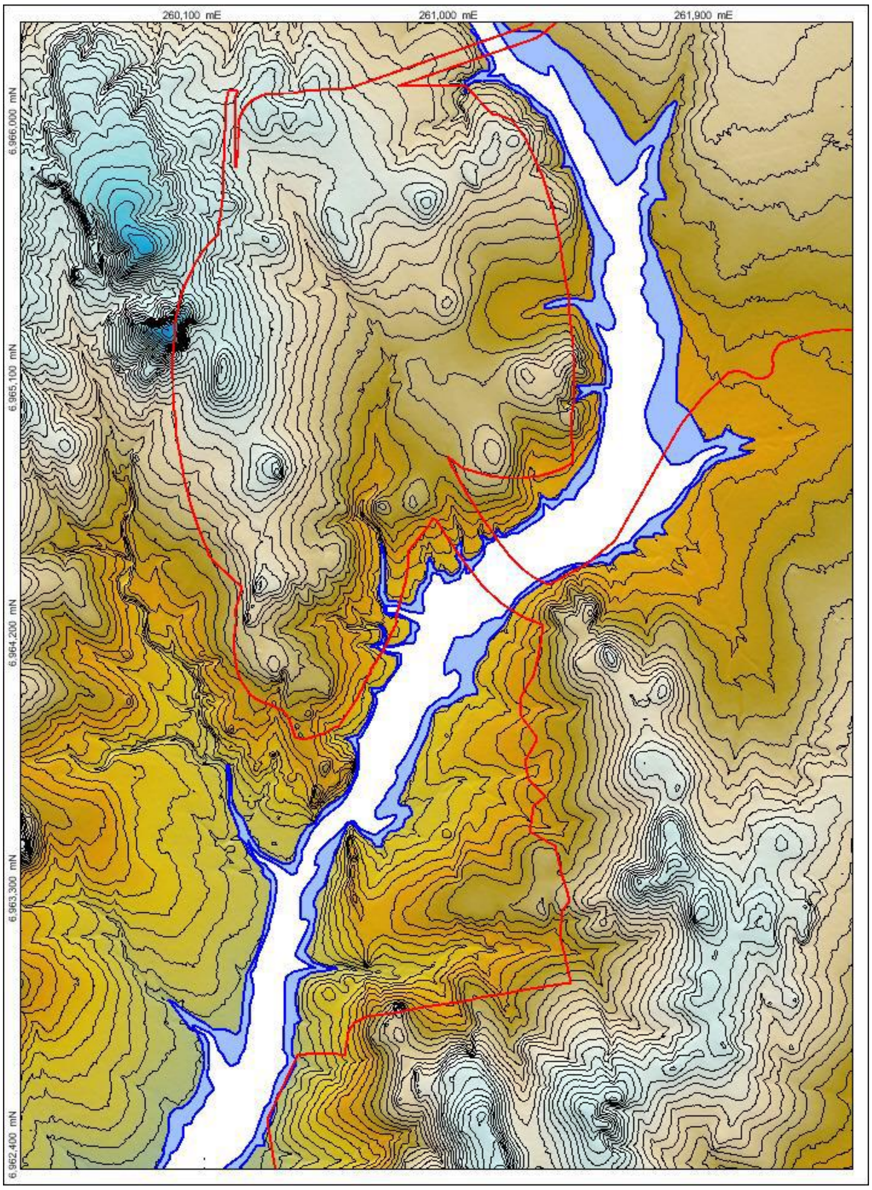

Figure 7-7: MKS Project modelled peak flood

MKS Project infrastructure (outline in red) and modelled peak flood levels for the 1:100 (white) and 1:1000 year events (Blue) (MWES, 2017)

Open pit

For the majority of creek flow events, there is no potential interaction between the flood water and proposed open pits. The potential for interaction only occurs at the margins of extreme flood levels which will occur very rarely and last only a matter of hours. Two small gullies are below the peak flood level at the Six Mile Well open pit disturbance area (**Figure 7-8)**. The surface profile line (black) depicted in **Figure 7-8** is along the western edge of the Six Mile Well open pit disturbance area (red line). A small amount of permanent bunding will be required to isolate the Six Mile Well open pit from high-stage creek flow. These bunds can be managed by short bunds of less than 1.5 m high. It is likely that these bunds will be incorporated into the normal operational pit perimeter bund and extended a further metre above the 1:1000 year level.

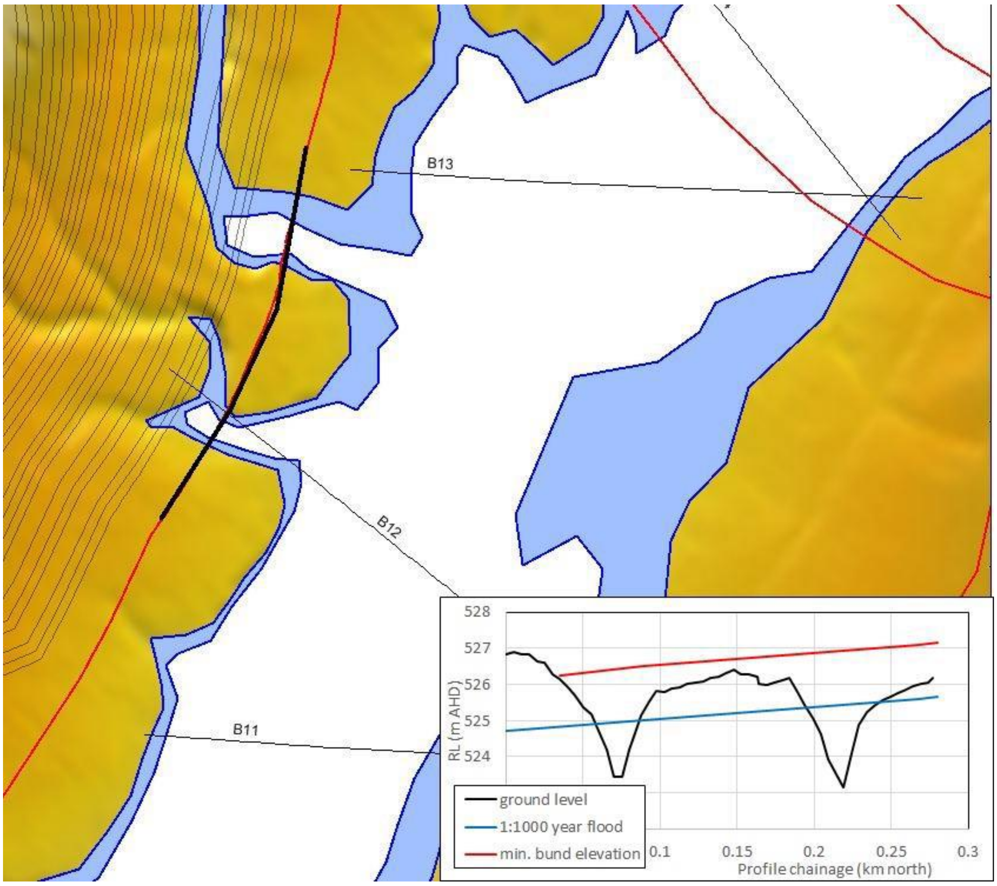

Figure 7-8: Jones Creek peak flow level near the SMW pit

Storm water drains

Permanent clean storm water drains diveriting stormwater flow from unimpacted areas around the site will also be required (MWES, 2017):

- North from NW corner of the Six Mile Well open pit. Length: 800 m, fall: 550 – 540 m, maximum depth: 2 m;
- South from NW corner of the SMP. Length: 200 m, fall: 545 – 539 m, maximum depth: 0.5 m;
- North around the WRD toe: Length: 1300 m, fall: 531 – 527 m, maximum depth: 1 m; and
- South around the WRD toe: Length: 1200 m, fall: 530 – 529 m, maximum depth: 1 m.

The final design capacity of the clean storm water drains should be 1:10 year peak flow and should include bunding such that peak flows exceeding the 1:100 year level remain on the clean side of the drain (MWES,2017).

Bridge crossings

Two bridge crossings over the Jones Creek will be required at the MKS Project (**Figure 2-3**). The surface profiles of the South and North crossings are presented in

Figure 7-9. Due to the low frequency and duration of flow events, a low level "ford" was considered as an appropriate creek-bed crossing. The following measures were recommended to mitigate excess sediment entrainment by intermittent creek flow events (MWES, 2017):

- Very coarse rock armouring of the bank cut sections up to the 1:100 year flood;
- Minimum build-up of road surface above natural creek level in the main stream;

- Initial construction and maintenance (after flow events) to use stockpile of suitably graded material (minimal fines and particle sizing compatible with creek sediments); and
- Best operational practice to minimize vehicle tracking of sediment during wet periods including:
  - Cladding of roads with appropriate materials;
  - Road drain and surface maintenance to avoid build up of sediment on roadways; and
  - Wheel wash as appropriate.

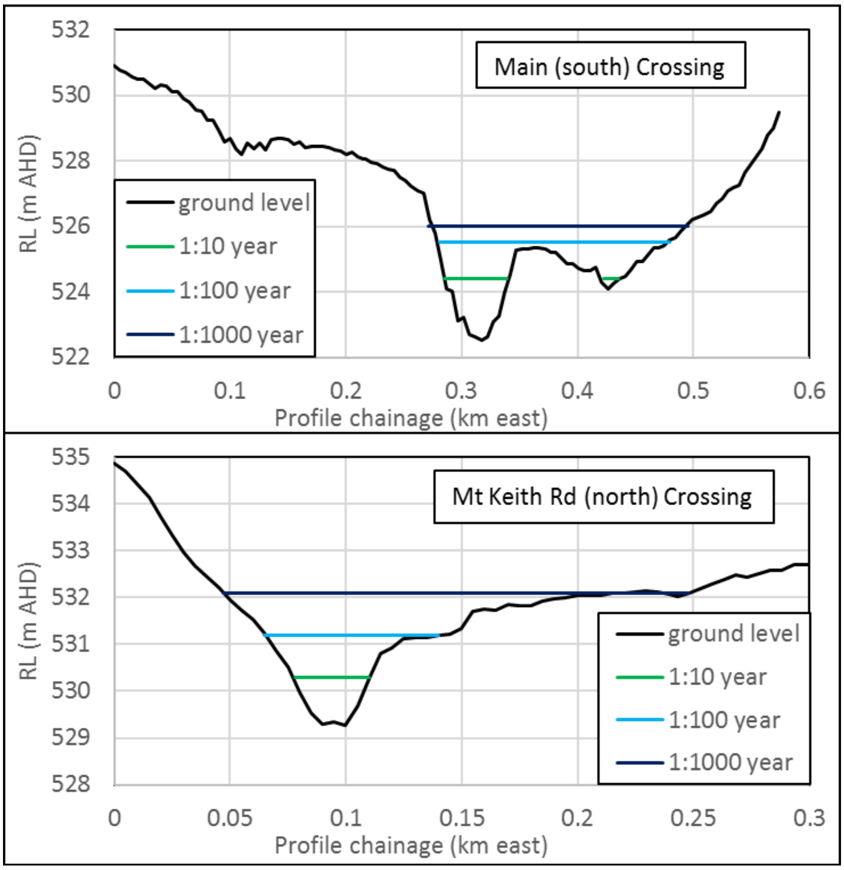

Figure 7-9: Profiles of the South and the North bridge crossing areas showing various flooding events

Haul road

The proposed haul road route and existing topography is presented in **Figure 7-10**. In general, the proposed haul road route was considered to pose relatively minor risks in regards to drainage management. The risks of impacts are likely to be minimised by relatively low surface gradients, drainage lines were only slightly incised and have small catchment areas, cross gradients are low and unable to sustain frequent overland flow. The following measures were recommended during the haul road construction (MWES, 2017):

- Competent rock cladding of material exposed in cuttings and in table drains on steeper sections;
- Adequate spacing of cross drains to minimize erosion in the table drain; and
- Low crown or outfall profile in areas where overland flow needs to be maintained.

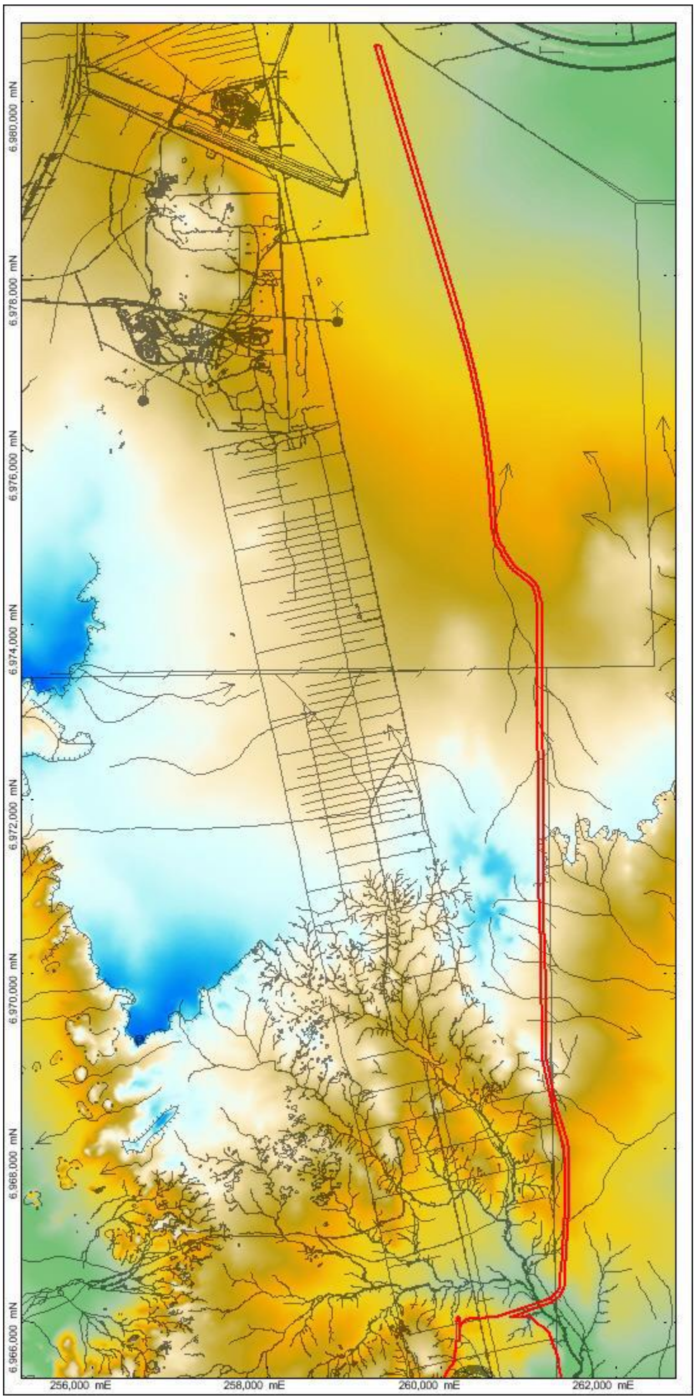

Figure 7-10 Proposed haul road route and topography

Closure basis of design

Flood studies at the nearby NMK site were used to underpin the basis of design (BoD) criteria determined as appropriate for surface water management features post-closure:

- Upstream catchment diversion structures will be designed to convey run-off from a critical duration 1:300 to 1:10,000 ARI rainfall event; to be determined on the basis of risk;
- Upstream catchment diversion structures will be designed to pass run-off from a critical duration PMP rainfall event;
- WRL top surfaces will be designed to retain incidental rainfall from a critical duration PMP rainfall event within cells;

- WRL berms will be designed to retain incidental rainfall and upstream run-off from a critical duration 1:1,000 year ARI rainfall event; and
- Drainage controls will be designed to achieve a 300 year design life.

The application of this BoD criteria within the design parameters of selected closure alternatives is covered in **Section 9**.

7.1.2.5 Hydrogeology

- **Groundwater is relatively scarce within the MKS Project area**
- **Groundwater is brackish, alkaline and the concentrations of most metals are low**
- **The Goliath open pit lake will function as a terminal sink aiding long-term groundwater management**
- **The backfilled Six Mile Well open pit will refill to a level close to the original static water level over about 50 years**

Groundwater is relatively scarce in the local region. There is no laterally continuous regolith horizon aquifer due to elevation, depth to water table and erosional denudation. Most of the bedrock lithology's have no primary or secondary porosity and drilling across most of the area has generated no groundwater yield (MWES, 2017).

The largest aquifer in the MKS Project area is the regolith-zone over the Six Mile Well dunite ultramafic which will be largely drained and mined. The host greenstone belt rocks also contain an array of minor narrow, steep and localised aquifers associated with geological contacts and structural features. Water level data indicates a degree of interconnection between these features and this array is likely to be continuous for 10's of kilometres to the north and south (MWES, 2017).

Baseline groundwater quality was tested from 50 samples collected during the drilling program and the following was noted (MWES, 2017):

- The salinity was considered brackish, with a highly variable EC, ranging between 1000 – 5000 µS/cm.
- The pH was slightly alkaline
- Concentrations of most metals were low and below laboratory detection levels. The exceptions were Ni and Bo which were elevated.
- Concentrations of nutrients were consistent with other arid regions of Western Australia.

On closure, the Goliath open pit floor will sit at approximately 80 m AHD, and the water level will gradually stabilise at less than 140 m AHD, resulting in a pit lake with a water level more than 300 metres below the pit crest. Short term fluctuations relating to the most extreme rainfall events will result in relatively minor variations from the long-term water level trend line, having a magnitude of no more than 2 m and duration of several months. Salinity has been modelled to reach approximately 5.5 g/L after 100 years and continues to rise linearly thereafter. Over thousands of years as salinity increases above 50 g/L then brine factor reductions in pit lake evaporation rate superimpose a very gradual rise in water table level and a very gradual reduction in the rate of salinity increase (MWES, 2017).

Groundwater levels in the backfilled Six Mile Well open pit will recover to the original static water level after about 50 years. Water levels will then continue to rise and slightly exceed baseline levels (due to increased recharge through the backfill) over about 100 years and long-term water quality is expected to be slightly improved. Groundwater is the volumetrically dominant source of water which will re-fill the void, so that void water quality groundwater will reflect the quality of natural groundwater (brackish at approximately 4.5 g/L) and with low levels of trace elements. A very gradual reduction in salinity will occur due to enhanced rainfall recharge through the back-fill (MWES, 2017).

7.2 Soil and Mine Waste Material Characterisation

- **Most waste rock is expected to be durable and to demonstrate good erosion stability**
- **Conservatively between 10-25% of the total waste rock volume may be PAF**
- **PAF rock will be encapsulated within the final WRL**

7.2.1 Soil Characteristics

The regional soil landscape of the Murchison subregion consists of an extensive plateau of low relief, characterised by gently undulating wash plains and sand plains sitting below lateritic or silcrete mesas and hills. Mesas form the top of the landscape over granitic basement geology, and typically have lateritic breakaways with kaolinised footslopes. Hills are typically low rises or domes of granite, gneiss or quartz (Tille 2006).

