McArthur River Mine

LONG-TERM TAILINGS MANAGEMENT PLAN

EPBC Act Approval 2014/7210
and VOA 0059
McArthur River Mining Pty Ltd

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1. Introduction

The McArthur River Mine (the Mine) is an open pit zinc, lead and silver mining operation in the Northern Territory (NT) located approximately 700 kilometres (km) south-east of Darwin, and approximately 45 km south-west of the township of Borroloola (Figure 1).

In addition to mining activities, the operations include an on-site concentrator and processing plant, and barge loading and shipping activities at the Bing Bong Loading Facility (BBLF) located in the Gulf of Carpentaria approximately 95 km north-northeast of the Mine (Figure 1).

McArthur River Mining Pty Ltd (MRM) is the operator of the Mine and is a wholly-owned subsidiary of Glencore. MRM is the world's largest producer of zinc in bulk concentrate form.

MRM operates the Mine in accordance with the requirements of its various environmental approval documents, including:

- Variation of Authorisation (VOA) 0059 (issued under the Northern Territory *Mining Management Act 2001* [MM Act]);
- EPBC Act Approval 2014/7210 (issued under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* [EPBC Act]);
- EPBC Act Approval 2003/954; and
- Waste Discharge Licence (WDL) 174.

The Mine's on-site mining and processing activities are conducted within Mineral Lease Northern (MLN) 1121, MLN 1122, MLN 1123, MLN 1124 and MLN 1125 (Figures 1 and 2).

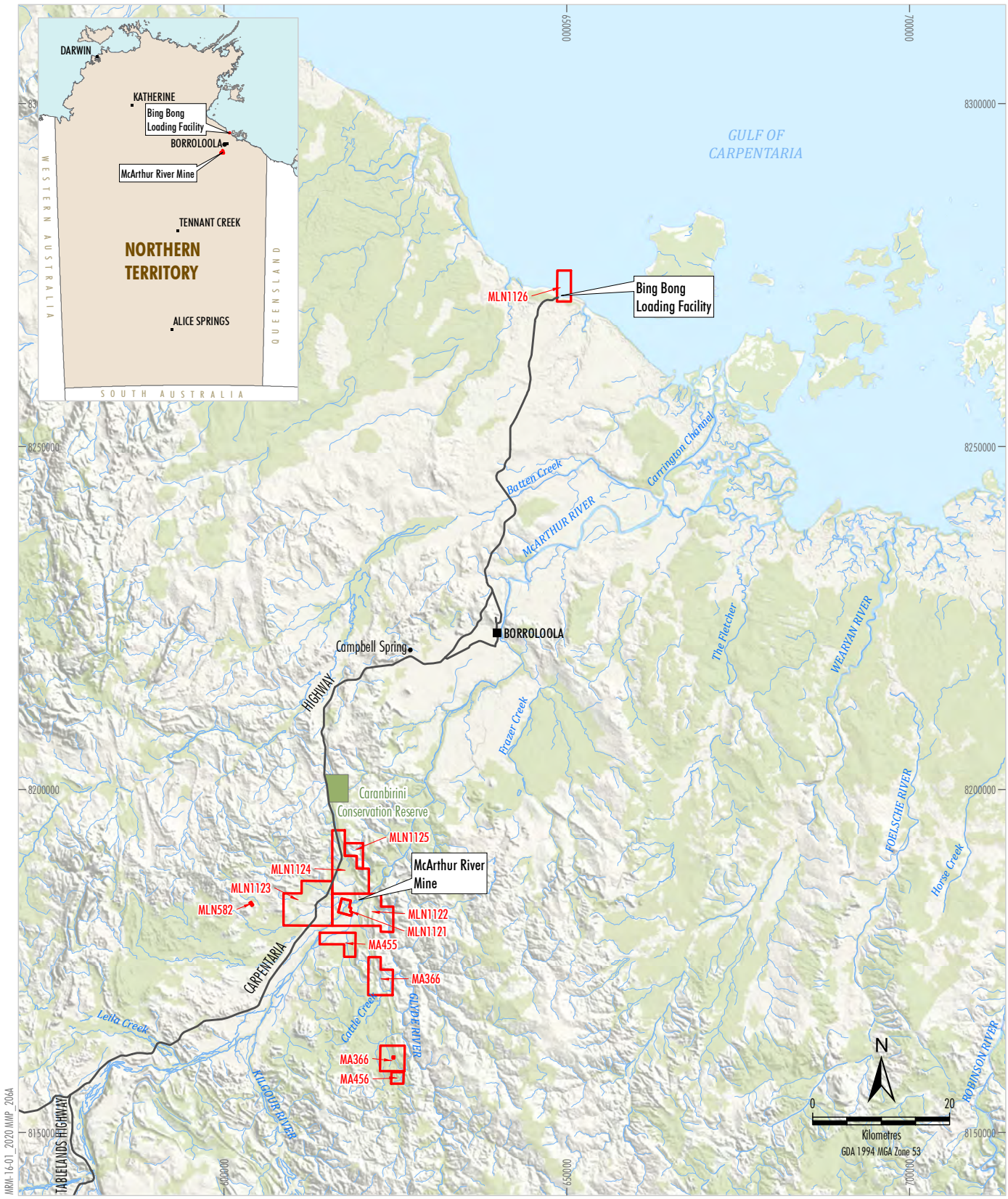
A summary of MRM's approval history is provided in Section 1.1 below.