The wash plains comprise gently inclined alluvial surfaces, typically with an almost continuous cemented laterite or red-brown hardpan formed below thin soils. Sand plains occur with stony plains and wash plains, characterised by red sandy loamy soils supporting mulga shrublands with spinifex grasslands (and some halophytic shrublands and eucalypt woodlands) (Tille, 2006).

A baseline assessment of soil was undertaken in March 2012 (OES, 2012). A total of five major soil units were identified across the MKS Project area including; Mulga sandplains, hills and slopes, stony plains, drainage lines and sparse Mulga woodlands. A summary of the physical and chemical characteristics of each soil unit is presented in **Table 7-4**.

Mulga sandplain

Soils from the Mulga sandplain unit were classified as sand to sandy clay loam with a weak to moderate consistence. They were generally moderately to very strongly acid, non-saline, non-sodic and had a moderate to rapid drainage class. Concentrations of metals were low, and nutrient levels were considered adequate for plant growth (OES, 2012).

Hills and Slopes

Soils from the hills and slopes unit had a high proportion of coarse material. The pH of soil was slightly to moderately alkaline and they were classified as non-saline to moderately saline. Concentrations of total metals, nutrients and plant available nutrients were low. The soil was unlikely to hardset and had a moderately slow to moderate drainage class (OES, 2012).

Stony Plains

Soils from the stony plains unit ranged from sandy loam or clay loam sand with a high proportion of coarse material. The soil was very strongly acid to moderately alkaline, classified as having a non-saline salinity and unlikely to hardset. Soil from this management unit was sodic indicating that they might be prone to dispersion. Concentrations of metals and nutrients were low (OES, 2012).

Drainage Lines

Soils from the drainage lines unit were classified as sand to clayey loam sand with a weak to moderate consistence. This soil had a higher proportion of silt and clay in comparison to the other soil management units. They were generally slightly acid to neutral pH, non-saline, non-sodic and had a moderate to very rapid drainage class. Concentrations of most metals except Cr were low. Concentrations of plant nutrients were also low (OES, 2012).

Sparse Mulga Woodlands

Soils from the sparse Mulga woodlands were classified as sand to clay loam sand with a loose consistence and few small, weak aggregates. The soil was characterised as stable to very stable, non-sodic to very sodic, non-hardsetting and had moderate to rapid drainage. The pH of the soils from the sparse Mulga woodlands was generally neutral to very strongly acid and had low concentrations of total metals and adequate amounts of plant-available nutrients (OES, 2012).

Table 7-4: Physical and chemical properties of soil units from the MKS Project area.

Soil unit	Physical properties						Chemical properties						
	Soil texture	Coarse	Soil colour	Soil stability	Soil Strength (kPa)	Hydraulic conductivity (mm/hr)	pH (H20)	Salinity class (dS/m)	Organic Carbon (%)	Nutrient status	Effective CEC (meq/100g)	ESP (%)	Total metal concentrations
Mulga sandplain	Sand to sandy clay loam	0 to 84	Red to Reddish yellow	Stable 3b	Non-hardsetting (<10)	Rapid to moderate	Very strongly to moderately acid (4.3 to 5.9)	Non saline	Low	Low	Very low	Not measured	Elevated Cr
Drainage line	Sand to clay loam sand	3 to 90	Red to reddish yellow	Stable 3b	Non-hardsetting (<25)	Very rapid to moderate	Slightly acid to neutral (5.9 to 8.0)	Non saline to slightly saline	Very low	Low	Low	Non-sodic	Elevated Cr
Hills and slopes	Loamy sandy to clay loam	21 to 78	Red to reddish yellow	Stable 3b	Non-hardsetting to hardsetting	Moderate to moderately slow	Moderately acid to alkaline (5.5 to 9.0)	Non saline moderately saline	Moderate	Low to moderate	Low to moderate	Non-sodic	Elevated Cr
Stony plains	Sandy loam to clay loam sand	6 to 87	Red to reddish yellow	Unstable to Stable 2 and 3b	Non-hardsetting	Very rapid to moderate	Very strongly acid to moderately alkaline (4.7 to 8.1)	Non saline to very saline	Low	Moderate	Moderate	Non-sodic to sodic	Low levels
Sparse mulga woodlands	Sand to clay loam sand	6 to 90	Red to reddish yellow	Stable to Very Stable 3 and 6	Non-hardsetting	Moderate to rapid	Very strongly acid to neutral (4.5 to 8.0)	Non saline to very saline	Low to moderate	Low to moderate	Moderate	Non-sodic to very sodic	Elevated Cr

*The values represented the average values for the good, moderate and poor ratings relative to suitability for plant growth and material stability (OES, 2012)

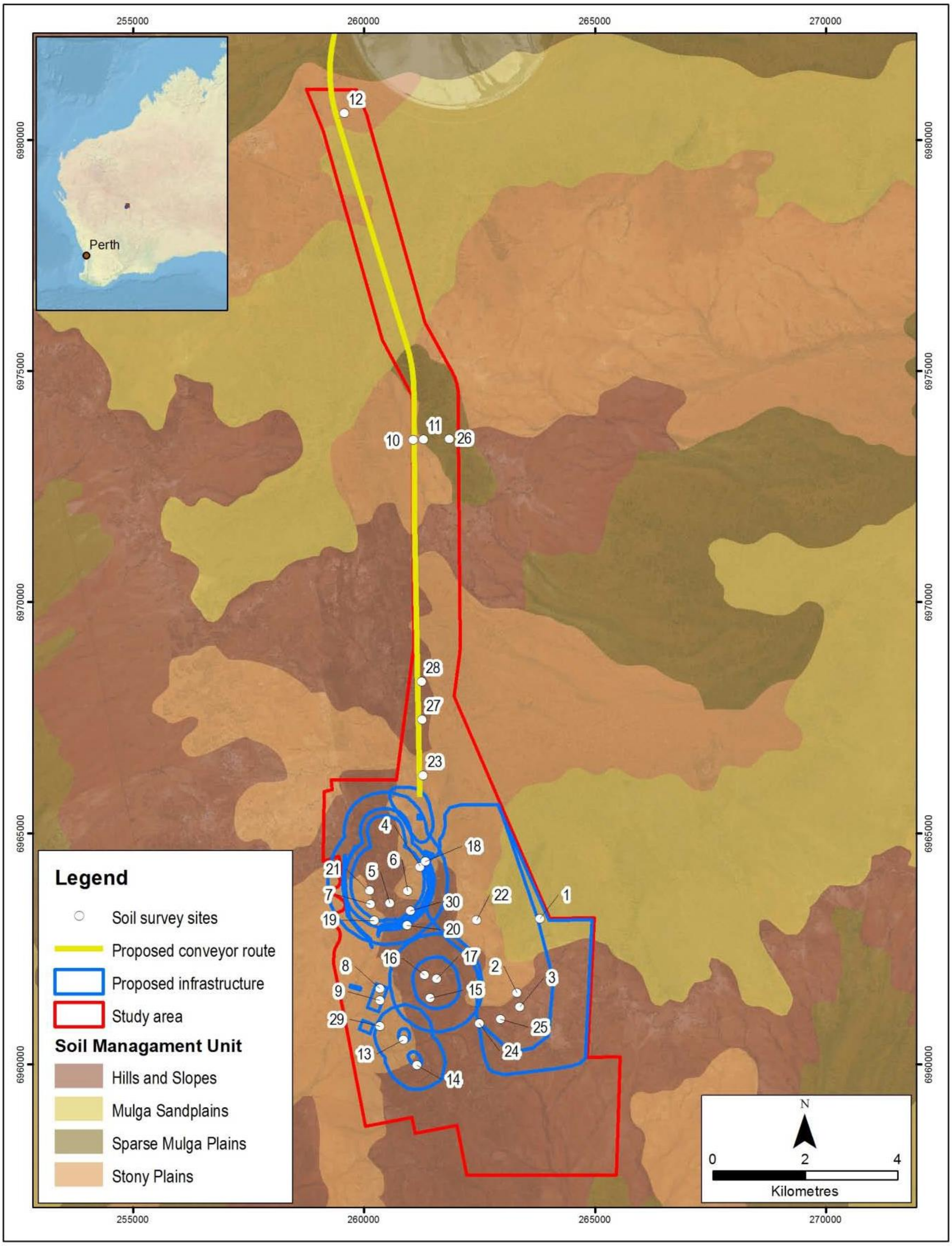

Figure 7-11: MKS Project soil units

7.2.2 Rehabilitation Resources

A minimum of 150 mm of topsoil shall be removed and stockpiled for use in rehabilitation. Soil from each soil unit was assessed for its suitability for rehabilitation purposes. Soils from the Mulga sandplain, drainage line, stony plains and sparse Mulga woodlands were considered suitable for use on lower slopes and flat areas only. Due to the high proportion of coarse material present in the hills and slopes unit, soil from this management unit was considered suitable for application to WRL slopes.

The volume of soil required for rehabilitation will be balanced against the volume of soil that is recovered during mining. A prioritised soil deployment plan will be developed based upon soil quality and volume, and an assessment of areas requiring rehabilitation including total area and aspect (elevated, flat, sloped).

7.2.3 Mine Waste Characteristics

7.2.3.1 Mine Waste Geochemical Characteristics

The geochemistry of proposed waste rock from the MKS Project has been analysed via two direct studies (Woodward-Clyde, 1991; ANSTO, 1996) and one review study (GCA, 2005)

Woodward-Clyde (1991) analysed samples from the Six Mile Well deposit over a range of 17 material sub-categories and analysed a sample of tailings supernatant and seepage waters. Waste rock samples were tested for acid formation potential, salinity and multi-element suites.

ANSTO (1996) analysed samples predominantly from the Goliath deposit, with a minor number of samples from the Six Mile Well deposit. Four samples of variable weathering states were analysed for tailings geochemistry. Waste rock samples were tested for acid formation potential and salinity.

GCA (2005) was commissioned as a later stage study, to assess both prior geochemical reports to ascertain whether further analysis was required for the characterisation of the deposits.

In the assessments conducted by Woodward-Clyde (1991) and ANSTO (1996), the following sampling density was applied:

Six Mile Well

- 72 waste rock samples (Woodward-Clyde) across 42 drill holes
- 12 waste rock samples (ANSTO) across 11 drill holes

Goliath

- 78 waste rock samples across 14 drill holes

From the above studies (GCA 2005; Woodward-Clyde 1991; ANSTO 1996) the following conclusions were made:

Waste Rock

- All regolith samples across both sites were classified as NAF.
- Most of the waste rocks tested for Six Mile Well and Goliath North were NAF.
- The volcanic sediment (footwall massive sulphide) present at both sites generally displays total sulphur values of 2.1–16.4% (offset to a degree by a groundmass with pH-buffering capacity), is classified as PAF (long lag) and is recommended to be encapsulated effectively within the WRL as AMD risk waste rock.

- Based on general estimates of rock proportions within the drilling database and on a conservative basis, it is estimated that the PAF volcanic sediment (footwall massive sulphide) may comprise between 10-25% of the total waste rock volume to be mined from both the Six Mile Well and Goliath deposits.
- Internal waste zone rocks (waste bedrocks within ore zones that are not segregated for stockpiling as low-grade ore) can be expected to create soluble Ni forms upon weathering, and should be encapsulated within the WRL as AMD waste rock. All talcose ores (from oxide to fresh) are included within this category, however they are expected to be processed (under the current mine plan) and as such they will not be stockpiled at the MKS Project.

Tailings

- Tailings can be considered NAF but may show elevated salinity and alkalinity over time.

7.3 Zone of instability

As part of the detailed design phase, assessment will be undertaken to better understand the closure related risks associated with the mining landforms, including the WRL and final voids. This assessment will include site specific assessments of the Zone of Instability (ZoI), to the satisfaction of the DMIRS,around the mining void to determine the positioning of abandonment bunds. Nickel West will utilise planar wedge analysis (PWA) methodology to estimate the ZoI.

7.4 Waste rock erosion properties and relative volumes

A review of the lithologies from the Six Mile Well and Goliath deposits was undertaken by Mine Earth (2017) to inform a desktop assessment of the likely erosion properties of key waste rock types. A review of the drilling database for these deposits has identified a variety of rock types including:

- Mafic rocks (basalts and dolerites)
- Ultramafic rocks
- Sedimentary rocks (siliceous/arenaceous sediments and shales)
- Felsic rocks (intrusives and porphyries)
- Metamorphic rocks (amphibole-chlorite metamorphics).

An assessment of the mineralogy and drillcore behaviour of these rock types was conducted to identify the main controls on each rock's physical characteristics (Mine Earth 2017). The results of this assessment are summarised below:

- Mafic rocks - It is likely that the mafic units will demonstrate good erosion stability.
- Ultramafic rocks - It is likely that the ultramafic units will demonstrate low erosion stability; especially from the weathered profile (oxide and transition zones).
- Sedimentary rock - Siliceous sediments should demonstrate good erosion stability; shale units may however demonstrate low erosion stability.
- Felsic rocks - It is likely that the felsic units will demonstrate good erosion stability.
- Metamorphic rocks - It is likely that the metamorphic units will demonstrate moderate erosion stability.

The physical review highlighted that the ultramafics and shale may demonstrate low erosion stability, whereas most of the other rock types should demonstrate moderate to high erosion stability. The ultramafic and shale waste rock units should not be placed on final WRD slopes because of concerns about their long-term erosion stability. These findings should be verified during mining however, once as-mined waste rock has been generated.

Waste rock volumes

The volumes of the broad lithological suites were estimated by viewing the drilling database and applying proportions to the planned excavated volumes (**Table 7-5** and **Table 7-6**). From this base, it is indicated that the ultramafics, sediments and mafic units are dominant at both Six Mile Well and Goliath deposits.

Table 7-5: Estimated Rock Unit Percentages for Six Mile Well

Oxidation	Hangingwall				Ore horizon	Footwall		
	Mafics	Sediments	Cliffs ultra mafic	Sulphidic Chert	NMK ultramafic (waste)	Sediments	Felsics	Mafics
Oxidise	3 %	1 %	3 %	1 %	6 %	6 %	1 %	1 %
Transitional	3 %	1 %	3 %	1 %	6 %	5 %	1 %	1 %
Fresh	7 %	2 %	7 %	2 %	20 %	15 %	2 %	2 %
Total	**13 %**	**4 %**	**13 %**	**4 %**	**32 %**	**26 %**	**4 %**	**4 %**

Table 7-6: Estimated Rock Unit Percentages for Goliath

Oxidation	Hangingwall				Ore horizon	Footwall	
	Sediments	Mafics	Felsics	Cliffs ultramafic	NMK ultramafic (waste)	Sediments	Mafics
Oxidise	3 %	4 %	1 %	2 %	3 %	4 %	4 %
Transitional	3 %	3 %	1 %	1 %	2 %	3 %	3 %
Fresh	9 %	11 %	2 %	6 %	13 %	11 %	11 %
Total	**15 %**	**18 %**	**4 %**	**9 %**	**18 %**	**18 %**	**18 %**

7.5 Other Closure Related Data

The results of rehabilitation trials at the nearby NMK operations are presented in this section, given their applicability to the rehabilitation of the MKS Project. The results of a rehabilitation benchmarking study, undertaken during the IPS are also included in this section.

7.5.1 NMK Rehabilitation Trials and Monitoring

- **Results to date from rehabilitation trials at NMK will be used to inform selected final landform designs at the MKS Project**
- **Placing topsoil on caprock or a rocky mine waste and deep ripping may be advantageous**

NiW has undertaken progressive rehabilitation and monitoring since the mid-1990s at nearby NMK where a total of 78 ha has been rehabilitated. In addition to progressive rehabilitation, rehabilitation (revegetation) trials have also been carried out on NMK WRL's. These trial areas have been subject to periodic monitoring to assess their performance and enable the identification and application of relevant learnings to future rehabilitation planning.

A summary of these trials and the key observations is included below and will be used to inform rehabilitation activities at the MKS Project.

7.5.1.1 NMK WRL Rehabilitation Trials

Since 1996, NMK WRL rehabilitation trials have focussed on:

1. Optimal slope geometry (concave design); and
2. Surface treatments to promote vegetation establishment.

Optimal Slope Geometry (Concave Design) Trial

In 2006, NiW commissioned Landloch to analyse potential WRL slope designs at NMK, including cover materials and erosion susceptibility. Modelling of erosion on various slope profiles was undertaken including simulated rainfall events and its effect on differing slope compositions, or design configurations. The study suggested that the concave shape had a theoretical advantage in minimising erosion over the equivalent linear slope.

As a result of this study, a concave slope rehabilitation trial was established on the southwest side of the West WRL (Figure 7-12) in 2007. The trial was designed to investigate concave slope design methodologies and applied cover materials. The 2007 trial section covered an area of ~27 ha. The prescribed slope treatment required the application of a thick cap rock and topsoil cover, followed by contour ripping and seeding with local species.

The 2008 rehabilitation section covers a total area of 12 ha. Topsoil was applied at a depth not exceeding 300 mm over 300 mm to 500 mm of caprock. Deep ripping to a depth of 1.4 m was applied along the contour. Hand seeding with local native seeds occurred at a rate of 9 kg/ha mixed with 1 kg/ha of Spongelite (soil improver). The additional 2009 rehabilitation section covered an area of 9.5 ha. Topsoil was applied at a depth of ~150 mm over 300 mm to 500 mm caprock, and was also deep ripped and hand seeded at a rate of 9 kg/ha.

Note, in some parts of the concave slope the topsoil cover exceeded 0.5 m, and was possibly over 1 m thick in sections. Whilst not formally recorded, anecdotal evidence obtained during the IPS suggests these sections may have received a thicker application of soil to overcome shortfalls in the construction methodology to achieve the design.

The performance to date of the concave slope has not been in line with expectations, with significant erosion evident in sections (**Plate 7-1**).

Plate 7-1: Erosion Gullies Observed in Concave Slope Trials

Notably, the results to date suggest:

- Slope length, steepness, cover treatments and drainage control influence batter stability;
- As NMK topsoil can be erodible, a thick surface layer of topsoil is unsuitable for long length slopes;
- The surface of the topsoil is prone to forming a crust which impacts the germination of seed and inadequate water capture;
- Where surface relief (e.g. broken surface, small crevices, cleared vegetation mulch, small swales) is not provided vegetation growth is unlikely to be sustainable;
- Safe cross-ripping of steep slopes can be problematic limiting the potential for effective slope treatment; and
- There were shortfalls in the quality controls applied during the construction of the slope (e.g. excessive topsoil placement [~0.5 m] in sections, ripping 'across' not 'on' the contour). Closure requires effective QA control during design, execution and post-execution to ensure performance expectations are met.

Figure 7-12: NMK Rehabilitated Areas and Monitoring Transects

Surface Treatments to Promote Revegetation

Various surface treatments on batter and berm rehabilitation have been trialled at NMK over the past two decades. Trialled surface treatments include varying depths of topsoil application and the use of wood mulch over oxide rock substrate. In addition to the trials, annual monitoring has been conducted since 2010 by Outback Ecology and prior to this by Western Botanical (from 1996).

Based on monitoring results to date, the following observations are applicable to closure planning and were considered in the development and selection of the preferred WRL closure solutions for the MKS Project:

- Mixing topsoil with either caprock or a rocky mine waste (via deep ripping) appears to provide superior erosion stability and revegetation;
- Some hard rock surface breakthrough on the rehabilitation surface (i.e. a rough textured, and not laminated surface) may be important in creating surface relief to promote vegetation growth;
- While uncontrolled erosion is undesirable, minor erosion rills on slopes can assist rehabilitation processes by trapping seed and water to promote initial vegetation growth;
- Revegetation of WRL slopes in the arid and drought-prone environment is typically more challenging than the revegetation of flat surfaces, which needs to be considered in the setting of performance criteria; and
- Even if non-vegetated, rocky slopes can provide desirable erosion control and habitat diversity value.

7.5.2 Industry Benchmarking Results

- **Comprehensive closure benchmarking study completed during the IPS is directly applicable to the MKS Project**
- **Study analysed industry experience from Australia and overseas**
- **Benchmarking results were critical as input in the evaluation and selection of preferred closure alternatives**

During the IPS a comprehensive benchmarking study (Stantec, 2017b) was completed to identify the lessons learned from mine closure globally, which may have relevance to the closure of NiW operations. The study compiled information from research and interviews with subject matter experts across key strategic and technical disciplines.

During the IPS, the outcomes from the benchmarking study were used to inform the evaluation and selection of the preferred closure alternatives as well as closure objectives, BoD, closure performance criteria, preliminary engineering of closure alternatives, stakeholder engagement strategy and relinquishment planning.

A summary of key findings relevant to MKS Project closure planning aspects is provided in **Table 7-7**.

Table 7-7: Benchmarking study key findings relevant to the MKS Project

Discipline	Key Findings or Learnings	Relevance to NiW Closure
WRLs		
WRL - Angle of repose slopes	There are precedents for approval of angle of repose slopes by regulators in Western Australia (Hercules project), Queensland (Kidston mine), and Tasmania (Mt Bischoff mine).	• The preferred closure solution for the MKS WRL delivers a superior outcome with each landform embankment re-profiled to less than 20°, nominally 18°. • The WRLs will be constructed with 20 m high lifts and 20 m wide berms, or alternate optimal batter-berm slope design configurations (e.g. 10 m wide berms and 10 m high lifts, or 30 m wide berms and 20 m high lifts, etc.) that achieve BoD criteria with up to 1.5 m of competent waste rock cover applied. • All slopes will be covered with ~0.2 m growth media, ripped and seeded to promote vegetation growth.
WRL - Concave slopes	At NMK, a large concave slope was constructed, but a deep layer of low erosion resistance material was spread on the slope and significant erosion occurred. If a thin layer of topsoil had been placed instead, it may have resulted in a much more stable outcome.	• Comments as above.
WRL - Tall single slopes	Various proponents (e.g. Telfer, Jack Hills) have investigated tall single slopes (60 m, 80 m or 100 m high), however, water velocity will eventually build up down the length of the slope unless the material of which the slope is constructed is porous and durable. The San Manuel mine in Arizona is an example where tall (100 m) steep single slopes are eroding in the lower third, and may require some back sloping benches or some concavity to be introduced.	• Tall single slopes may lead to high levels of erosion due to increased water velocity down the length of the slope. The preferred closure solution for the MKS WRL delivers a superior outcome due to: – Each landform embankment being re-profiled to less than 20°, nominally 18°; – Construction of 20 m high lifts and 20 m wide berms, or alternate optimal batter-berm slope design configurations (e.g. 10 m wide berms and 10 m high lifts, or 30 m wide berms and 20 m high lifts, etc.) that achieve BoD criteria with up to 1.5 m of competent waste rock cover applied; – All slopes will be covered with ~0.2 m growth media, ripped and seeded to promote vegetation growth; and

Discipline	Key Findings or Learnings	Relevance to NiW Closure
		– Where single slopes are used, the linear distance will be optimised and/or the slopes flattened, to improve erosion performance.
WRL - Berm and Batter Design	Examples of WRL rehabilitation batter and berm designs were reviewed from Mt Leyshon, Jundee, Pardoo, Wodgina, Abydos and Mt McClure mines. Berms have attracted criticism for their ability to concentrate drainage and result in serious erosion issues. Much of this criticism can be overcome by maximising berm storage capacity (wider berms), constructing them correctly (level in terms of RL), discouraging ponding adjacent to the batter crest (berm back sloping and crest bunds) and minimising the potential for cross-flow within berms (cell bunds).	• The preferred closure solution for the MKS WRL will maximise the stability of these landforms as they will be constructed with 20 m high lifts and 20 m wide berms, or alternate optimal batter-berm slope design configurations (e.g. 10 m wide berms and 10 m high lifts, or 30 m wide berms and 20 m high lifts, etc.) that achieve BoD criteria. • The benches will be back sloped and contain a 1 m high bund to control drainage. • Embankments will manage a 1:1,000 year ARI rainfall event with the top surface capturing a PMP rainfall event. • Rehabilitated WRL slopes will be revegetated using native species.
WRL - Vegetated outcomes	There are instances where non-vegetated outcomes have been approved by WA regulatory authorities. Examples include Wallaby, Sunrise Dam and Red October mines. In these cases, there has been a lack of suitable materials for use as a growth medium.	• The MKS WRL preferred closure solution is to apply a ~0.2 m growth media to the top surface and embankment, rip and seed at ~7 kg/ha.
WRL - Reasons for landform failures	Wider industry experience of the IPS study team identified several primary reasons for why rehabilitated WRL landforms can fail, including: Failure to properly characterise waste rock and growth medium materials. A number of case studies have been cited where poor materials identification has resulted in material erosion, lack of vegetation and in some cases, the potential for acid metalliferous drainage. Failure to develop (and test through progressive rehabilitation pre-closure) a competent design that adequately allows for effective drainage in local conditions. Failure to construct the rehabilitated landform to the intended design due to operator error and lack of adequate QA/QC during execution.	• Materials characterisation has been a feature of the IPS to adequately define key material physical and geochemical properties at this preliminary closure planning stage. • NiW is proposing a greater focus on lead indicators in the development of closure objectives and criteria (see **Sections 5 and 6**). Increased front-end loading in design will help to ensure there is adequate focus on the development of a robust WRL final landform pre-execution that achieves the Basis of Design. • The Basis of Design specified in this MCP was informed by results of industry benchmarking to ensure their relevance and adequacy.

Discipline	Key Findings or Learnings	Relevance to NiW Closure
		• A rigorous QA/QC program is proposed by NiW for the construction of closure activities which will involve quality assurance reviews undertaken by qualified third parties appointed by NiW to oversee the competent completion of activities.
Open Pits		
Open Pit	Backfilling of final voids above the water table can result in a worse outcome compared to leaving the pit open with a water body. This is because it can become a flow-through system instead of a terminal sink, resulting in the migration of metals from the (former) mining area to the groundwater. Important to assess the risks associated with final voids on a case-by-case basis to ensure the solution is optimal for the local conditions (e.g. problematic materials, sensitive receptors, potential for future mining, etc.).	• The Goliath pit will be left open to develop a pit lake. • The Six Mile Well open pit will be backfilled with waste rock, however water quality predictions by MWES (2017), indicate that groundwater quality will improve due to recharge through the backfill material.
Design Criteria		
Design Criteria	WA regulators generally expect surface water infrastructure to be designed to manage large rainfall events including the management of an upstream catchment that may impact on a rehabilitated landform. It is expected that the impacts of the event would be contained and result in no unacceptable off-site impact/s.	• **Section 9** outlines the proposed design criteria for site drainage post closure and indicates that the surface of the WRLs and TSFs have been designed to contain a PMP rainfall event. The proposed closure solution is designed to convey water from a storm event between 1:300 and 1:10,000; and to capably pass >1:10,000 flood event within site drainage infrastructure.
	Failure to properly design / size drainage is a key source of waste rock landform failure. Designing to large rainfall event provides a degree of conservatism that means that the drainage infrastructure will accommodate most drainage events even if there are some errors in material characterisation or construction. Failure to plan for extreme rainfall events has resulted in significant unplanned cost to operators as evidenced in the Equity Silver mine case study where a severe storm occurred (beyond the severity predicted) and overwhelmed the waste rock landform cover and AMD treatment facility resulting in significant repair costs.	• Comments as above.

Discipline	Key Findings or Learnings	Relevance to NiW Closure
	A design life of 200 to 300 years was generally viewed by those interviewed as the length of time that it is possible to look forward and predict performance and on this basis would be suitable as criteria in the Basis of Design. Basis of Design can be something seldom used to truly anchor design criteria, being used instead to retrofit support of a preferred solution. Few practical examples are available to demonstrate an engineering design life that will remain stable for a pre-defined period of time.	• BoD were determined for MKS prior to finalising the selected closure solutions. They informed the design scope for closure alternatives, and final selections. A landform design life of 300 years was selected to help ensure these facilities will be constructed to manage risks for an extended period of time post-closure.
Relinquishment		
Mining Tenement Relinquishment	There are very few examples in WA where closed mines have been relinquished to the State Government in a co-ordinated manner. Two exceptions are the Bottle Creek mine and Alcoa's Jarrahdale mine which were relinquished in 2001 and 2005 respectively (Mackenzie 2016; DITR 2006; Grant 2007). Putting aside funds and/or other mechanisms that buffer the exposure that a custodial authority/third party has to residual liabilities post-relinquishment, may assist in applications for relinquishment of mining tenure.	• Building a credible and achievable path to timely relinquishment of mining tenure and residual liabilities post-closure was a focus of the IPS. This review recognised, in part, the challenges faced by industry and regulators alike in creating a workable and agreeable process demonstrated by the lack of examples of successful relinquishment in WA. The result has been the commitment to a range of measures in this MCP which together attempt to assist creating a timely path to relinquishment, addressing those issues that have caused process failure or paralysis in the past. These measures include an allocation in the closure cost estimate to cover reasonable costs associated with maintenance and related works post-relinquishment, increased progressive QA reviews and tollgate approvals before advancing to the next closure phase and the commitment for NiW to engage and fund an ICA (whose qualifications and experience are acceptable to the DMIRS) to independently review and report on the adequacy of the closure planning and execution works until relinquishment has been achieved (**Section 5** and **6**).
	The Queensland State Government is moving towards a progressive relinquishment process, in part, to deal with the uncertainty that a lack of standards and precedence brings to closure of mines and eventual relinquishment.	• Comments as above.

Discipline	Key Findings or Learnings	Relevance to NiW Closure
	Regulators tend to focus on lag indicators (i.e. outcomes achieved post closure), especially those associated with vegetation systems. There is a move to present more lead indicators to regulators rather than lag indicators and with focus on the macro essentials not micro details (i.e. if macros are good, micros will take care of themselves over time but not reverse will work) to provide increased certainty to proponents, regulators and the community.	• NiW is proposing a greater focus on leading indicators in the development of closure objectives and criteria (see **Section 6**). Increased front-end loading in design will help to ensure there is adequate focus on the development of a robust WRL final landform pre-execution that achieves the Basis of Design.
	Currently vegetation criteria focus on natural analogues (i.e. an undisturbed site nearby to the mine). The difficulty with this standard approach for vegetation on mined landforms is that these landforms are artificially constructed and therefore will inherently have characteristics that differ from surrounding natural systems particularly during initial decades post-closure and in some cases permanently. DMIRS have accepted for a number of mines in the Pilbara (e.g. Pardoo, Mt Dove, Wodgina, Abydos) that the *best achievable rehabilitation performance* on disturbed sites will be the vegetation target.	• Comments as above. Relevant and realistic closure performance criteria was an important pre-requisite in the development of the closure success measures per **Section 6** of this MCP.

7.5.3 Assessment of Rehabilitation Measurement Regimes

During the IPS, the regimes used previously by NiW and industry to measure rehabilitation performance were evaluated. The review purpose was to inform the development of appropriate and achievable closure performance criteria and measurement techniques. As part of this review, NiW assessed the ongoing applicability and value being created to performance measurement from Ecosystem Function Analysis (EFA) monitoring which has been previously employed at NiW. EFA is made up of Landscape Function Analysis (LFA) together with quantitative vegetation monitoring, erosion monitoring and a faunal habitat complexity assessment.

While EFA is an industry-recognised technique, it was identified as having limitations in being used as a primary technique for measuring rehabilitation success at NMK. These limitations included:

- As for all ecosystem monitoring methods, EFA can only be applied after all stages of landform construction, soil placement and vegetation establishment have occurred. It is therefore a lagging rather than leading indicator, and necessarily can only identify issues after rehabilitation works are completed when the ability to effectively repair and restore serious design and other issues is greatly diminished. More emphasis on early indicators of rehabilitation performance is considered superior as an approach, reducing the latent risks that pass through otherwise to post-execution;
- The EFA technique, along with other on-ground monitoring approaches, is limited to repeat monitoring of established transects over time. Variability within rehabilitated areas, together with limitations on resources available for monitoring, means that these localised sampling points are unlikely to fully represent the performance of the entire, diverse rehabilitated area at NMK;
- EFA is a measure of soil and vegetation aspects of rehabilitation. While it is often complemented with monitoring of erosion features in ‘horizontal’ transects either side of the EFA transect, and whole of- landform inspections, it does not measure other landform parameters such as geochemical changes to the soil / waste rock, geotechnical stability, etc; and
- The LFA component assesses visual indicators of landscape function, which can be used to compare with natural landscapes and can be used in completion targets. However, it is not intended as a detailed quantitative measure of soil processes. Therefore, it may be difficult to infer from LFA data the key issues or constraints that are contributing to the rehabilitation outcomes.

NiW will continue to investigate the most appropriate rehabilitation monitoring regime to best measure performance success. As part of this, all phases of closure from landform design to post-execution will be monitored and measured to more emphasise leading indicators over those lagging, and will consider the following:

- Prior to Closure Execution: Detailed plans of the proposed landform construction and rehabilitation will be prepared and approved by regulatory authorities, including detailing the objectives of the engineering drawings, material specifications, volumes and construction technique. This information will be valuable in tracking the original aims and objectives of the rehabilitation works;
- During Closure Execution: Detailed capture of actual construction including survey volumes, construction methodology, and testing of materials and seed to confirm suitability. It is important that deviations from the approved design should not occur unless agreed and signed off with NiW and, as appropriate, regulatory authorities. As an example, a key learning from the concave, single slope trial at NMK was that too thick a topsoil layer was placed on the

slope - this decision was made during the construction process without appropriate input and approval, and was not detected as a construction flaw until after construction was complete. Subsequently, this has led to excessive erosion of this rehabilitated slope; and

- Post closure execution: Monitoring techniques will be suitable for the range of site-specific parameters that are required to be monitored. This will vary depending on the objectives of each rehabilitated area and may include parameters such as vegetation cover and diversity, geotechnical stability, geochemical changes, erosion (wind, water) and environmental factors (climate, dust, bushfire, etc). Identified in the IPS, a key element is expected to be the incorporation of aerial imagery (e.g. unmanned aerial vehicle surveys), with image analysis techniques that can capture vegetation parameters such as cover, condition and potentially differentiation of plant genera (for example using an object-based image analysis approach) as well as erosion features. Such an approach is simple, cost effective, accurate and can measure an entire area at a single time as opposed to localised quadrats or transects that may be misrepresentative.

Additional details on the overall process proposed for closure performance measurement is included in **Section 6**.

8 IDENTIFICATION AND MANAGEMENT OF CLOSURE ISSUES

The effective identification, characterisation, evaluation, mitigation and monitoring and review of risks is fundamental to successful mine closure. These processes must distil data and opinion to qualify the risks requiring remedy at closure. A competent understanding of risks must inform decision-making during all phases of closure.

As part of BHP, NiW implements a systematic, comprehensive process for the identification and evaluation of closure risks. These processes comply with the relevant internal standards, including *Our Requirements for Risk Management* which is based upon guidance from *ISO 31000 Risk Management*. Consistent with Section 4.11.1 of the 2015 Guidelines the NiW approach *"allows a systematic review and analysis of risk and cost benefit in both engineering and environmental terms, as well as identification of opportunities associated with closure."*

A closure risk register was developed for MKS as a subset of the closure risk assessments that were undertaken as part of the IPS for NiW operations. The closure risk register has informed the selection of preferred closure alternatives for domains and the closure cost estimate, to allow for provision for residual risk. The MKS closure risk register is included as **Appendix C**.

An overview of the closure risk evaluation process, including results, is presented below.

8.1 Risk Evaluation Process

A Closure Risk Register is maintained for NMK and has been prepared for the MKS Project (**Appendix C**). The NMK Register was comprehensively reviewed during the IPS for NMK and has been refined specifically for the MKS Project.

In addition to closure risks, and consistent with Section 4.11 of the 2015 Guidelines, opportunities were also identified as part of evaluation workshops held during the IPS. Opportunities were defined by NiW as features inherent within the mining or natural settings that have the potential to enhance or optimise closure outcomes, aligned with closure objectives (**Section 5.2**).

Other inherent advantages at the MKS Project and considered during risk evaluation workshops were the generally favourable, inert conditions of the existing mining landforms (e.g. WRLs with low PAF generation and seepage potential; and the final Goliath void acting as a terminal groundwater sink to minimise, in combination with the high evaporation rate, the potential for any impacts from the final pit lake).

An inherent advantage of the locale is the general lack of sensitive receptors in the near vicinity of the MKS Project, reducing any potential risk severity. The exceptions to this are the stock bores located in the pastoral lands and the Wanjarri Nature Reserve. Both of these local features were considered during risk evaluations as sensitive receptors.

Both the stock bores and Wanjarri Nature Reserve are considered unlikely to be impacted by the MKS Project closure. This finding of low risk was primarily attributable to the following:

1. The location of the Wanjarri Nature Reserve is within a separate sub-catchment area and therefore it is located outside of the drainage path for surface water flows from rehabilitation areas);

2. The locations of the Nature Reserve and stock bores are cross-gradient with the regional groundwater flow and therefore groundwater typically drains away from (and not towards) these receptors; and
3. The location of the Nature Reserve is to the east of the MKS Project when the predominant easterly wind direction is considered reducing the potential for dust impacts at the Nature Reserve.