1.1 Approval History Summary

The Mine is currently a major open pit mining operation, however the Mine was initially developed as an underground mining operation in 1994.

Until 2006, the Mine was an underground operation producing approximately 333,000 dry metric tonnes per annum (dmtpa) of bulk lead-zinc-silver concentrate for overseas and domestic markets. The Mine was converted to an open pit operation following the completion of the 2005 Environmental Impact Assessment process for the Phase 2 Project and issue of EPBC Act Approval 2003/954 on 20 February 2009.

In 2012, MRM submitted to the Northern Territory (NT) Government, the *McArthur River Mine Phase 3 Development Project Draft Environmental Impact Statement* (Phase 3 EIS). In 2013, the NT Government approved the MRM Phase 3 Development Project (Phase 3 Project). The Phase 3 Project extended the life of the Mine by nine years to 2036, increased ore production from 2.5 million tonnes per annum (Mtpa) to 5.5 Mtpa, improved the ore processing facilities to increase concentrate output from 360,000 dmtpa to 800,000 dmtpa and involved improvement, expansion and upgrades of existing infrastructure.



LEGEND

- Mineral Lease/Exploration
- Major Road
- River/Creek

Source: Geoscience Australia - Topography (2006); Department of Environment and Natural Resources (2016)

McARTHUR RIVER MINE

Regional Locality

Figure 1

MRM-16-01_2020 MMP_207A

LEGEND

Mineral Lease

Source: Orthophoto MRM (2018); Department of Environment and Natural Resources (2016)

McARTHUR RIVER MINE

Mine Site

Figure 2

In late 2013, MRM lodged the 2013-2015 Mining Management Plan (2013-2015 MMP) with the NT Government under *the Mining Management Act 2001*. The 2013-2015 MMP incorporated amendments to the classification of overburden and resultant modifications to overburden emplacement design, particularly the North Overburden Emplacement Facility (NOEF).

The amendments presented in the 2013-2015 MMP were referred to the NT Environment Protection Authority (NT EPA) in March 2014, under the NT *Environmental Assessment Act 1982* (NT EA Act). The NT EPA determined that the amendments were significantly different from those approved under Phase 3 and that an assessment of the modifications under the NT EA Act via an Environmental Impact Statement was required.

Subsequently, MRM submitted the *McArthur River Mine Overburden Management Project Draft Environmental Impact Statement* (Draft OMP EIS) in early 2017. The subsequent *McArthur River Mine Overburden Management Project Supplementary Environmental Impact Statement* (Supplementary OMP EIS) was then submitted in early 2018. In July 2018, the NT EPA completed its assessment of the OMP EIS (Draft and Supplementary) and issued *Assessment Report 86 for the McArthur River Mine Overburden Management Project* (Assessment Report 86), recommending the OMP for approval.

The NT EPA's Assessment Report 86 included 30 recommendations, which were then conditioned by the then NT Department of Primary Industry and Resources (DPIR) (now Department of Industry, Tourism and Trade) (DITT) into the Mine's VOA 0059 Approval (dated 15 August 2019) and WDL 174. Since August 2019, VOA 0059 has been varied on two occasions, on 18 June 2021 and 5 May 2022.

Similarly, following consideration of the NT EPA's Assessment Report 86 and the OMP EIS, Federal government approval of the OMP was received from the then Department of the Environment and Energy (now the Department of Climate Change, Energy, the Environment and Water [DCCEEW]) on 12 June 2019, with the issue of EPBC Act Approval 2014/7210. EPBC Act Approval 2014/7210 has since been varied on two occasions, on 18 December 2020 and on 22 April 2022.

The OMP formally commenced on 13 November 2020.

1.2 Purpose and Scope of this LTMP

This Long-term Tailings Management Plan (LTMP) has been prepared to address the requirements of Condition 13 of EPBC Act Approval 2014/7210 and Condition 24 of VOA 0059, and specifically outlines the currently proposed closure strategy for the Mine's Tailings Storage Facility (TSF) and Open Pit following the cessation of mining activities. This Plan also provides a Forward Works Program to further progress long-term tailings management planning.

The requirements of these Conditions are outlined in Attachment A, including a reconciliation table providing where in this Plan each Condition is addressed .

Given the Conditions of EPBC Act Approval 2014/7210 and VOA 0059 were developed in consideration of the recommendations from the NT EPA's Assessment Report 86, there are specific Recommendations and commentary from Assessment Report 86 which are directly relevant to the requirements for this LTMP, and provide context to the scope of this LTMP. Accordingly, Attachment A also details the requirements of Recommendation 12 from Assessment Report 86, and other Recommendations and commentary from the Assessment Report which are of relevance to long-term tailings management and the mine closure strategy for the TSF and the Open Pit.

These Recommendations and commentary from Assessment Report 86 support MRM's preferred closure strategy for the TSF and open pit, which is described in Sections 2.2 and 2.3.

The independent review requirements for this LTMP are outlined in Attachment B.

Considering this Plan has a closure focus and is relevant to the management of tailings in the long-term, to differentiate this Plan from any operationally focussed MRM tailings management plan, this Plan has intentionally been titled 'MRM Long-term Tailings Management Plan'.

1.3 Linkage with MRM Mine Closure Plan

This LTMP reflects proposed closure strategies presented in the OMP EIS and should be considered a preliminary and iterative plan given:

- this LTMP is required to be submitted to DCCEEW and the NT EPA prior to finalisation of MRM's Closure Objectives and prior to finalisation of MRM's Mine Closure Plan (required by Conditions 96 to 98 of VOA 0059 Approval); and
- MRM proposes to progressively plan for the tailings reprocessing phase (and closure) over the next decade to ensure detailed plans and designs are in place prior to the commencement of tailings reprocessing in approximately 2038.

Further details regarding MRM's closure planning and current and future Mine Closure Plan are provided in Section 4. It is anticipated that this LTMP would be reviewed and revised once the MRM Mine Closure Plan has been developed and approved.

Section 6 outlines the triggers for review and revision, if necessary, of this LTMP.

1.4 Relevant Guidelines, Standards and Procedures

This LTMP has been prepared in consideration of DCCEEW's *Environmental Management Plan Guidelines* (Commonwealth of Australia, 2014) (as applicable to the scope of this LTMP).

Other guidelines, standards and policies that are applicable to MRM's TSF and MRM's closure planning process include:

- Glencore Tailings Storage Facility and Dam Management Standard;
- Glencore Tailings Storage Facility Policy;
- Glencore Tailings Storage Facility Framework;
- Global Industry Standard on Tailings Management;
- Glencore Closure Standard (GRP-STD-HSEC-019-v1.0, 2021);
- Glencore Closure Planning Guideline;
- Glencore Zinc Closure Planning Framework; and
- Glencore Zinc Capital Management Framework.

Glencore's comprehensive governance framework, including MRM's Independent Tailings Review Board (ITRB) and Glencore's ITRB, assists to provide a structured system for risk identification, mitigation and management for MRM's TSF and for MRM closure planning.

1.5 Acronyms and Abbreviations

To assist review of this LTMP, the acronyms and abbreviations used throughout this plan are provided Table 1 below.