To ensure its efficacy, the NMK Closure Risk Register and effectiveness of any implemented risk controls will be subject to annual review, with a deep-dive risk evaluation conducted as part of the triennial update of the NMK MCP.

8.2 Risk Evaluation Results

The uncontrolled (inherent) closure risks ranked as having the highest potential severity and likelihood for the Project were associated with the Landforms closure domain and the ability to reliably achieve tenement and land (residual liability) relinquishment within a reasonable timeframe (across all domains).

Table 8-1 summarises those risks initially ranked as 'High' from the evaluation of uncontrolled closure risks, and includes the revised controlled (residual) risk rankings after controls were applied (**Appendix C**).

Table 8-1: Summary of High (Uncontrolled) Risks and Controlled Rankings

Domain	Risk Issue	Risk Ranking	
		Uncontrolled	Controlled
Landform	Landform failure causing instability and discharge of sediment-laden run-off and/or dust impacting the surrounding environment and land use.	High	Low
All	Relinquishment of tenements and residual liabilities not achieved and / or within a reasonable timeframe post-closure.	High	Medium

The residual risk rankings for all the uncontrolled 'High' risks identified in **Table 8-1** were reduced after the proposed control measures were considered. The Closure Risk Register (**Appendix C**) details the analyses and mitigation measures for all closure risks.

9 CLOSURE IMPLEMENTATION

This section describes the main elements of the closure execution strategy, and proposed solutions for closure domains related to the Stage J Project. As the closure date nears, and particularly when within 5 years of being realised, additional information from the detailed engineering design phase (DPS) of the closure planning will be incorporated in this section.

9.1 Closure Execution Strategy

Closure is a feature of the LoA planning at NiW. The efficacy of the NiW MCPs and related closure cost estimates are reviewed annually in accordance with BHP requirements. These updates are subject to regular internal QA and risk assurance audits to verify the rigour and compliance of the work with relevant BHP and industry standards.

As part of LoA planning, the expected life of the integrated NiW Asset is reviewed annually. The closure date determined from the LoA plan informs the intensity and cadence of annual closure planning - preliminary planning if beyond 10 years or advanced if less - to ensure NiW's preparedness for a planned closure scenario.

The MKS closure execution strategy has its aim to implement closure activities in an integrated, productive and effective manner from the closure date, consistent with closure objectives (**Section 5.2**) and the approved MKS MCP.

The closure execution strategy has the following 5 main phases:

1. **Progressive Rehabilitation** - During operations, the planned rehabilitation of disturbed areas is an important element of the execution strategy. It progressively reduces closure risks, uncertainties and costs whilst testing the effectiveness and the feasibility, including constructability, of rehabilitation designs. It provides a demonstration to stakeholders, including regulatory authorities, that NiW is delivering the target closure outcomes. It also builds rehabilitation knowledge and skills capacity in the workforce that can continue to be leveraged pre-closure and transferred to closure execution;

2. **Transitional Planning** - This covers the phase from operations to cessation to closure including the transition planning for the NiW workforce, suppliers and contractors, finalising detailed closure designs and construction specifications, internal and external stakeholder updates, obtaining final regulatory approvals and licences, development of construction management plans and QA control plans, selection of contractors to undertake the closure works and making the site safe for a transition to closure;

3. **Contractor Mobilisation** - This includes measures to safely mobilise contractors and plant to site, and working with these contractors to ensure they have all the necessary internal and external permits to commence;

4. **Decommissioning, Demolition and Disposal** - This includes decommissioning, decontamination, demolition and disposal of all equipment no longer required (except by agreement with a third party) and disposal of contaminated soils and other wastes in preparedness for rehabilitation activities; and

5. **Land Rehabilitation** - This involves the rehabilitation of disturbed ground to the approved landform designs and the completion of assurance audits (**Section 6.2**) to the satisfaction of BHP and the DMIRS.

Once this final fifth phase of land rehabilitation is completed, then the monitoring and maintenance period will commence.

Engagement with key stakeholders will be maintained by NiW throughout all closure execution phases, as appropriate.

The timing of start of some or all closure activities at the MKS Project may vary subject to strategic alignment of interests or interdependencies with other NiW sites, which if not considered may result in premature or inefficient execution. The start of some phases may also be delayed if necessary (tollgate) statutory approvals have not yet been obtained.

Consistent with the 2015 Guidelines, at least two years prior to the planned closure date, the NMK MCP will be materially updated to include specific details in relation to the decommissioning and land rehabilitation phases.

9.2 Closure Execution Activities

This section presents the selected closure alternatives and associated activities for each closure domain. These alternatives are the output from the IPS which sought to identify fit-for-purpose closure solutions that effectively and efficiently managed inherent closure risks and with outcomes that would be acceptable to key stakeholders.

The closure solutions presented in this section were informed by the following:

- Legal obligations (**Section 3**);
- BHP standards (**Section 3**);
- Stakeholder feedback (**Section 4**);
- Post-mining land-uses (**Section 5.1**);
- Closure objectives (**Section 5.2**);
- Knowledge base update (**Section 7**);
- Progressive rehabilitation (**Section 7.5.1**);
- Site rehabilitation trials (**Section 7.5.1**);
- Industry benchmarking results (**Section 7.5.2**);
- Closure risk assessment update (**Section 7.5.3**); and
- IPS Study team practical experience in mine closure.

In addition, BoD criteria were developed to provide the mandatory design parameters for the selected closure alternative. The development of this criteria considered results from industry benchmarking (**Section 7.4.2**), including from both within and external to BHP. This BoD criteria is important to define and standardise for key attributes the minimum design criteria to be met. This approach ensures that closure alternatives are anchored to a defensible and standardised suite of design criteria, which direct (and not react to) the solution scope.

Descriptions of the selected closure alternatives for each key closure domain, and supporting information including existing conditions, BoD criteria, relevant figures, key assumptions and proposed trials, are provided below.

9.2.1 Selected Closure Alternative for Mining Landforms

DOMAINS: Mining Landforms	
Planned Conditions - Key Features (Figure 9-1)	
WRL: • One WRL that will be constructed east of the open pits. • The final construction will consist of 4 lifts, each 20 m high. • Due to variations in surface topography, the maximum WRL height will be 85 m. • Most waste rock types should not present an acid and metalliferous drainage risk. • The volcanic sediment has been classified as PAF (long lag) and should be encapsulated within the WRL • The ultramafic and shale waste rock units should not be placed on final WRL slopes because of concerns about their long-term erosion stability.	**ROM:** • The ROM will be constructed north east of the Six Mile Well open pit. • Will be constructed to 535 RL, and be approximately 15 m high. • Will be constructed from mine waste.
Current Operating Status: Planned	**Area Disturbed:** 521 ha (WRL: 445 ha; ROM: 76 ha) **Area Rehabilitated:** 0 ha
Location: WRL: 262400 mE, 6963000 mN ROM: 260800 mE, 6965500 mN	**Tenements:** M53/246, M36/422, M36/183, M36/185
Nominal Closure Date (based on current mining approvals): FY2032 **Expected Closure Date** (based on LoA plan, assuming future growth approvals): Earliest FY2040	

DOMAINS: Mining Landforms

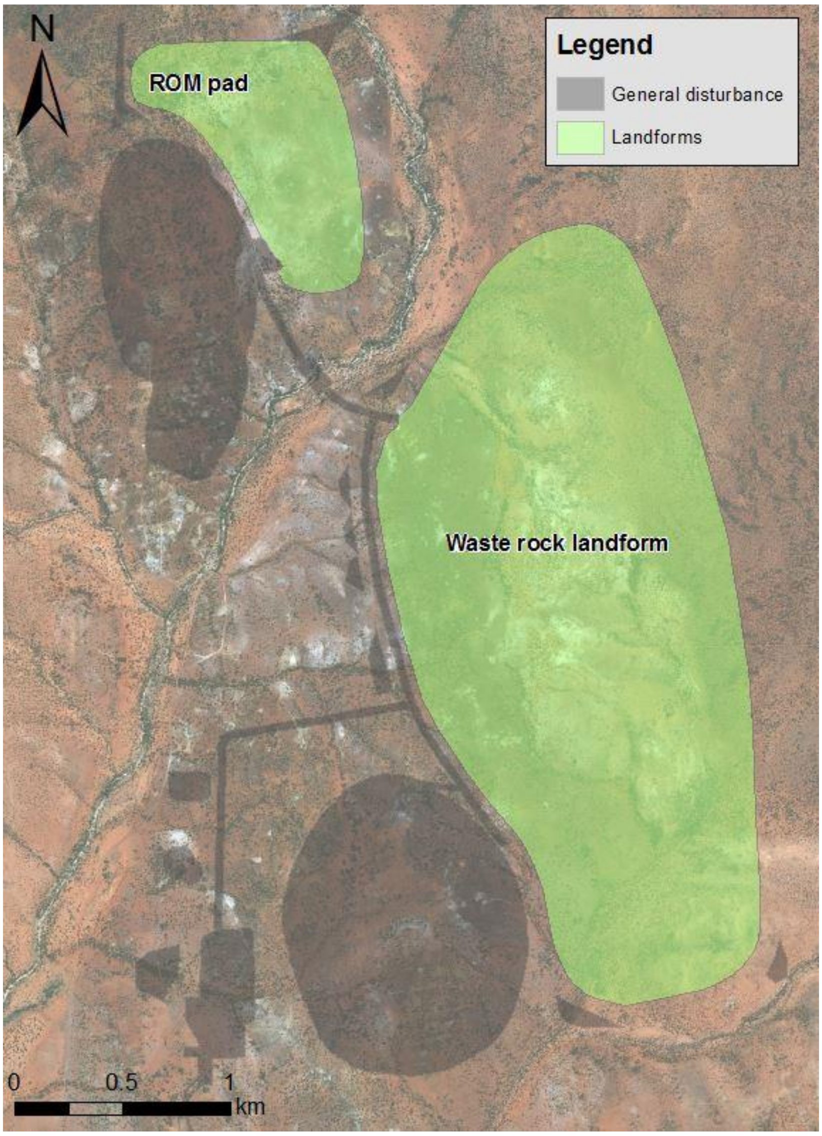

Figure 9-1: WRL and ROM pad

BoD Criteria

- Final top surface to retain incidental rainfall from a critical duration PMP rainfall event.
- Final landform, including drainage controls / features, to have a 300-year design life.
- Slope stability achieved through reprofiling up to 20°, nominally 18°.
- Geotechnical FoS >1.3 under static conditions.
- Abandonment bund positioned outside of ZoI, or as agreed with the DMIRS.
- Berms will be designed to retain 1:1,000 year ARI rainfall event with adequate freeboard, with cross bunds installed at periodic intervals to minimise the concentration of drainage in any one area and encourage revegetation.
- Diversion structures will be designed/amended to convey run-off from a minimum critical duration 1:300 ARI rainfall event; with the actual design event to be determined on a risk basis from further studies.

Selected Closure Alternative - Key Features

DOMAINS: Mining Landforms

Cover *(controlling safety, dust, erosion and surface drainage risks)*

- Up to 1.5 m* of durable rock armour applied to low stability / oxide exposures on Landform slopes.
- Up to 0.5 m* of inert rock material applied to any residual PAF exposures on WRL top (flat) surface.
- Place ~0.2 m* thick growth medium (topsoil and / or caprock) over waste rock.
- Waste rock that presents a real risk of generating AMD will be effectively encapsulated within the WRL.

Drainage *(controlling surface drainage and erosion risks, and promoting revegetation)*

- Landform design will be water-retaining, limiting potential for run-off from the flat surfaces.
- Top surface will retain incidental rainfall from a critical duration PMP rainfall event (BoD).
- Crest bunds will be installed on benches and top surfaces.
- Flat surfaces (benches and top) will be back sloped, designed to minimise overtopping risk.
- Catchment cell bund and cross bunds will maximise retention of water on the flat surfaces.
- Berms will be designed to retain 1:1,000 year ARI rainfall event with adequate freeboard, with cross bunds installed at periodic intervals to minimise the concentration of drainage in any one area and encourage revegetation.
- Construct toe bund around external perimeter of WRLs.
- The ~500 m section of WRL toe located within the Jones Creek floodplain will be rock armoured to minimum elevation of 529 mRL to account for a 1:1,000 yr flood event.
- Upstream run-off from the east of the WRL will be conveyed around the northern and southern toe of the WRL in engineered drains.
- Diversion structures will be designed/amended to convey run-off from a minimum critical duration 1:300 ARI rainfall event; with the actual design event to be determined on a risk basis from further studies.

Stability *(controlling geotechnical, seepage and erosion risks)*

- 20 m high lifts and 20 m wide berms, or alternate optimal slope design configurations (e.g. 10 m wide berms and 10 m high lifts, or 30 m wide berms and 20 m high lifts, etc.) that achieve BoD criteria (**Figure 9-2**).
- All slopes re-profiled to nominally 18°, up to 20°.
- Up to 1.5 m of durable rock armour applied to all low stability exposures.
- All slopes will be covered with up to 0.2 m growth medium.
- All material will be placed outside of the ZoI, or otherwise as agreed with the DMIRS.

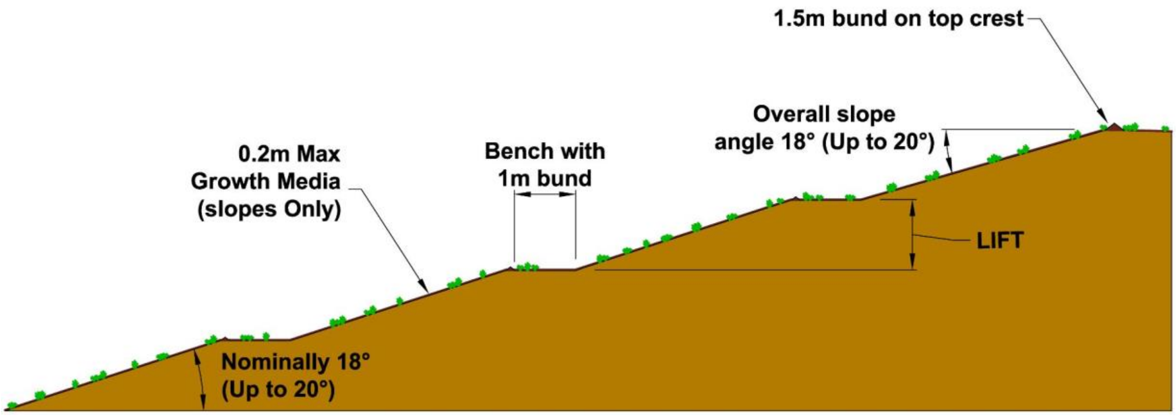

Figure 9-2: Cross-Section of Rehabilitated Landforms - Entire Slope

DOMAINS: Mining Landforms

ZoI *(controlling safety, geotechnical and erosion risks)*

- ZoI boundary will be estimated to the satisfaction of the DMIRS, with an additional 10 m buffer allowance, plus more distance (up to 5 m) for drainage control and bund construction (**Figure 9-3).**

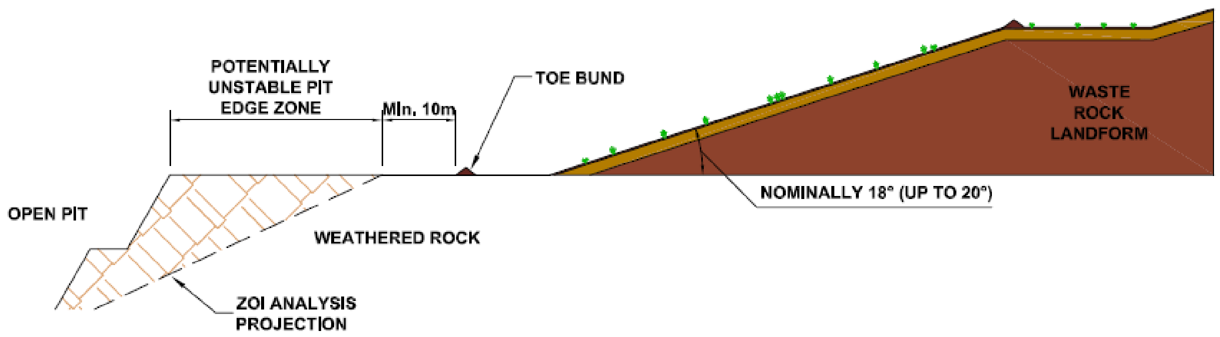

Figure 9-3: Cross-Section Showing WRL Relocated Outside ZoI

Revegetation *(aiding control of dust and erosion risks, and supporting target land-use)*

- Application of up to 0.2 m thick growth medium.
- Rip on contour and sow using a 7 kg/ha native seed mix.
- Growth medium will comprise a combination of topsoil/caprock (where available).
- Catch cells and cross bunds on flat surfaces will additionally promote vegetation establishment by helping to retain rainfall run-off.

Selected Closure Alternative - Construction Activities

1. Pushdown slopes of WRLs, ROM pad and Low Grade stockpiles to nominally 18^0, up to 20^0.
2. Berms will be designed to retain 1:1,000 year ARI rainfall event with adequate freeboard, with cross bunds installed at periodic intervals to minimise the concentration of drainage in any one area and encourage revegetation.
3. Up to 1.5 m of durable rock armour applied to all low stability / oxide and PAF exposures on slopes.
4. Any residual PAF exposures on WRL top surface are to be covered with up to 0.5 m of inert rock material.
5. Remove waste rock material from within the ZoI (including allowances) where safe to do so, or as otherwise agreed with the DMIRS.
6. Cover any used tyres and other wastes generated from site with ~5 m of inert rock material to manage the risk of contact with a surface fire, and to be well outside of any deep ripping zone within the surface profile.
7. Grade top surface to 1.5° (2.5%) back-sloped from crest edge for ~30 m.
8. Install ~1.5 m waste rock bund at WRL crest.
9. Construct low berms (1.0 m high) every ~100 m along berms and catch cells on top surfaces at ~2 cells per hectare to limit water flow and promote water storage and release.
10. Construct toe bunds and diversion drains around the external perimeter of the WRLs including within the pit side ZOI buffer area to divert local drainage away from the toe of the WRLs and enable retention of any erosional material generated from the slopes of the WRL.

DOMAINS: Mining Landforms

11. Place up to 0.2 m growth media, rip on contour and sow with native seed (at a rate of 7kg/ha) and fertiliser on WRL surfaces.
12. Install stock fencing, locked gates and signage around all landforms.

Indicative Rehabilitation Materials Balance (see Section 7.2.3 for further details)

Feature	Waste rock (m^3)	Topsoil required (m^3)[1.]	Topsoil likely to be collected (m^3)[2.]
Landforms			
WRL	205,000,000	534,000	781,000
ROM Pad	10,785,000	91,000	113,000
Total required (domain only)	**NA**	**625,000**	**894,000**

[1.] Assuming a topsoil application depth of 0.2 m

[2.] Assuming a recovery depth of 0.25 m and a handling loss of 10%

Selected Closure Alternative - Key Assumptions

1. Armour thickness up to 1.5 m will achieve erosional stability (to be confirmed by field trials pre-closure).
2. Cover of PAF exposures with inert rock up to 0.5 m will achieve target control (to be confirmed by field trials pre-closure).
3. Low Grade Stockpiles will not be processed during operations and therefore will require rehabilitation at closure.
4. The majority of existing rehabilitation areas will not require material rework (i.e. periodic maintenance only) in order to achieve closure performance criteria and enable tenement and residual liability relinquishment.
5. WRL material within the ZoI can be safely removed. It if cannot be safely removed, then an alternate solution will be agreed with the DMIRS.
6. Successful revegetation can be achieved on a growth media up to 0.2 m. This was investigated during the IPS, but will be subject to further studies and field trials pre-closure. If a thinner growth medium (e.g. 0.1 m) is feasible to produce the target revegetation outcomes, as confirmed from trials, then this will be adopted.
7. Use of topsoil and caprock remains as the preferred growth media at closure. If no caprock was used, then an overall topsoil deficit in the order of ~1 Mm^3 could be expected across total NMK rehabilitation areas.
8. Future operations, including growth projects, do not materially alter the inherent closure risks associated with WRLs and Low Grade Stockpiles (e.g. PAF risks remain low, ZoI boundaries remain equivalent).

Key Data Gaps - Research Priorities

No.	Data Gap	Proposed Research Activity	Indicative Timing
1	Waste rock characterisation	A pre-mining assessment of the geochemical and physical	

DOMAINS: Mining Landforms			
		(erodibility) of waste rock has been undertaken, but these findings need to be verified on an ongoing basis during operations.	During mining operations, as part of future NMK MCP updates
2	Detailed designs for landforms.	Develop detailed designs based on the as constructed geometry, actual waste rock properties and associated constraints / opportunities of the landforms.	
3	Topsoil inventory and quality.	Preliminary topsoil inventories have been developed for the MKS Project. However, during operations, inventories of rehabilitation materials are to be updated based on actual recovery rates. Prior to use in rehabilitated areas the quality of soil available for use is to be determined and a deployment plan developed based on these characteristics.	
4	Surface water management on and around the landforms.	Develop a plan for managing surface water post closure. Concept plans exist and these will be refined once infrastructure has been developed.	
5	Identify areas that may require rock armouring.	Identify areas on the as constructed landforms which may require rock armouring.	
6	Develop rehabilitation seed lists and plan for the collection and management of seed resources.	Develop a seed list for revegetation based on the baseline flora and vegetation assessments and investigate potential sources of seed.	

9.2.2 Selected Closure Alternative for Open Pits

DOMAIN: Open Pits	
Existing Conditions - Key Features (Figure 9-4)	
Goliath open pit: • Will be mined in two stages; • Stage 2 waste will be backfilled into the Six Mile Well pit; and • Following mining it is anticipated the pit shell will be 1,420 m long, 1,130 m wide and 465 m deep.	**Six Mile Well open pit:** • Following mining it is anticipated the pit shell will be 1,400 m long, 740 m wide and 270 m deep; and • Will be backfilled to ground level RL.

DOMAIN: Open Pits

Current Operating Status:	**Area to be Disturbed:**
Planned	Goliath Open Pit ~ 125 ha Six Mile Open Pit ~ 87 ha
Location: Goliath Open pit; 261600 mE, 6962000 mN Six Mile Well pit; 260400 mE, 6965000 mN	**Tenements:** M36/185, M36/184, M36/183, M36/246

Nominal Closure Date (based on current mining approvals): FY2032
Expected Closure Date (based on LoA plan, assuming future growth approvals): Earliest FY2040

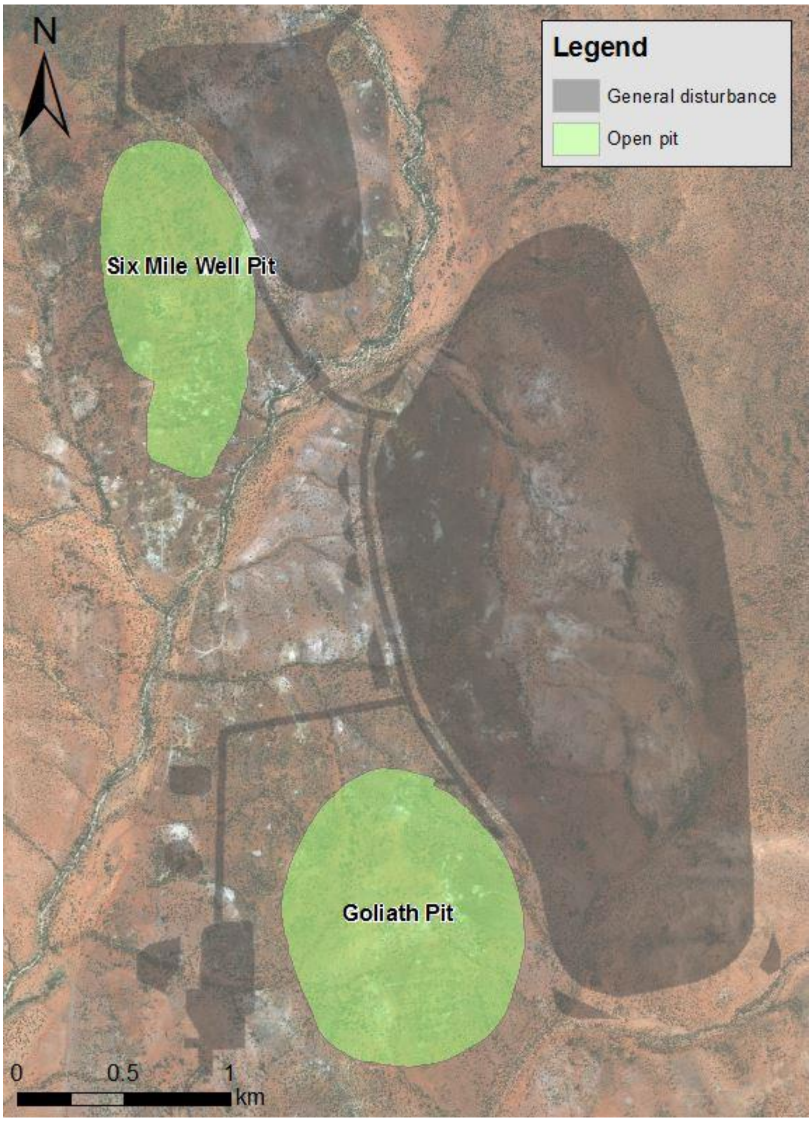

Figure 9-4: Open pits

BoD Criteria

- For the Goliath open pit, abandonment bund positioned outside of ZoI, or as agreed with the DMIRS
- 300 year design life for water management (drainage) structures

DOMAIN: Open Pits

- Diversion structures will be designed/amended to convey* run-off from a minimum critical duration 1:300 ARI rainfall event; with the actual design event to be determined on a risk basis from further studies
- Diversion structures will be designed to pass^ run-off from a critical duration PMP rainfall event

** "Convey" a standard condition where drainage is conveyed within the diversion, below the design maximum water level*

^ "Pass" an extreme condition where drainage, which exceeds the capacity of the diversion, is passed over engineered spillways constructed in the diversion embankment

Selected Closure Alternative - Key Features

Safety *(controlling safety, geotechnical and erosion risks)*

- Construct pit abandonment bund with competent waste rock to prevent inadvertent vehicular access.
- Install perimeter stock fencing around the final voids (outside of the abandonment bund) to deter cattle access.
- Install bunds from waste rock across pit access ramps as a further line of defence to deter inadvertent people and stock access to the final void, and pit lake (if abandonment bunds and stock fences are breached).

ZoI *(controlling safety, geotechnical and erosion risks)*

- ZoI boundary estimated using site-specific geotechnical data and PWA methodology, with an additional 10 m buffer allowance, plus more distance (up to 5 m) for drainage control and bund construction (**Figure 9-5**).
- WRL material within the ZoI (including allowances) will be removed, or as otherwise agreed with DMIRS.
- 2 m high abandonment bund will be constructed outside of the ZoI (including allowances).
- Install drains, as required and where safe to do so, around crest of pit to divert water away from pit crest.

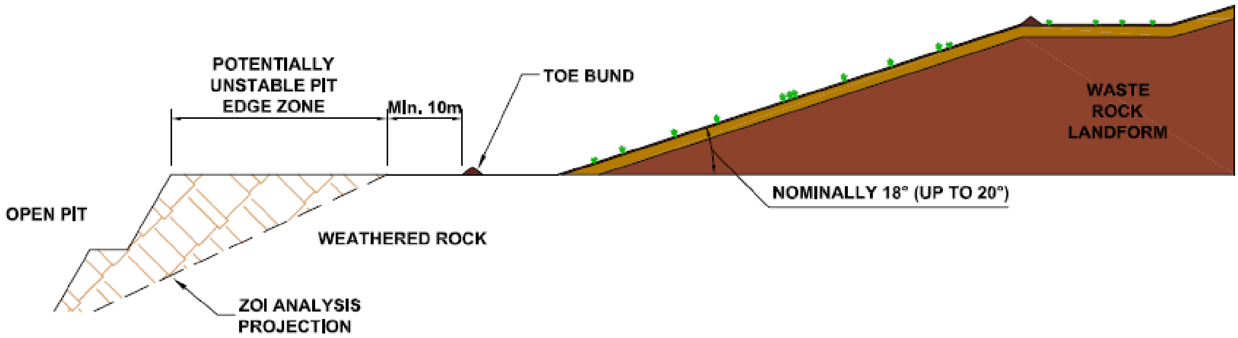

Figure 9-5: Cross-Section Showing Landform Stand-Off from ZoI Boundary

Drainage *(controlling site wide surface drainage and erosion risks)*

- Design post-mining surface water structures to minimise impacts on regional drainage and maintain downstream flows.

DOMAIN: Open Pits

- All surface water diversion structures required to be located outside of the pit ZOI and abandonment bund.
- Flood protection bunds at the Six Mile Well open pit will be removed on closure.

Revegetation of the Six Mile Well open pit backfill area if appropriate *(aiding control of dust and erosion risks, and supporting target land-use)*

- Application of up to 0.2 m thick growth medium.
- Rip on contour and sow using a 7 kg/ha native seed mix.
- Growth medium will comprise a combination of topsoil/caprock (where available).

Selected Closure Alternative - Construction Activities

Open Pit

- Pushdown slopes of WRLs up to 20^0 (nominally 18^0), per **Section 9.2.1.**
- Construct 2 m high abandonment bund (consistent with DMIRS Guidelines 1997), and per design specification.
- Excavate slots across the ramp at regular intervals to permanently prevent down ramp pit access, and control run-off.
- Block off top of ramp with 2 m high earthen bund.
- Cut off and rehabilitate former access roads to the pit no longer required during closure monitoring and maintenance.
- Install stock fencing, locked gates and signage around the pit perimeter (outside of the abandonment bund).

Site Wide Drainage

- Upgrade existing surface water diversion drains per design specification.
- Construct other structures (e.g. sedimentation dams) per design specification.

Indicative Rehabilitation Materials Balance

Feature	Waste rock (m^3)	Topsoil required (m^3)[1.]	Topsoil likely to be collected (m^3)[2.]
Open Pits			
Goliath open pit	NA	NA	187,000
Six Mile Well open pit	83,000,000	104,000	130,000
Total required (domain only)	**83,000,000**	**104,000**	**317,000**

[1.] Assuming a topsoil application depth of 0.2 m

[2.] Assuming a recovery depth of 0.25 m and a handling loss of 10%

Selected Closure Alternative - Key Assumptions

1. The Goliath Pit final void will become a terminal sink (pit lake) of poor water quality, with net outflows (evaporation) generally exceeding inflows (rainfall and groundwater infiltration).

Key Data Gaps – Research Priorities

DOMAIN: Open Pits			
No.	**Data Gap**	**Proposed Research Activity**	**Indicative Timing**
1	Surface water management	Develop a plan to manage surface water after closure. Concept plans exist and these will be refined once infrastructure has been developed.	During mining operations, as part of future NMK MCP updates
2	Revegetation of Six Mile Well open pit area.	Determine if a revegetation outcome can be achieved on the backfilled Six Mile Well open pit area.	
3	Waste rock characterisation	A pre-mining assessment of the geochemical and physical (erodibility) of waste rock has been undertaken, but these findings need to be verified on an ongoing basis during operations.	
4	Topsoil inventory and quality	Preliminary topsoil inventories have been developed for the MKS Project. However, during operations, inventories of rehabilitation materials are to be updated based on actual recovery rates. Prior to use in rehabilitated areas the quality of soil available for use is to be determined and a deployment plan developed based on these characteristics.	
5	Develop rehabilitation seed lists and plan for the collection and management of seed resources.	Develop a seed list for revegetation based on the baseline flora and vegetation assessments and investigate potential sources of seed.	

9.2.3 Selected Closure Alternative for Non-Process Infrastructure

DOMAIN: NON-PROCESS INFRASTRUCTURE	
Existing Conditions - Key Features (Figure 9-6)	
• Administration Offices. • Fuel Farm – non-permanent, self-bunded area with associated diversion drains. • Dewatering Facility – HDPE lined pond • Bridge Crossings (North and South) • Drainage Controls - on the western side of the WRL.	• Unsealed Roads (access roads and tracks). • Haul Road (20 km haul road to NMK) • Laydowns (Mining Contractor Laydown). • Topsoil Stockpiles.
Current Operating Status: Planned	**Area Disturbed:** 144 ha **Area Rehabilitated:** 0 ha
Location: Various	**Tenements:** M53/217, M53/218, M36/658, M36/677, L36/206, M36/246, M36/399, M36/288, M36/422, M36183, M36/286, M36/184, M36/285 and M36/185

DOMAIN: NON-PROCESS INFRASTRUCTURE

Nominal Closure Date (based on current mining approvals): FY2032

Expected Closure Date (based on LoA plan, assuming future growth approvals): Earliest FY2040

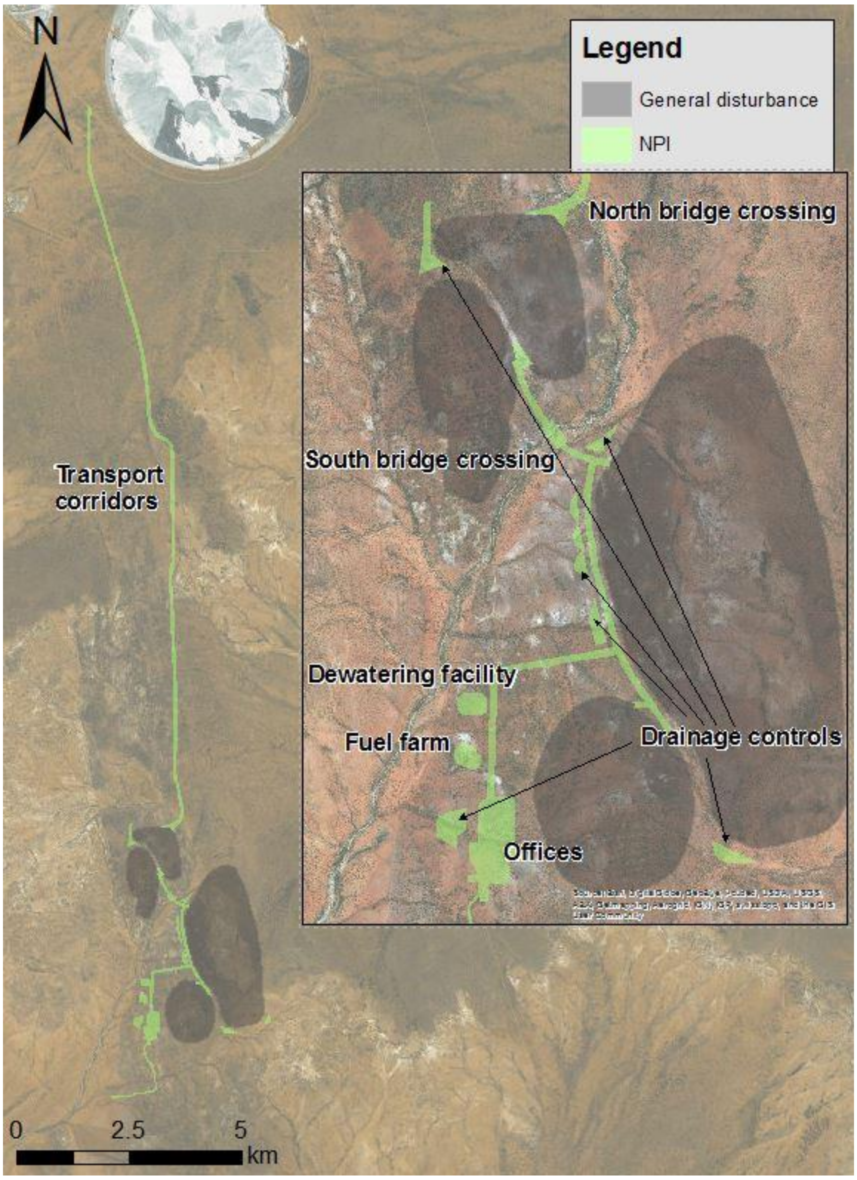

Figure 9-6. Non-Process Infrastructure

BoD Criteria

- Below ground infrastructure will be removed, decommissioned or buried to nominal depth of 0.5 m bgl. In some circumstances, less clearance (i.e. < 0.5 m) may be appropriate after a plant specific risk-based assessment.
- Above ground infrastructure will be removed, unless otherwise agreed with the party who will inherit the land.
- Contaminated soil exceeding remediation criteria, agreed with a CSA and relevant regulatory authorities, will be removed up to 0.5 m bgl.

Selected Closure Alternative - Key Features

DOMAIN: NON-PROCESS INFRASTRUCTURE

Removal and Disposal *(controlling health and safety, surface and groundwater contamination and post-mining land-use risks)*

- Demolish and remove all above-ground infrastructure, unless agreed with relevant stakeholders.
- All fill material and culverts will be removed at the bridge crossings to reinstate natural flows.
- Remove or bury below ground infrastructure to 0.5m bgl, unless specific risk assessment determines less.
- If identified, remove hazardous materials and dispose on-site within a designated hazardous waste facility.
- Backfill excavated areas with suitable inert material, sourced on-site, providing a new cover of up to 0.5 m.
- Excavate contaminated soil to a maximum 0.5 m bgl in areas where remediation criteria (agreed with the CSA and relevant regulatory authorities) is exceeded, preventing potential for direct soil contact with people and fauna. See **Figure 9-7**.