TABLE 1: ACRONYMS AND ABBREVIATIONS CITED THROUGHOUT THIS LTMP

Assessment Report 86: *Assessment Report 86 for the McArthur River Mine Overburden Management Project* (NT EPA, 2018)	**MCA**: Multi-criteria analysis
BBLF: Bing Bong Loading Facility	**ML**: Mineral Lease
DCCEEW: Commonwealth Department of Climate Change, Energy, the Environment and Water	**MM Act**: Northern Territory *Mining Management Act 2001*
DITT: Department of Industry, Tourism and Trade	**MMP**: Mining Management Plan
DME: Department of Mines and Energy (former)	**MRM**: McArthur River Mining Pty Ltd
dmtpa: dry metric tonnes per annum	**Mtpa**: million tonnes per annum
DPIR: Department of Primary Industry and Resources (former)	**NLC**: Northern Land Counci
EC NT: Environment Centre of the Northern Territory	**NOEF**: Northern Overburden Emplacement Facility
EDO: Environmental Defenders' Office (NT) Inc	**NT**: Northern Territory
EIS: Environmental Impact Statement	**NT EA Act**: Northern Territory *Environmental Assessment Act 1982*
EPBC Act: Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*	**NT EPA**: Northern Territory Environment Protection Authority
GZAA: Glencore Zinc Assets Australia	**OMP**: Overburden Management Project
HSEC: Health, Safety, Environment and Community	**OMP EIS**: *McArthur River Mine Overburden Management Project Draft Environmental Impact Statement (MRM, 2017). McArthur River Mine Overburden Management Project Supplementary Environmental Impact Statement* (MRM, 2018).
ICMM: International Council on Mining and Minerals	**PAF**: potentially acid forming
IM: Independent Monitor appointed by DPIR	**PAF HC**: PAF with high acid production capacity
ITRB: Independent Tailings Review Board	**the Mine**: McArthur River Mine
KCB: Klohn Crippen Berger Pty Ltd	**TOR**: Terms of Reference
km: kilometre	**TSF**: Tailings Storage Facility
LOM: life-of-mine	**VOA**: Variation of Authorisation 0059
m: metre	**WDL**: Waste Discharge Licence

2. Long-term Tailings Management and Closure Strategies Relevant to this LTMP

2.1 Long-term Tailings Management

The strategy for long-term tailings management and closure of the Mine are detailed in MRM Draft OMP EIS and further refined in the MRM Supplementary EIS.

With approval of the OMP under EPBC Act Approval 2014/7210 and VOA 0059, the currently approved project involves the reprocessing of tailings. Residual tailings remaining after reprocessing would then be placed within the open pit, and ultimately submerged under the final void pit lake. Saturation of the tailings material (and other waste material) would reduce reactivity of tailings material, and therefore this strategy would reduce potential environmental risks associated with the OMP, compared with a long-term tailings management strategy involving retention of the TSF as a final landform. As outlined in Attachment A, this strategy is supported by the NT EPA and key stakeholders, including tailings management experts.

In accordance with EPBC Act Approval 2014/7210 Condition 13(a), MRM is approved to, and currently proposes to, proceed with the reprocessing of tailings within 15 years of the end of open pit mining.

The MRM Draft and Supplementary OMP EIS's included 15 assessments, studies and plans relevant to long-term tailings management and the proposed closure strategy for the Mine TSF and final void, including:

Draft OMP EIS:

- a detailed Mine Closure Plan (Appendix S of the Draft OMP EIS), supported by a Conceptual Model for Closure Planning (Appendix E of Draft EIS);
- a comprehensive TSF Life-of-Mine Plan (Appendix I of Draft EIS), including tailings geochemistry analysis;
- a Groundwater Impact Assessment (Appendix T of Draft EIS) including life of mine, closure and post-closure simulations of potential groundwater impacts;
- Surface Water Impact Assessment (Appendix U of Draft EIS) including life of mine, closure and post-closure simulations of potential surface water impacts;
- a Final Void Limnology Assessment (Appendix V of the Draft EIS);
- Tailings Deposition to Final Void Consolidation Modelling and Deposition Concepts (Appendix AC of Draft EIS); and
- an Aquatic Ecology Impact Assessment (including the assessment of impacts under closure scenarios) (Appendix W of Draft EIS).