Revegetation *(aiding control of dust and erosion risks, and supporting target land-use)*

- Application of up to 0.2 m thick growth medium.
- Rip on contour and sow using a 7 kg/ha native seed mix.
- Growth medium will comprise topsoil if available, which will be sourced from existing on-site stockpiles.

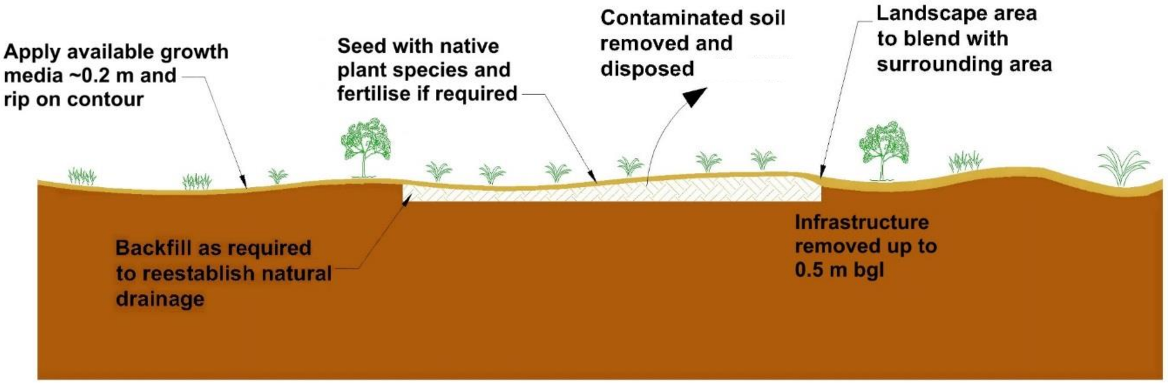

Figure 9-7. Section Illustrating Excavation /Removal and Backfill/ Rehabilitation in Processing Areas

Selected Closure Alternative - Construction Activities

1. Isolate all electrical equipment.
2. Decommission all services (e.g. electrical, water, sewer, etc) to all plant and equipment.
3. Transport all unused fuel and reagents off-site.
4. Identify, remove and dispose of (i.e. bury) all hazardous materials (including asbestos materials) at the designated hazardous waste landfill at the NMK TSF 1, or other approved disposal location (prior to the rehabilitation of that area).
5. Demolish and remove all infrastructure (plant and equipment), unless otherwise agreed in writing with relevant stakeholders including the third party that will inherit and be responsible for these facilities post-relinquishment.
6. Remove scrap steel off-site for recycling, where feasible. Maximise other feasible materials recycling or re-use.

DOMAIN: NON-PROCESS INFRASTRUCTURE

7. Dispose of non-hazardous (inert) demolition debris and non-recyclable materials to identified disposal areas on-site including the process water ponds and / or WRLs (prior to the rehabilitation of those receival areas). This includes, but is not confined to, all bitumen surfaces such as roads, car parks and hardstand areas.
8. Remove residual concrete slabs and footings up to a depth of 0.5m bgl, or cover with 0.5 m of inert rock medium.
9. All underground services will be left in-situ where they are located more than 0.5 m deep, and it is safe to do so.
10. Excavate contaminated soils up to 0.5 m bgl and transport to the TSF or alternative approved disposal facility for burial within trenches in the tailings (prior to the rehabilitation of that area).
11. Backfill excavated areas with inert waste rock and / or caprock and re-contour surface to reinstate local drainage.
12. Place up to 0.2 m of soil and / or caprock and rip and sow with a native seed mix (at rate 7 kg/ha), with fertiliser, all areas of ground disturbance.
13. Restore site drainage, as appropriate, to minimise the potential for erosion and support the post-mining land-use.
14. Install stock fencing, locked gates and signage around rehabilitated areas until revegetation has well established.

Indicative Rehabilitation Materials Balance

Feature	Waste rock (m^3)	Topsoil required (m^3)[1.]	Topsoil likely to be collected (m^3)[2.]
Offices	NA	20,000	25,000
Fuel Farm	NA	3,000	4,000
Dewatering Facility	NA	4,000	4,000
Haul and Access Roads	NA	125,000	156,000
Drainage Controls	NA	24,000	24,000
Total	**NA**	**176,000**	**213,000**

Selected Closure Alternative - Key Assumptions

[1.] Assuming a topsoil application depth of 0.2 m

[2.] Assuming a recovery depth of 0.25 m and a handling loss of 10%

DOMAIN: NON-PROCESS INFRASTRUCTURE

1. All potentially hazardous materials (and sources) are known and accounted for.
2. The demolition and removal of all plant and equipment has been assumed for now in closure planning. However, where there is residual value to the post-mining land-use and / or a third party that will inherit the management and / or ownership of the land (e.g. DPLH), then the retention of part or all of select Process Infrastructure may occur where (liability transfer) has been agreed to with those parties in writing.
3. An upper limit of 6,000 mg/kg of nickel, based on NEPM Health Investigation Levels for Industrial Sites, and an excavation depth to maximum 0.5 m bgl have been assumed as the acceptable criteria for remediating contaminated soil.
4. Contaminated soil below a depth of 0.5 m bgl is left in-situ under an inert cover with no potential for direct contact with persons or fauna.
5. Local native vegetation is tolerant of elevated soil minerals, including nickel, and so it is not assumed if persisting within a deep root zone at >0.5 m depth as being a potential inhibitor to plant establishment and growth.
6. Reprocessing of nickel contaminated soil prior to closure has not been assumed, however, this option will be investigated and pursued, if feasible, prior to or during closure works in the Process Infrastructure domain.
7. Successful revegetation can be achieved on a growth media up to 0.2 m. This was investigated during the IPS, but will be subject to further studies and field trials pre-closure. If a thinner growth medium (e.g. 0.1 m) is feasible to produce the target revegetation outcomes, as confirmed from trials, then this will be adopted.
8. Use of topsoil and caprock remains as the preferred growth media at closure. If no caprock was used, then an overall topsoil deficit in the order of ~1 Mm^3 could be expected across total NMK rehabilitation areas.
9. Future operations, including growth projects, do not materially alter the inherent closure risks associated with the Process Infrastructure domain.

Key Data Gaps - Research Priorities

No.	Data Gap	Proposed Research Activity	Indicative Timing
1	Surface water management.	A concept plan for surface water management has been developed, but this will be refined with particular emphasis on the bridge crossings.	During mining operations, as part of future NMK MCP updates
2	Topsoil inventory and quality.	Preliminary topsoil inventories have been developed for the MKS Project. However, during operations, inventories of rehabilitation materials are to be updated based on actual recovery rates. Prior to use in rehabilitated areas the quality of soil available for use is to be determined and a deployment plan developed based on these characteristics.	
3	Contaminated sites.	Undertake a contaminated sites assessment and develop an appropriate management plan if required.	

9.2.4 Selected Closure Alternative for Pastoral Improvement Opportunity

In addition to implementing work programs for closure domains, execution activities to improve local pastoral conditions and land capability are also proposed as part of the suite of closure commitments for the NiW mines. The pastoral land-use assessment described in **Section 5.1.1.3** sets the context and basis for incorporating these voluntary improvement measures within the range of closure commitments for NiW mines.

The proposed pastoral improvement works (not specific to the MKS Project but which are together applicable to all NiW mines as they are located within the same collective of large pastoral leases in the region) are described in **Table 9-1.** The detailed scope for the selected pastoral works will be subject to further discussions with the DPLH as part of future updates of this MCP to ensure they are acceptable to the DPLH as a basis for tenure relinquishment at closure.

Table 9-1: Pastoral Improvement Activities for Implementation at Closure

No.	Activity	Description
1	Install 10 new stock (water) bores	Provide additional water sources within the lands surrounding the mines to increase local grazing capacity (stocking rates).
2	Install 100 km of new stock fencing	New fencing to improve stock management.
3	Fence Landforms and final void	Fencing to exclude cattle from final landforms materially altered by former mining, and that are most susceptible to active grazing impacts. Abandonment bunds and bunds at the top of pit access ramps will be installed as further lines of defence to deter cattle access to the final void.
4	Provide funding for maintenance of improvements post-relinquishment	Provide funding for the maintenance of improvements (e.g. new fencing and stock water bores) post relinquishment for a defined period of time agreed with the party to inherent the ownership and management of the land.
5	Develop a Rangelands Management Plan, with scope to be agreed between the DPLH and NiW, and implement priority improvement measures agreed with the DPLH	Develop Rangelands Management Plan, or equivalent, to assist the management of the wider rangelands and implement measures agreed with the DPLH prioritising repair of eroded landscapes and improved conservation outcomes.

The commitment to this program is intended to be an achievable, sustainable precedent for NiW. It goes beyond any legal obligations to commit to improving land capability on a wider, regional basis. It is intended to increase the feasibility of local pastoralism post-closure and leave a larger, positive legacy post-closure from NiW mining.

These pastoral (and wider land) improvement works, when implemented, are expected to deliver the following benefits:

1. ***Increased cattle stocking rates*** - Sustainably increase stocking rates in the locale by up to 500 head of cattle (note, the pre-mining stocking rate of the total mining disturbance area at NMK is ~35 head of cattle). This will be done by improving areas which are currently unviable or offer low grazing value;

2. ***Increased economic opportunities for local pastoralism*** - These measures should help increase the economic viability of local pastoral enterprises by providing additional sources of income and employment;

3. ***Protection of rehabilitated landforms and biodiversity*** - Fencing of rehabilitated mining areas, including WRLs, TSFs and the final void, will minimise the potential for inadvertent cattle access and grazing that could otherwise degrade the integrity and stability of these landforms and the target biodiversity outcomes; and

4. ***Increased biodiversity, land restoration and conservation outcomes*** - Implementation of the Rangelands Management Plan (or equivalent), with its scope and resulting commitments to be agreed to between the DPLH and NiW, and additional fencing to control stock movements should improve the condition of local landscapes aiding their ability to support a sustainable mix of post-mining land-uses.

As discussed with the DPLH during the IPS, by implementing these measures along with the other closure work programs described in **Section 9.2**, this is intended to provide the basis for DPLH (as the anticipated future land manager of the underlying pastoral estate) to consider accepting responsibility for the rehabilitated NMK site at tenement relinquishment. Discussions regarding what are the acceptable terms and conditions for the State Government to accept the residual liability of rehabilitated land post-closure at NMK will be subject to ongoing discussions and negotiations with the DPLH and the DMIRS as closure planning advances.

9.3 Closure Execution Schedule

Table 9-2 provides the closure execution (works) schedule developed to complete the main activities closure execution at NMK which will incorporate MKS. The schedule is indicative only given the preliminary stage of closure planning at this time, and will be subject to further review and refinement in future as material advances in planning are made.

Table 9-2: Indicative Closure Execution Schedule (Assuming the Nominal LoA FY2032 Closure Date)

	Activity	Start Date	Finish Date
1	Progressive Rehabilitation	Ongoing	FY2032
2	Closure Works Pre-planning*	FY2030	FY2032
3	Contractor Mobilisation*	FY2032	FY2033
4	Decommissioning, Demolition and Disposal*	FY2033	FY2035[1]
5	Land Rehabilitation	FY2033	FY2039[2]

[1] *Demolition of some facilities may be delayed until completion of land rehabilitation activities (e.g. to provide contractor housing)*
[2] *Includes an initial drying period for tailings in NMK TSF 2 before it is assumed large operating equipment can safely traverse the TSF surface.*

**This timing is integrated with the timing of the closure of NMK.*

Detailed planning for closure execution, including scheduling, will start ~5 years prior to the expected closure date. This MCP will be updated with additional information from this planning at this time and submitted to the DMIRS for their approval. During this phase, and prior to the start of major closure construction works, NiW will also submit to the DMIRS for their approval an Independent QA audit report (see **Table 6-1**) verifying that the detailed engineering design is consistent with the BoD and other relevant criteria and will achieve closure objectives.

Importantly, the closure date nominated in **Table 9-2** is for indicative purposes only. **Section 1-1** describes the basis for the expected closure date at this time being at the earliest FY2032 (subject to regulatory approvals).

10 CLOSURE MONITORING AND MAINTENANCE

10.1 Monitoring Scope

The aim of closure monitoring is to measure the performance of closure activities over time. Monitoring assesses the condition of rehabilitated landforms and other features against closure performance criteria (**Section 6.2**) to demonstrate that relevant closure objectives (**Section 5.2**) have been achieved. In doing so, closure monitoring is the final verification phase post-execution to enable relinquishment of mining tenements and residual liabilities.

Table 10-1 summarises the proposed NMK post-execution performance monitoring and reporting schedule. The monitoring activities focus on macro-indicators of rehabilitation success to verify landform fundamentals are in place.

The closure monitoring program is intended to measure the:

1. Competency of rehabilitated landforms to withstand natural regimes and forces;
2. Qualities of surface water run-off and groundwater in the locale, to demonstrate that landforms are non-polluting;
3. Revegetation success in rehabilitation areas, to demonstrate the biodiversity aspect of post-mining land uses is achieved; and
4. Pastoral improvement and land restoration outcomes, to demonstrate that the target benefits have been delivered.

Results from this monitoring will be used, along with other relevant information, to inform the QA audits conducted post-execution (**Section 6.2**). These audits will verify that closure performance criteria have been met.

Post-execution monitoring will build upon the information gained from monitoring of existing rehabilitation areas that preceded this phase during mining (pre-execution) and the construction (execution) of closure works. These monitoring results, combined with wider NiW operational experience gained from progressive rehabilitation, will continue to inform the optimisation of closure rehabilitation designs and construction.

In evaluating performance, it is important to recognise that processes like erosion, drought and fire are natural features of the landscape and that all post-mining landforms will succumb to these forces (events) over time. The task at closure is to ensure that such impacts caused to post-mining landforms are within their assimilative capacities.

Monitoring and analyses will be conducted by suitably qualified persons in accordance with relevant industry standards. Monitoring activities will also be subject to continual review prior to and post closure execution to ensure their continued relevance in providing meaningful, accurate and cost-effective verification of closure performance.

Table 10-1: Post-Closure Monitoring and Reporting Schedule

ASPECT	ACTIVITY DESCRIPTION	MONITORING YEARS POST-EXECUTION										
		1	2	3	4	5	6	7	8	9	10	11
SAFETY												
Site Safety	• Visual inspections to confirm abandonment bund integrity, condition of perimeter fencing and signage and indicators of unauthorised entry. • Verify no exposed hazardous materials (previously covered or buried) and no steep-sided erosion gullies or other features outside of fencing that pose an unacceptable safety risk to persons, stock or native fauna.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
STABILITY												
Geotechnical Stability	• Verify geotechnical performance is within predicted ranges. To be verified via field inspections and analysis of broad-scale survey data by a suitably qualified geotechnical engineer/s.	✓	✓	✓	✓	✓		✓			✓	
Erosional Stability	• Verify landform erosion is within predicted rates. This is to include erosion within and resulting from surface water structures. To be verified via field inspections and analysis of broad-scale (e.g. aerial) survey data by a suitably qualified engineer/s, with further assessment as required.	✓	✓	✓	✓	✓		✓		✓		
NON-POLLUTING												
Surface Water Quality	• Verify the quality of surface water run-off from final landforms is not adversely impacting any downstream sensitive receptors and is within the assimilative capacity of the landscape. To be verified via field inspections, and sampling / lab analysis as required.	✓	✓	✓	✓	✓		✓		✓		
LAND USE												
Biodiversity	• Monitoring of rehabilitated areas against analogue sites to compare plant cover, density and species richness (see **Table 6-1**). Monitoring will also verify established vegetation is self-	✓	✓	✓		✓					✓	

ASPECT	ACTIVITY DESCRIPTION	MONITORING YEARS POST-EXECUTION										
		1	2	3	4	5	6	7	8	9	10	11
	sustaining. To be verified via field survey / inspections and broad-scale (e.g. aerial) survey data. This monitoring will be conducted annually post wet season for the first three years following the completion of rehabilitation activities to provide early opportunity to implement mitigation measures, as outlined in **Section 10.3**, in the instance that revegetation is unsuccessful. Following the first three years of monitoring, NiW propose to reduce survey frequency. However this approach hinges on the return of initial favourable results from the initial three year period.											
Weeds and Feral Animals	• Monitoring of infestations of weeds and feral animals to inform maintenance activities. On ground weed surveys will be conducted annually post wet-season by qualified persons in the first three years following the completion of rehabilitation activities. Higher survey intensity in the initial years of vegetation establishment allows for increased opportunity to implement mitigation measures to mitigate/eradicate weed species, thus providing favourable circumstances for the establishment of native vegetation and reducing the potential for rehabilitation areas to provide a source of weed infestation to neighbouring areas of environmental sensitivity (e.g. Nature Reserve, PEC). Following the first three years of monitoring, NiW propose to reduce survey frequency. However this approach hinges on the return of favourable results from the initial three year period.	✓	✓	✓		✓					✓	
Pastoral Improvement Initiatives	• Visual inspections to confirm condition of new stock fencing and operational stock bores. • Monitoring of the wider landscape to verify the effectiveness of implemented measures arising from the Rangeland Management Plan. To be verified via field inspections and broad-scale (e.g. aerial) survey data.	✓	✓	✓	✓	✓		✓		✓		
REPORTING												

ASPECT	ACTIVITY DESCRIPTION	MONITORING YEARS POST-EXECUTION										
		1	2	3	4	5	6	7	8	9	10	11
Annual Environmental Report	• Annual summary of the results from closure monitoring and maintenance activities, including assessment against closure performance criteria (**Section 6.2**).	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
Periodic QA Audit Reports	• QA audit reports, completed by suitably qualified person/s approved by the DMIRS, to assess cumulative monitoring results to verify compliance with closure performance criteria (**Section 6.2**), and as a basis to support the timely and effective relinquishment of mining tenements and residual liabilities.					✓					✓	
Closure Completion (Relinquishment) Report	• After the final periodic QA Audit Report has been accepted by the DMIRS as confirming closure performance criteria (**Section 6.2**) have been met, this Closure Completion Report will consolidate the collective results from all monitoring, inspections, observations and maintenance activities conducted post-execution, and the periodic QA audit reports submitted to the DMIRS. The purpose of this report is to provide a consolidated report to the DMIRS (and other relevant parties, including agencies that represent the future land owner / manager e.g. DPLH) that collates all relevant information to demonstrate that the closure objectives and performance criteria have been met, providing the basis for relinquishment of mining tenements and the transfer of residual liabilities (the latter subject to terms and conditions of a specific legal agreement) to the State Government or another third party.											✓

10.2 Monitoring Duration

The anticipated duration of monitoring after completion of all NMK closure execution activities at the MKS Project domains, is 10 years. Note, an additional year (Year 11) is shown in **Table 10-1** as the final reporting year, to submit the Closure Completion Report.