Supplementary EIS:

- a Final Void Closure Process report (Appendix B of Supplementary EIS);
- a Pit lake closure with strategic riverine connectivity report (Appendix D of Supplementary EIS);
- an Updated TSF Life of Mine Plan (Appendix I of Supplementary EIS);
- an Updated Groundwater Impact Assessment (Appendix L of Supplementary EIS);
- an Updated Mine Pit Lake Modelling report (Appendix M of Supplementary EIS);
- a Revised Final Void Limnology Assessment (Appendix O of the Supplementary EIS);
- a Revised Tailings Consolidation Report (Appendix P of the Supplementary EIS); and
- an Adaptive Management Framework (Appendix R of Supplementary EIS) which details the strategy for proactively managing and mitigating the OMP's environmental risks.

The following sections outline the currently proposed closure strategies for the TSF and Open Pit/Final Void, consistent with that presented in the OMP EIS (Draft and Supplementary). The extensive body of work/studies undertaken for the EIS, listed above, support these strategies.

The Mine Closure Plan, required 5 years prior to closure of the Mine (in approximately 2045), will formalise closure planning. As outlined in Section 4.4, the Mine Closure Plan is required to be prepared in consultation with key stakeholders (including community and regulatory stakeholders), reviewed by relevant independent panels (which include mine closure experts) and is subject to approval by the DITT.

With regard the terminology of 'Open Pit' and 'final void' throughout this Plan. 'Open pit' refers to the landform up until the end of waste material emplacement. 'Final void' refers to the landform once rapid filling with water has commenced.

2.2 TSF Closure Strategy

As outlined in the Draft (and Supplementary) EIS, in general, the current life-of-mine (LOM) plan for the OMP involves:

- rehandling/extraction of tailings from the TSF using a hydraulic mining system at the end of Open Pit mining (in approximately 2038);
- reprocessing of tailings to extract recoverable metals for a period of approximately 10 years;
- disposal of residual tailings (i.e. tailings material remaining after reprocessing) within the Open Pit; and
- rehabilitation of the TSF including decommissioning and removal of the TSF structure.

Reprocessing tailings and rehandling of the tailings to the open pit/final void provides an improved long-term tailings management strategy (compared with retaining tailings in the TSF and the TSF remaining as a final landform) and removes the requirement for long-term maintenance and management of the TSF, and removes the potential environmental risks associated with retaining the TSF.

Hydraulic mining of tailings and placement of tailings back into a pit (for subsequent inundation by the pit lake) is a known technology, and is the preferred strategy for long-term tailings management. Advantages of this strategy include:

- reduced oxidation of tailings during rehandling, thus decreasing potential reactivity of the tailings and potential seepage from the TSF, and lowering potential risk to Surprise Creek;
- as the tailings are to be stored sub-aqueously, dust generation will be greatly reduced as well as the potential for tailings oxidation;
- supernatant water will be recycled from the open pit for hydraulic mining use; and
- additional cover material for the TSF will not need to be sourced as a cover will not be required.

Following the completion of extraction of tailings within the TSF, any residual contaminated material at the base/floor of the TSF and inner embankments is planned to be sampled and analysed to inform remediation requirements (Section 3.2). Embankment deconstruction would be undertaken using dry mining methods.

The rehabilitation objective for the TSF is to create a safe, stable, non-polluting landform generally consistent with pre-mining topography. To achieve this, the TSF embankments are planned to be deconstructed and reshaped to form a gently sloping, water shedding landform with a design that channels surface water towards Surprise Creek and Little Barney Creek. Topsoil would then be applied across the landform at a thickness of approximately 0.1 metre (m).

The proposed final land use of the TSF landform is a cattle grazing area, vegetated with native woodland species and pasture species. Therefore, revegetation would involve reseeding areas of the landform with different seed mixes. Slow release fertiliser and gypsum is also proposed to be used to assist with establishment of vegetation and soil improvement. Water management structures would also form part of the rehabilitated TSF final landform.

MRM's Rehabilitation Management Plan describes proposed rehabilitation strategies for the TSF domain, and all rehabilitation domains, which will be formalised in the Mine Closure Plan (Section 4.4).

Preliminary conceptual plans of the TSF for the hydraulic mining phase and post-closure are included in the Updated TSF Life of Mine Plan (Appendix I1 of the Supplementary EIS).

Groundwater monitoring of groundwater bores surrounding the TSF would also continue to be undertaken to inform the performance of the groundwater regime surrounding the TSF and to validate groundwater modelling predictions for the closure stage as outlined in Supplementary EIS Appendix L *Updated Groundwater Impact Assessment Final Report*. The interception trench between the TSF and Surprise Creek is planned to remain operational, subject to long-term monitoring results.

2.2.1 Tailings Reprocessing Strategies

2.2.1.1 HYDRAULIC MINING METHOD

Hydraulic mining is currently the preferred method for remining of tailings within the TSF for proposed reprocessing.

Hydraulic mining utilises high-pressure water monitors (water canons) to break-up and slurry the tailings in the TSF. The flow of water at high pressure is directed onto the surface of the tailings in a sweeping motion in such a way as to create a ditch on the surface. The slurry would then drain to a sump by gravity via channels carved out by the monitor. From the sump, the slurry would be pumped to the reprocessing plant. The depth of the tailings deposit is anticipated to be approximately 35 m, and would require hydraulic mining in three ±10 m high benches, and potentially a fourth bench to remove any contaminated TSF base/floor material. The tailings would then be initially pumped through a trommel screen to surge tanks located adjacent to the TSF, and then pumped from the surge tanks to the reprocessing plant at a solids content of approximately 55%.

Tailings are anticipated to be extracted at a nominal rate of 35,000 tonnes per day via the hydraulic mining system including up to four hydraulic monitors and two sumps.

The use of hydraulic mining ensures that tailings materials are thoroughly mixed with water throughout the mining and transfer process to the processing plant. Maintaining a high moisture content of the tailings reduces the reactivity of the material. Recycled water, including supernatant water from the open pit, is currently planned to be used for hydraulic mining water demand.

As outlined in Section 5, a tailings management risk assessment is planned to be undertaken as part of a Forward Works Program for this LTMP. A key objective of this risk assessment will be to assess the risks associated with hydraulic mining of the TSF and to identify required risk mitigation measures and controls. The other key objective of the risk assessment will be the identification of current knowledge gaps that will need to be addressed by a study or relevant works program (for example, a tailings reprocessing operational plan and a TSF geotechnical study for the hydraulic mining phase). MRM plans to conduct the tailings management risk assessment in 2025.

2.2.1.2 ALTERNATIVE METHOD

Dredging is an alternative method to hydraulic mining for reprocessing of tailings. Dredging would involve operation of a dredge on the surface of the TSF on a continuous basis. The slurried tailings would be initially pumped through a trommel screen to surge tanks located adjacent to the TSF and then pumped from the surge tanks to the processing plant.

Dredging would however require a pond to be established on the TSF surface with a minimum depth of 1m to enable the dredge to pump slurried tailings. Given the upstream design and construction of the Mine TSF, ponding of water within the TSF presents risks to wall stability and overall dam safety. The ponding of water would also increase seepage to groundwater and may increase seepage potential to Surprise Creek.

Additionally, a dredging operation has been estimated to be significantly less cost efficient comparted with hydraulic mining. Based on the potential dam stability/safety risks and estimated operating cost, this method is not considered a suitable tailings reprocessing method.

Should an alternate tailings reprocessing method to hydraulic mining be assessed as feasible, MRM would review the method in consultation with the MRM ITRB, TSF Panel and Closure Panel and relevant regulatory agencies.

2.2.2 Reprocessed Tailings Disposal Options

The Draft OMP EIS included a TSF LOM assessment detailing long-term tailings management strategy, with an Updated TSF LOM Plan provided in the Supplementary EIS. The initial TSF LOM assessment included a multi-criteria analysis (MCA) of various operational TSF design alternatives and of three TSF closure alternatives.

The MCA included analysis of each 'alternative' against the following criteria:

- environmental performance criteria;
- constructability and maintenance criteria;
- financial cost criteria; and
- societal and stakeholder benefits criteria.

In accordance with the Terms of Reference (TOR) requirements for the OMP, the MCA included the assignment of scores (1-5 and Not Applicable) to compare the alternatives in the context of the following effects:

- short term effects (0-100 years duration), including:
  - local level effects (within the mining lease); and
  - regional level effects (beyond the mining lease); and
- long term effects (100-1,000 years duration), including:
  - local level effects; and
  - regional level effects.