This decade of post-execution monitoring is generally consistent with Section 4.13 of the 2015 Guidelines that state *“a minimum monitoring period after closure should be provided for in the Mine Closure Plans, usually in the order of 10 years”*.

As discussed in **Section 6.2**, NiW has put significant emphasis on QA monitoring and control and independent auditing during the closure design and construction phases to identify any potential issues early when there is the greatest opportunity, during closure, to effectively address any concerns or departures from plan. This is intended to minimise the potential for issues arising during the post-execution phase helping to reduce the monitoring duration.

NiW recognises that whilst 10 years is the target post-execution monitoring period, this duration will ultimately be determined by progressive results and when regulatory authorities agree closure performance criteria has been met.

10.3 Maintenance Scope

Maintenance activities will be responsive to monitoring data. Taking an adaptive management approach, as issues are identified from data analyses, actions will be taken which include maintenance works to restore compliance to plan. Other actions may include follow up monitoring to confirm the result or to broaden the analysis to better characterise the issue and determine the most effective remedy as part of any maintenance response.

Examples of maintenance activities that could be implemented post-execution, include:

- Repairs of eroded rehabilitated landforms and surface water features;
- Restoration of failed or damaged abandonment bunds and perimeter fencing;
- Re-seed of poorly vegetated areas;
- Control of weeds in revegetated areas;
- Restoration of design capacities of surface water features; and
- Repairs of stock fencing and water bores to support the intended pastoral improvements.

These are examples only and not intended to cover the complete range of maintenance activities that could be implemented. Ultimately, the scale and timing of maintenance works will be commensurate with the issues arising and, as appropriate, will be scoped and executed in consultation with relevant stakeholders including the DMIRS.

10.4 Relinquishment Timing

Consistent with above, the relinquishment of NMK mining and pastoral tenements and any residual land liability is targeted for ~10 years after completion of all closure execution activities. The timing is after demonstration of compliance against closure performance criteria and related objectives has been shown and accepted by the DMIRS.

NiW recognises, consistent with feedback received from the DPLH and DMIRS during the IPS, that suitable funding arrangements for maintenance works associated with the rehabilitated landforms post-relinquishment will need to be agreed to with the DPLH (as the State agency likely to inherit the ownership / management of this land), or another suitable third party who seeks to assume responsibility for the tenure and/or land at this time.

This approach is considered consistent with the relevant requirements of the 2015 Guidelines, and specifically Section 2.8 which states:

"Relinquishment of a tenement requires formal acceptance from the relevant regulators that all obligations under the Mine Closure Plan associated with the tenement, including achievement of completion criteria, have been met and, where required, arrangements for future management and maintenance of the tenement have been agreed to by the subsequent owners or land managers."

At the time of this MCP, only preliminary discussions on the need for such a funding arrangement had been discussed with the DPLH (and the DMIRS), with future MCP revisions to include increasing details on the status of these negotiations

11 FINANCIAL PROVISIONING

NiW has implemented a process for annual review and update of a closure (financial) provision assigned to cover NMK closure costs. This process satisfies internal requirements of BHP that adopt industry accounting standards and best practice.

In BHP, the development of closure plans and related financial provisions are required from the outset of a mining development. Closure is also a mandatory consideration in LoA planning which is reviewed annually. These internal obligations ensure closure risks are considered throughout operational planning and decision-making.

The main objective of financial provisioning for closure is to ensure adequate funds are assigned for closure to satisfy relevant legal and other requirements and to mitigate future risks associated with an inaccurate accounting provision. These processes are subject to independent review and audit by the Group Risk Assessment and Assurance (RAA) team of BHP Corporate. This team assembles experienced closure and financial specialists from across BHP operations to audit the adequacy of closure plans and their related cost estimates. RAA audits are typically undertaken biannually. Audit findings are reported to the NiW Asset President and BHP Risk and Audit Committee. Information regarding aggregate BHP closure provisions is publicly reported in BHP Annual Reports.

In addition to above, Asset closure at NiW has been managed as a major capital project since 2015 (**Section 1.3**). This has imposed additional project controls and BHP governance on the development of the closure scope and cost estimate, to ensure its rigour and accuracy with sufficient contingency for risk scenarios. In 2017, the IPS produced a revised Class 4 closure cost estimate that will form the basis of future closure provision updates..

12 INFORMATION MANAGEMENT

Given the inherent complexities, including decades from planning start until relinquishment of tenements and residual liabilities, the secure storage of relevant data and other information is a crucial element of effective closure planning.

At NiW, the closure planning team maintains a ‘paperless’ system whereby relevant documents are logged (being scanned if only a hard copy is available) in a central location on the mains computer server. This mains server is backed up daily by BHP to ensure the protection and safe storage of uploaded records. A closure document inventory is maintained according to key categories (e.g. MCPs, IPS, legal, stakeholders, technical studies).

Closure obligations derived from regulatory approvals are recorded in the NiW land management database (‘Land Assist’) which links operating licence, ministerial and mining tenement conditions to the site/s to which they relate. This database is maintained with new or varied approval conditions by a system administrator, and it provides alerts to the administrator who notifies key personnel in advance of when compliance items are due.

Spatial data including (but not confined to) closure domain boundaries, rehabilitation areas, topsoil and caprock stockpile locations, flora and fauna survey data and sensitive receptor locations (e.g. Wanjarri Nature Reserve, stock bores, heritage sites, etc) are maintained in the NiW Geographic Information System (GIS) database.

Landform engineering drawings are permanent records stored on the ‘ProjectWise’ database, maintained by NiW.

Closure documents that are stored in the NiW information management system may contain commercially sensitive or confidential information. As a control, there are restrictions on the internal personnel who can access this information (authority is required from the Manager Closure Planning) increasing the protection of the information.

Historical records, typically hard copy, from pre-2005 (i.e. the WMC era) have been archived in a records database and are physically stored in a designated facility separated from NiW offices, which can be accessed on request.

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14 ABBREVIATIONS

Abbreviation	Meaning
AEP	Annual Exceedance Probability
AER	Annual Environmental Report
AHD	Australian Height Datum
AMD	Acid Mine Drainage
ANZMEC	Australian and New Zealand Minerals and Energy Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ARI	Average Recurrence Interval
bgl	Below Ground Level
BHP	Broken Hill Proprietary (Ltd)
BHPB	BHP Billiton
BoD	Basis of design
BoM	Bureau of Meteorology
CSA	Contaminated Sites Auditor accredited by WA Department of Water and Environmental Regulations
DMP	Department of Mines and Petroleum
DBCA	Department of Biodiversity Conservation and Attractions
DJTSI	Department of Jobs, Tourism, Science and Innovation
DMIRS	Department of Mines, Industry Regulation and Safety
DoL	Department of Lands
DoW	Department of Water
DPaW	Department of Parks and Wildlife
DPLH	Department of Planning, Lands and Heritage
DPS	Definition Phase Study
DSD	Department of State Development
DWER	Department of Water and Environmental Regulations
EFA	Ecosystem Functional Analysis
EPA	Environmental Protection Authority
FIFO	Fly-in Fly-out
FoS	Factor of Safety
FY	Fiscal Year
GIS	Graphic Information System
ha	Hectares
IBRA	Interim Biogeographic Regionalisation for Australia
ICA	Independent Closure Auditor
IFD	Intensity-Frequency-Duration
IPS	Identification Phase Study
LGA	Local Government Area
LoA	Life of Asset
MCP	Mine Closure Plan
m	Metres
m^3	Cubic Metres

Abbreviation	Meaning
mm	Milometres
mg/kg	Milligrams per kilogram
MRF	Mining Rehabilitation Fund
MKS	Mt Keith Satellite
Mt	Million Tonnes
Mtpa	Million Tonnes per Annum
NAF	Non Acid Forming
NGO	Non-government organisation
NiW	Nickel West
NKC	Kambalda Concentrator
NKS	Kalgoorlie Smelter
NKW	Kwinana Refinery
NLN	Leinster
NMK	Mt. Keith
NOI	Notice of Intent
NRM	Natural Resource Management
OEPA	Office of Environmental Protection Authority
PAF	Potentially Acid Forming
PEC	Priority Ecological Communities
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PSEIA	Preliminary Social and Economic Impact Assessment
PWA	Planar Wedge Analysis
QA/QC	Quality Assurance/Quality Control
RA	Risk Assessment
RAA	Group Risk Assessment and Assurance
ROM	Run-of-Mine
SMART	Simple, Measurable, Achievable, Realistic and Timely
SPS	Selection Phase Study
SRCE	Standard Reclamation Cost Estimator
TEC	Threatened Ecological Communities
TransAlta	TransAlta Energy Corporation Pty Ltd
TSF	Tailings Storage Facility
UCL	Unallocated Crown Land
µS/cm	Micro Siemens Per Centimetre
WA	Western Australia
WMC	Western Mining Corporation Resources Ltd
WRL	Waste Rock Landform
YNP	Yakabindie Nickel Project
ZoI	Zone of Instability

APPENDICES

Appendix A: MKS Project Closure Obligations and Commitments Register

Appendix B: External Stakeholder Meetings Register (2015 to 2017)

Appendix C: MKS Project Closure Risk Register

APPENDIX A – MKS PROJECT CLOSURE OBLIGATIONS AND COMMITMENTS REGISTER

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CLOSURE OBLIGATIONS

Source	Obligation	Relevant section of the MCP
DMIRS TENEMENT CONDITIONS		
M36/422, M36/399, M36/288, M36/286, M36/285, M36/246, M36/185, M36/184, M36/183, M36/677, M36/658, M53/217, M53/218	All surface holes drilled for the purpose of exploration are to be capped, filled or otherwise made safe immediately after completion.	Refer to Section 9 of the MCP
M36/288, M36/185, M36/184 M53/217	At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the State Mining Engineer.	Refer to Section 9 of the MCP
M36/288, M36/185, M36/184 M36/183 M53/217 M53/218	At the completion of operations, or progressively where possible, all access roads and other disturbed areas being covered with topsoil, deep ripped and revegetated with local native grasses, shrubs and trees to the satisfaction of the State Mining Engineer.	Refer to Section 9 of the MCP
M36/183 M53/217	At the time of decommissioning of the tailings facility and prior to rehabilitation, a further review by a geotechnical/engineering specialist will be required to be submitted to the State Mining Engineer. This report should review the status of the structure and its contained tailings, examine and address the implications of the physical and chemical characteristics of the materials, and present and address the results of all environmental monitoring. The rehabilitation stabilisation works proposed and any on-going remedial requirements should also be addressed.	NA
L36/206	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	Refer to Section 9 of the MCP

Source	Obligation	Relevant section of the MCP
DMIRS TENEMENT CONDITIONS		
	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.	
M53/218	On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or an alternative agreed outcome to the satisfaction of an Environmental Officer, DMIRS.	Refer to Section 9 of the MCP

APPENDIX B –STAKEHOLDER FEEDBACK REGISTER (2015 - 2017)

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MKS Project specific engagement

Date	Document	Department	Stakeholder Comments / Issues	NiW Response
October 2017	Feedback from the EPA regarding the MKS Project Environmental Scoping Document	DBCA	Flora and vegetation in relation to rehabilitation and closure – Address potential indirect impacts persisting after mining has finished (e.g. pit lakes).	See Section 8
			Backfilling of pits to above the groundwater level to be considered to reduce the attraction of native fauna which may be harmed in accessing and / or contact with pit lake water or by attracting fauna or stock which may harm surrounding flora and vegetation, or predators which may prey on native fauna.	See Section 8 and section 9.2.2
			Prepare a Mine Closure Plan consistent with the *Guidelines for Preparing Mine Closure Plans* (DMP and EPA, 2015) which addresses the development of completion criteria to maintain the quality of groundwater and surface water, and management or removal of artificial sources (i.e. pit lakes), so that environmental values are maintained post closure.	Complete
			Changes to existing access to the reserve and amenity for members of the community and traditional owners visiting the nature reserve during construction, operation and closure should be confirmed and addressed in the ERD.	See Section 4
October 2017	EPA Scoping document	EPA	Prepare a Mine Closure Plan consistent with Guidelines for Preparing Mine Closure Plans (DMP and EPA, 2015), which includes methodologies and criteria to ensure progressive rehabilitation of disturbed areas to a final agreed land use.	Complete
			Model the impact of different flooding scenarios during operations and post-closure on infrastructure and final landforms.	See Section 7.1.2.4 and Section 7.1.2.5
			Provide a description of monitoring, management, closure and rehabilitation arrangements and attach a management plan.	See Section 10
			Contamination of groundwater as a result of mixing with water formed in a pit lake after closure.	See Section 7.1.2.5

Engagement conducted with DPLH during IPS

Date	Meeting Purpose	Attendees	Stakeholder Comments / Issues	NiW Response
15/11/2016 DPLH offices Perth DPLH Update #1	Introductory meeting for NiW to provide an overview to the DPLH on the IPS works program. Seek DPLH feedback on grazing and / or other pastoral activities as a viable post-mining land use at mine sites in the Northern Goldfields.	DPLH NiW	1. In general, the DPLH raised no issues with the proposed IPS work plan and expressed appreciation for the update. 2. DPLH said that a grazing or other pastoral post-mining land use would not be the most viable and beneficial in these marginal grazing conditions, and with the investment not justified for the additional head of cattle. Consistent with the feedback received from the NiW Pastoral Sub-Lessee on 09/11/16, the DPLH was keen to see alternative measures considered to improve cattle stocking rates and general land capability within the wider pastoral leases to more substantially and sustainable increase the benefits to local pastoralism. 3. DPLH requested a presentation of the results from the contaminated sites investigations conducted as part of the IPS.	1. Noted. 2. Noted. This feedback was considered along with other stakeholder and technical inputs in the evaluations and selections of feasible post-mining land uses (**Section 5.1**) and pastoral improvement initiatives. 3. Completed. NiW presented to the DPLH on mine contaminated sites investigation results from IPS on 06/01/2017.
06/01/2016 DPLH offices Perth	Present the mine contaminated sites results from Stage 2 investigations and the shortlisted closure options under consideration	DPLH NiW	1. DPLH acknowledged the comprehensiveness of the work completed to date. DPLH recognised that the focus of the presentation today was non-pastoral-related and so mainly for information only for DPLH (as was requested).	1. Noted.

Date	Meeting Purpose	Attendees	Stakeholder Comments / Issues	NiW Response
DPLH Update #2				
15/02/2017 DPLH offices Perth DPLH Update #3	Seek DPLH feedback on the draft scope of the pastoral land use and opportunity assessment.	DPLH NiW	1. The DPLH noted the scope as reasonable and did not identify any additional items they would want considered. DPLH said they would be keen to see the results to discuss what they would support in the MCPs.	1. Noted. NiW to proceed to plan on this basis. Follow up meetings were held on 31/03/2017 and 03/05/2017 to present the assessment results and implications for the MCPs.
31/03/2017 DPLH offices Perth DPLH Update #4	Update the DPLH on progress in the land use assessment	DPLH NiW	1. DPLH reconfirmed their previous feedback that pastoral/grazing is not a preferred land use by them for heavily impacted mining areas (e.g. TSFs, WRLs, voids) that have been rehabilitated in this region of the Goldfields. The DPLH were keen to see alternative approaches considered to increase overall gains to local pastoralism and to discuss the pending results from the pastoral opportunity assessment. NiW is to present these results at the next meeting. DPLH asked that NiW articulate the pros / cons in pastoral terms for any options presented.	1. Noted. Pastoral improvement options were presented at the next meeting held with the DPLH (03/05/2017), with the pros / cons, and nett gain, offered by each option discussed.
03/05/2017 DPLH offices Perth DPLH Update #5	Present findings from the land use and pastoral opportunity assessment. Obtain DPLH feedback on the selected pastoral improvement option recommended for adoption in the MCPs.	DPLH NiW	1. The DPLH agreed with the findings from the land use assessment. 2. DPLH indicated that the selected alternative was not 'gold plating' but appropriate for the circumstances. The DPLH said that by adopting the selected alternative, stocking rates in the pastoral leases could increase from the current ~1,500 head of cattle to ~2,000. 3. DPLH asked who will bear the cost of maintaining post-relinquishment the new infrastructure (bores, fencing) associated with the selected alternative. NiW confirmed that 'low maintenance costs' formed part of the criteria to evaluate different options. NiW said it estimated the maintenance costs for infrastructure proposed for the selected option would be in the order of $10K / annum and therefore low and sustainable compared with the benefits from the material increase in stocking rates in the pastoral leases. 4. The DPLH asked that NiW also consider adding 1) stock fencing for the TSFs, WRLs and final void; 2) investigate restoring areas within the pastoral leases degraded by pre-mining land uses; and 3) developing a Rangeland Management Plan for the pastoral leases (that may incorporate the land restoration measures from 2) and create pastoral and conservation Win/Win outcomes).	1. Noted. 2. Noted. 3. Completed. The selected alternative was expanded to incorporate these additional measures.
23/05/2017 NMK Mine-Site DPLH Update #6	At the request of the DPLH, NiW hosted a site visit at NMK by the Office of the Auditor General (OAG) and the DPLH to present its approach to the assessment of pastoral interests in closure planning, including its engagement approach with the DPLH to create a clearer path to relinquishment of residual liabilities post-closure.	DPLH OAG NiW	1. DPLH and OAG were both complimentary of NiW's forward planning and assessment rigour in the IPS. The DPLH and OAG also complimented NiW on its engagement approach, and for engaging early with the DPLH as a key stakeholder (as both a key advisor on pastoral matters and as the likely benefactor of the closed sites).	1. Noted.

APPENDIX C – MKS PROJECT CLOSURE RISK REGISTER

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Domain	Risk Issue	Causes	Risk Analysis - Consequences and Likelihood (NOTE: Analysis assumes no risk controls applied)	Uncontrolled (Inherent) Risk Score	Risk Controls	Controlled (Residual) Risk Score
Landforms	Landform failure causing instability and discharge of sediment-laden run-off and/or dust impacting the surrounding environment and land use	• Water or wind erosion • Slope failure • Erodible WRL surface materials • Weathering of hard rock material • Poor slope design, and / or construction • Failed drainage structures • Earthquake/s or extreme rainfall event/s	Consequences • Unstable WRL final landform. • May result in exposure of non-competent or PAF materials. • Dust containing metals and/or asbestos containing materials could be generated. • Unacceptable rate of sediment movement beyond assimilative capacity of the surrounding areas. • Impacts to native vegetation and surface water quality in the locale may occur impacting local environmental values and pastoral land use. • Significant repair and maintenance costs. • Failure to achieve the target post-mining land use. • Potential delays in achieving tenement and land relinquishment. • These impacts are likely to result in a negative community perception of closure outcomes and potential non-compliance/s with legal obligations. Likelihood • Likely - Could easily be incurred and has generally occurred in similar projects. Benchmarking results support this.	**HIGH**	• Final WRL landform to have a 300-year design life. • WRL slopes designed to achieve a geotechnical stability FoS >1.3 under static conditions. • Batter and berm configuration of 20 m high lifts and 20 m wide berms, or alternate optimal batter-berm slope design configurations (e.g. 10 m wide berms and 10 m high lifts, or 30 m wide berms and 20 m high lifts, etc.) that achieve BoD criteria including being designed to control critical duration 1:1,000 year ARI rainfall event. • Reprofiling to a nominal 18°, and no greater than 20°. • Up to 1.5 m of durable rock armour is applied to all low stability material and PAF exposures on slopes. • All slopes will be covered with up to 0.2 m of growth medium, ripped on contour and revegetated, increasing the uptake of rainfall run-off. • WRL top surface will be water-retaining to manage rainfall from a critical duration PMP rainfall event. • Crest bunds will feature on benches and top surfaces. • Flat surfaces (benches and top) will be back sloped, designed to minimise overtopping risk. • Toe drains will be installed around perimeter of WRLs. • Funding provision for repair and maintenance in rehabilitation areas • **Section 9.2.1** includes further details of the risk control features associated with the selected alternative for the WRLs.	**LOW**
Landforms	Seepage of elevated solutes impacting sensitive groundwater receptors	• Mineral weathering and infiltration of incidental rainfall	Consequences • Metals could leach and impact groundwater quality beneath the site. • Likelihood • Possible - Could be incurred, and has occurred in a minority of similar studies or projects. Benchmarking results support that "Likelihood" should be rated either "Possible" or "Unlikely" (would be rare to occur) in lieu of the inherent groundwater conditions.	**LOW**	• Relatively low volumes of waste rock with the potential to generate acid and metalliferous drainage will be produced during mining from the MKS Project. • Mined waste rock with the potential to generate acid and metalliferous drainage will be effectively encapsulated within the WRL beyond the reach of the average seasonal wetting front – to minimize seepage risk. • Vegetated cover will enhance evapotranspiration. • Up to 1.5 m rock armouring place on exposed surfaces. • Vegetated cover will enhance evapotranspiration. • Review opportunities to process Low Grade Stockpiles prior to closure. • **Section 9.2.1** includes further details of the risk control features associated with the selected alternative for the WRLs.	**LOW**
Open Pit	WRL slope failure due to pit wall failure	• Landform toe (before or after reprofiling) overlaps with the pit ZoI • Failed drainage controls • Inflow of water into the pit resulting in an	Consequence • Uncontrolled landform slope failure and mass erosion. • Potential exposure of low competency materials and resultant erosional stability risks. • Significant repair and maintenance costs. • Failure to achieve the target post-mining land use. • Potential delays in achieving tenement and land relinquishment.	**MEDIUM**	• Removal of WRL material inside the ZoI boundary (including allowances) • Implement drainage controls to divert run-off from the WRLs away from the pit crest, and upstream run-off around the pit footprint. • Reprofiling to a nominal 18°, and no greater than 20°. • Up to 1.5 m of durable rock armour is applied to all low stability material and PAF exposures on slopes.	**LOW**

Domain	Risk Issue	Causes	Risk Analysis - Consequences and Likelihood (NOTE: Analysis assumes no risk controls applied)	Uncontrolled (Inherent) Risk Score	Risk Controls	Controlled (Residual) Risk Score
		increase in pore pressure • Regional seismicity	Likelihood • Possible - Could be incurred, and has occurred in a minority of similar studies or projects.		• All slopes will be covered with up to 0.2 m of growth medium, ripped on contour and revegetated, increasing the uptake of rainfall run-off. • WRL top surface will be water-retaining to manage rainfall from a critical duration PMP rainfall event. • Crest bunds will feature on benches and top surfaces. • Flat surfaces (benches and top) will be back sloped, designed to minimise overtopping risk. • Toe drains will be installed around perimeter of WRLs. • Funding provision for repair and maintenance in rehabilitation areas • **Section 9.2.2** includes further details of the risk control features associated with the selected alternative for the Open Pit.	
Open Pit	Pit lake water quality impacting sensitive environmental receptors and stock	• Poor quality water of post-mining pit lake due to geochemistry of pit walls, evapo-concentration and seepage with elevated solutes or run-off. • Stock or native wildlife drinking from pit lake • Pit lake filling and overtopping, discharging to surrounding areas and / or draining to / recharging the water table. • Higher than baseline water level in the backfilled Six Mile Well Open pit resulting in recharge to the surrounding environment.	Consequence • Potential toxicity to stock and native wildlife (mammals, birds) through ingestion and direct contact with pit lake water. • Bio-magnification of aquatic ecosystem food chain within pit lake. • Potential discharge of pit lake water to surrounding environment causing erosion and contamination of drainage lines, impacting ecological receptors and land use. Likelihood • Unlikely – Known to happen, but only rarely. Studies undertaken during the IPS indicated that once the pit lake water becomes hypersaline, fauna will not drink the water. The inherent depth of the void and its predicted function as a sink post-closure for groundwater, and the predicted low lake level due inherently reduce (in the absence of controls) risk.	**LOW**	• Construct abandonment bund and perimeter stock fencing around final void. • Construct bund across top of pit access ramps as another line of defence to deter stock (cattle) access to the pit lake. • Divert surface water away from pit to enable the pit lake to become hypersaline earlier whilst also reducing stability (erosion) risks. • Ensure stock bores in pastoral land surrounding the final void are not adversely impacted by closure activities and therefore are able to provide sufficient available water for stock (to minimise need for cattle to pursue alternate water in-pit). • **Section 9.2.2** includes further details of the risk control features associated with the selected alternative for the Open Pit. .	**LOW**

Domain	Risk Issue	Causes	Risk Analysis - Consequences and Likelihood (NOTE: Analysis assumes no risk controls applied)	Uncontrolled (Inherent) Risk Score	Risk Controls	Controlled (Residual) Risk Score

Open Pit	Failure of site drainage network causing uncontrolled surface water flows	• High intensity storm events (based on flow velocity and rate)
		• Bund and drainage network criteria not designed for closure (current design for 1 in 100 years suitable for operational phase only)
		• Excessive sedimentation which fills up behind bund reducing capacity
			Consequence
			• Erosion of numerous landform features including:
			  • Toe of landforms - resulting in landform instability and release of material.
			  • Pit walls - potentially increasing instability and subsequent impacts on the WRLs.
			• Reduced downstream surface water flow to environment and pastoral receptors resulting in potential impact to surrounding land use and vegetation within the broader landscape.
			• Vegetation impacts across the broader landscape from sedimentation and elevated solutes.
			• Surface water may ultimately drain to the final void impacting stability.
			• Fill and overtopping of voids may result in release of saline and elevated solute water to the surrounding environment impacting land use and vegetation in surrounding areas.
			Likelihood
			• Likely - Could easily be incurred and has generally occurred in similar studies or projects. Benchmarking results support this.
				MEDIUM	• Design and construct surface water management features to achieve BoD criteria.
					• Drainage network designed to ensure that run-off, where feasible / safe to do so, is conveyed away from the open pits.
					• WRL embankments to be armoured with up to 1.5 m of waste rock.
					• Implement QA procedures during design and construction to ensure integrity of work done and its suitability for closure.
					• **Section 9.2.2** includes further details of the risk control features associated with the selected alternative for the Open Pit.
						LOW

Non-Process Infrastructure	Contaminated soil and groundwater impacting sensitive environmental receptors and land use	• Wind erosion and dust from ore stockpiles. • Erosion and exposure of any cover over buried hazardous materials	Consequences • Contamination of surface water runoff and off-site migration. • Dust containing metals and/or asbestos containing materials could be generated. • Potential impacts to stock through incidental ingestion of contaminated surface soil / dust during grazing. Likelihood • Possible - Could be incurred, and has occurred in a minority of similar studies or projects. Benchmarking results support that "Likelihood" should be rated either "Possible" or "Unlikely" (would be rare to occur) in lieu of the inherent groundwater conditions.	**LOW**	• Targeted excavation of contaminated soil up to 0.5 m bgl to remove surface contamination, reducing leachate risk, prevent direct contact with persons and fauna and mitigating contaminated surface water run-off and dust issues. • Excavated areas will be backfilled with inert waste rock / caprock preventing the potential for contact with any underlying residual metals, etc in soils below the excavation depth. • Excavated (contaminated) soil and spill and other hazardous residues from plant and equipment will be disposed of (and buried) within approved designated areas (e.g. NMK TSFs). • As a control for any residual risk, the target post-mining land use in Processing Infrastructure areas is non-pastoral (**Section 9.2.3**) and so cattle grazing will be generally discouraged, particularly in any formerly contaminated areas. • **Section 9.2.3** includes further details of the risk control features associated with the selected alternatives for the Non-Process Infrastructure domains.	**LOW**
All Domains	Safety incident to third party from accessing the site post-closure	• Unrestricted access to site (nil or failed fencing) • Absent or poor signage warning of safety hazards • Infrastructure remaining post-closure	Consequences • Significant injury or fatality to persons who access the site. • A serious incident is likely to result in a negative community perception. Likelihood	**MEDIUM**	• Access to open pits will be controlled by installing an abandonment bund and perimeter fencing around final voids and other heavily altered mining landforms (e.g. WRLs). • Former access roads to site will be rehabilitated to discourage their continued use. • Signage alerting people to the dangers and prohibiting unauthorised access will be installed around site.	**LOW**

Domain	Risk Issue	Causes	Risk Analysis - Consequences and Likelihood (NOTE: Analysis assumes no risk controls applied)	Uncontrolled (Inherent) Risk Score	Risk Controls	Controlled (Residual) Risk Score
		is left in an unsafe condition • Hazardous materials are left on site post-closure • Incompatible post-mining land use exposing persons (and stock) to unsafe conditions	• Unlikely - Known to happen, but only rarely. Benchmarking results support this, as incidents to third parties post-closure are known to have occurred in similar situations.		• All above ground and below ground infrastructure (up to 0.5 m depth) will be removed, except where it is preferred they be retained by the third party who will inherit the land post-closure. • Fill any redundant surface water ponds. • Remove, and dispose of in designated areas (e.g. TSFs), all hazardous chemicals / materials. • **Section 9.2.2** includes further details of the proposed safety risk controls associated with the selected alternatives for the Open Pits.	
All Domains	Relinquishment of tenements and residual liabilities not achieved and / or within a reasonable timeframe post-closure	• Closure objectives and performance criteria not met • Closure objectives and performance criteria unrealistic, unfit for site conditions, too complex or too difficult to measure • Closure funds are exhausted when further works are still required • Late stakeholder engagement, particularly of likely party/parties to inherit land post-closure leads to unsatisfactory outcomes for future owner • Lack of early regulatory approval (and proponent and regulator adherence to thereafter) of a clearly defined and feasible path to relinquishment • Delays in regulator review or decision-making, or assessment process stalls with no feasible end • Continually changing regulatory / other stakeholder expectations during long closure planning terms • Lack of many and comparable good precedents in WA to	Consequences • Relinquishment delayed beyond reasonable time (~10 years post-execution of all closure works), or never realised at all. • Erosion of confidence in and therefore commitment to the relinquishment process, from a lack of process certainty, reducing the will and appetite of all parties to invest in it. • Excessive, protracted post-execution costs rendering relinquishment unviable. • The potential for future, productive use of the land may be stifled or delayed. • Prolonged delays may result in a negative community perception of mine closure. Likelihood • Likely - Could easily be incurred and has generally occurred in similar studies or projects. Benchmarking results support this, with a lack of comparable precedents in WA.	**HIGH**	• Setting of credible, achievable land uses and performance criteria which are fit for site conditions (and constraints). • Performance criteria with focus on landform fundamentals (e.g. surface materials, slope stability, drainage controls), recognising with these met that other features (vegetation, fauna) can be reliably expected to increase with time (and without detailed or prolonged measurement), but the same could not be expected vice versa. • Appointment of an ICA of suitable qualifications and experience to review the integrity of work completed throughout closure planning and delivery. • This MCP, and its approval by DMIRS, providing the basis for achieving relinquishment, if met. • Active engagement with regulatory authorities during the IPS to consider their feedback in the MCP. Authorities engaged included the DMIRS and DPLH, noting the DPLH was primarily engaged as the State agency most likely to inherit the management of post-mining lands at relinquishment. • Field trials proposed nearby at NMK on WRLs will confirm the effectiveness of proposed treatments reducing uncertainty in delivering at closure. • Provision in the closure cost estimate for funding limited post-execution works and a final relinquishment payment (as funds for an agreed period to provide for continued land management). • **Sections 5 and 6** include further details of the assessment and risk control features relating to relinquishment of tenements and residual liabilities.	**MEDIUM**

Domain	Risk Issue	Causes	Risk Analysis - Consequences and Likelihood (NOTE: Analysis assumes no risk controls applied)	Uncontrolled (Inherent) Risk Score	Risk Controls	Controlled (Residual) Risk Score
		benchmark against and provide process certainty				
All Domains	Rehabilitated / closed mining areas adversely impact neighbouring areas of environmental sensitivity (adjacent Nature Reserve, the PEC, and significant flora)	• Weeds from rehabilitated/closed mining areas migrate to adjacent environmentally sensitive areas including the PEC and significant flora • Surface water and sediment run-off from rehabilitated/closed mining areas adversely impacts the adjacent environmentally sensitive areas	Consequences • Loss or reduction (in plant cover and species richness) of PEC and significant flora. • Closure performance criteria not achieved. • Target land uses not realised. • Potential delays in achieving tenement and land relinquishment. Likelihood • Likely - Could easily be incurred and has generally occurred in similar studies or projects.	**LOW**	• Regular weed inspections (**Section 10**) • Weed management and control at closure, as needed (**Section 10**). • Development of SMART completion criteria prior to closure which considers weed management and rehabilitation within a PEC. • Implement rigorous QA throughout the closure design and execution phases, including coverage of revegetation, with progressive review tollgates by regulatory authorities before proceeding from design to construction to post-execution (**Section 6.2**). • Implement pre-closure trials and studies to demonstrate proof of concept for key areas of technical or financial risk/s, including revegetation performance in local conditions, to increase the likelihood of success in closure execution (**Section 9.2**). • Appointment of an ICA of suitable qualifications and experience (acceptable to authorities) to review the integrity of work completed, including revegetation planning and execution, throughout closure planning and delivery (**Section 6.2**). • An allocation has been made in the closure cost estimate (**Section 11**) for some revegetation maintenance of rehabilitation areas post-closure. • **Section 9.2** includes further details of the revegetation risk control features associated with the selected alternatives for key domains.	**LOW**
All Domains	Land use and revegetation targets for rehabilitation areas are not achieved	• Revegetation does not establish or fails to persist from lack of rainfall, drought/s or other natural causes • Poor seed quality, unsuitable growth medium or insufficient capillary break to hostile substrate • Unrealistic target post-mining land uses • Unrealistic or inappropriate revegetation performance criteria	Consequences • Sparse or partial revegetation outcomes. • Closure performance criteria not achieved. • Target land uses not realised. • Potential delays in achieving tenement and land relinquishment. Likelihood • Likely - Could easily be incurred and has generally occurred in similar studies or projects. Benchmarking results support this, and the need for realistic post-mining land uses and closure performance criteria for post-mining landforms.	**MEDIUM**	• Application of up to 0.2 m of growth media (topsoil and/or caprock) in rehabilitation areas (assuming adequate, suitable growth medium resources). Ripping and sowing with native seed and fertiliser mix, and sowing in preferred seasons. • Setting realistic post-mining land uses and reliable, meaningful and achievable performance criteria that recognise the limitations of the local conditions (**Section 6.2**). • Implement rigorous QA throughout the closure design and execution phases, including coverage of revegetation, with progressive review tollgates by regulatory authorities before proceeding from design to construction to post-execution (**Section 6.2**). • Implement pre-closure trials and studies to demonstrate proof of concept for key areas of technical or financial risk/s, including revegetation performance in local conditions, to increase the likelihood of success in closure execution (**Section 9.2**). • Appointment of an ICA of suitable qualifications and experience (acceptable to authorities) to review the integrity of work completed, including revegetation planning and execution, throughout closure planning and delivery (**Section 6.2**).	**LOW**

Domain	Risk Issue	Causes	Risk Analysis - Consequences and Likelihood (NOTE: Analysis assumes no risk controls applied)	Uncontrolled (Inherent) Risk Score	Risk Controls	Controlled (Residual) Risk Score
					• An allocation has been made in the closure cost estimate (**Section 11**) for some revegetation maintenance of rehabilitation areas post-closure. • **Section 9.2** includes further details of the revegetation risk control features associated with the selected alternatives for key domains.	
All Domains	Loss of revenue to Local and State Government and end of in-kind support to local community organisations resulting in a loss or disruption of services and amenities in the local community	• Loss of payment of rates to the Shire of Wiluna • Loss of royalty payments to State government • Less local employment opportunities from end of MKS mining • Loss of in-kind support to the regional community	Consequences • Reduction in Shire of Wiluna income. • Reduction in income for the State government • Level of services available from Shire to the local community decreases. • These impacts may result in a negative community perception. Likelihood • Likely - Could easily be incurred and has generally occurred in similar studies or projects. Benchmarking results support this.	**MEDIUM**	• Stakeholder engagement with State Government and Shire Councils to continue throughout the closure planning process to provide sufficient notice of the actual closure date, to ensure an orderly transition for any impacted services and amenities. • Implement programs, as appropriate, to minimise any potential for adverse disruption to impacted services and amenities. • During mining operations, reduce the reliance of local communities on NiW contributions by assessing their autonomy and resilience in the event of sudden or planned funding end.	**LOW**
All Domains	Loss of revenue to NiW contractors, suppliers and local businesses	• MKS closure results in a loss of business from NiW to third parties.	Consequences • Adverse impacts to contractors and suppliers. • These impacts may result in a negative community perception. Likelihood • Unlikely - Known to happen, but only rarely, as closure is an anticipated part of mining for these third parties. Limited dependence now of local businesses on NiW northern operations.	**LOW**	• Stakeholder engagement to continue throughout the closure planning process to provide sufficient notice of the actual closure date, to ensure an orderly transition for impacted contractors, suppliers and local businesses.	**LOW**