The TSF closure alternatives assessed in the MCA included:

TSF Closure Alternative 1:

Retaining all tailings at the TSF, with subsequent re-profiling of the TSF landform and capping with a benign cover. This alternative was the proposed TSF closure strategy in the Phase 3 EIS. This alternative would involve no reprocessing of tailings.

TSF Closure Alterative 2:

Rehandling/extracting tailings from the TSF and placement into the open pit using a hydraulic mining method, with subsequent re-profiling and rehabilitation of the TSF site. By removing tailings from the land surface, this alternative would eliminate potential long-term risks associated with seepage, settlement, tailings geochemistry and stability. This alternative would involve no reprocessing of tailings.

TSF Closure Alternative 3:

Reprocessing of all tailings in the TSF using a hydraulic mining method, transfer of slurried tailings to processing plant, with residual tailings emplaced within the open pit.

The results of the MCA showed a clear preferable alternative, Alternative 3: reprocessing of tailings then placing the residual tailings back into the open pit.

The key considerations for why 'Alternative 3' prevailed include (MRM, 2018):

- Geochemical characteristics of OMP tailings material:
  - The reactivity of the tailings is highly dependent on moisture content (i.e. saturated tailings have a lower reactivity, while dried tailings have a higher reactivity).
  - Maintaining high in-situ moisture content is key to reducing tailings oxidation rates and risks associated with long-term management of the MRM tailings.
  - Therefore by emplacing tailings in the open pit submerged under water, and removal of the TSF from the Mine final landform, this strategy would:
    - minimise reactivity of the tailings on a permanent basis;
    - the TSF would be completely removed as a potential contaminant source;
    - significantly reduce the potential for seepage of contaminants off-site, and significantly lower the risk of impacts to Surprise Creek;
    - remove the risk of dust generation from the TSF; and
    - no requirement to source additional cover material for the TSF, therefore development of new clay borrow areas would not be required.
- Constructability/mining method considerations:
  - Hydraulic mining and tailings reprocessing are known industry methodologies.
- Financial considerations:
  - Income generated from tailings reprocessing would off-set the costs of the approximate 10 year rehandling period.
- Societal and stakeholder benefit considerations:
  - An additional 10 years of mine life associated with tailings reprocessing phase would provide ongoing employment (albeit minimised workforce).

Review of Other Reprocessed Tailings Disposal Options

Other possible strategies for disposal of residual tailings are outlined in Table 2 below, including reasons why these strategies are not considered to be suitable.

TABLE 2 REVIEW OF OTHER RESIDUAL TAILINGS DISPOSAL OPTIONS

Other Residual Tailings Disposal Strategy	Review
Transferring the residual tailings back to the TSF and rehabilitating the TSF landform	This strategy is not considered suitable due to: • Significant rehandling cost which would minimise overall feasibility of reprocessing tailings. • Although reprocessing of tailings would remove some contaminants from the residual tailings material, the retention of a TSF as a final Mine landform is not approved under the OMP and is not supported by the NT EPA (and other key stakeholders) as outlined in the NT EPA's Assessment Report 86 which provides: *As discussed previously, the most significant measure for the control of long-term, ongoing contamination of groundwater as a result of the tailings domain is considered to be the Proponent's preferred closure strategy, the disposal of tailings in the mine pit void. The IM (2017) indicated that it strongly supports the re-processing and in-pit disposal option proposed in the Draft OMP EIS, which would ensure that the tailings remain inundated in the long term, thereby preventing further sulfide oxidation and providing a much more secure closure outcome than would be achieved for a TSF with a cover system. This view is also supported by Noller (2017), the ITRB, and the EDO, ECNT and NLC.*

TABLE 2 REVIEW OF OTHER RESIDUAL TAILINGS DISPOSAL OPTIONS (CONTINUED)

Other Residual Tailings Disposal Strategy	Review
continued	*In consideration of the PAF(HC) classification and potentially high reactivity of tailings when desiccated, the NT EPA considers that above-ground tailings storage at MRM into the long term constitutes an unacceptably high risk to the McArthur River and its catchment given the risk of structural failure and consequent potential for contamination. The NT EPA is of the view that depositing the tailings in the pit void using appropriate placement methods and a water cover is absolutely critical to meeting its overarching environmental outcome for the McArthur River in the long term. The NT EPA would prefer that the tailings are reprocessed to remove additional metals prior to in-pit disposal.*
Co-disposal of residual tailing material in the NOEF	This strategy is not considered suitable due to: • Open pit mining operations, waste rock emplacement operations and NOEF construction activities will have ceased at the stage of tailings reprocessing. Therefore, the co-disposal of residual tailings with waste rock in the NOEF would not be available. • The geochemical characteristics of OMP tailings material (i.e. saturating the reprocessed tailings material and therefore maintaining high in-situ moisture content is key to reducing tailings oxidation rates). Therefore, placement of reprocessed tailings material in the NOEF would not provide a moisture level sufficient to minimise oxidation potential and would likely contribute to / increase acid and metalliferous drainage generation from the NOEF. Regardless of the sequencing of operations, the addition of residual tailings material into the NOEF may require an expansion of the footprint of the NOEF landform, which would require further assessment and approval applications.
Encapsulating the residual tailings material in the open pit once deposition is complete, with a waste rock capping layer or other capping material, prior to rapid filling with water	This strategy is not considered suitable due to: • This strategy would require rehandling waste rock material from the NOEF would minimise overall feasibility of reprocessing tailings. • Residual tailings material consolidation characteristics are unlikely to support a waste rock layer (i.e. the waste rock may submerge within tailings material), and this process may then be exacerbated and accelerated by water ingress form rapid filling of the pit lake.
Complete backfill of final void with residual tailings material and water rock material (i.e. no pit lake)	This strategy is not considered suitable due to: • This strategy was contemplated in the Draft OMP EIS MCA and the MCA concluded that this strategy would not be considered suitable given (MRM, 2018): ○ *poor quality groundwater from the stored load in the backfilled overburden has the potential to migrate into the external environment. This water would then likely express into surface water features*. ○ *The very high costs associated with this alternative would inhibit Project feasibility.*
Transferring residual reprocessed tailings material back to the TSF temporarily prior to disposal in the open pit	This strategy is not considered suitable due to: • This strategy would involve significant material rehandling, the anticipated cost of which would be likely to minimise overall feasibility of reprocessing tailings.

2.2.3 TSF Seepage Management

A TSF Interception Trench has been constructed between the TSF Cell 1 and the adjacent Surprise Creek, to capture seepage from the TSF, and to minimise this seepage from reporting to Surprise Creek via the groundwater system. The gravel-filled trench includes slotted pipes connected to a series of sumps, with penstock valves to allow control of the water level in the various drain sections. Pressure relief wells drilled at nominal 10 m intervals have been installed along the full length of the trench. Collected seepage water is pumped for recycling in the processing plant.

Following completion of tailings reprocessing (once all tailings have been mined/extracted from the TSF), the TSF Interception Trench and associated pump system infrastructure are planned to remain operational for a period of time and are ultimately planned to be removed, subject to monitoring results confirming low risk to environmental values following removal.

MRM's Water Management Plan and associated surface water and groundwater monitoring programs would continue to be undertaken during the tailings reprocessing stage, and during the Mine decommissioning and closure phases, to validate the site water balance and hydrogeological model, including TSF seepage modelling predictions for each Mine phase.

2.3 Final Void Closure Strategy

As outlined in Section 2.1, MRM completed comprehensive modelling, studies and assessments to inform a detailed Mine Closure Plan for the end of the mine life. The key studies relevant to the long-term tailings management and the final void, which support the Mine Closure Plan presented in the EIS, included tailings and waste material geochemical analysis, final void water quality and water balance modelling and assessment, groundwater and surface water modelling and potential impact assessments, final void geotechnical analysis, tailings and waste material deposition planning for the final void, a final void and McArthur River connectivity study, aquatic ecology and terrestrial ecology impact assessments as well as a mine closure plan risk assessment.

This extensive body of work supports MRM's preferred closure strategy for the Open Pit/Final Void which would involve:

1. Deposition of residual tailings (remaining following tailings reprocessing operations), and other select post-mining waste material from other rehabilitation domains, within the open pit.
2. Following the completion of reprocessed tailings material and other waste material placement, rapid filling of the open pit with water, from groundwater recharge and from surface water harvested from the McArthur River during periods of high flow.
3. Creation of a final void pit lake that is hydraulically isolated from the McArthur River.
4. Once water quality within the isolated final void pit lake is demonstrated to be within acceptable levels and is consistent with modelled behaviour, a 20 m wide section of the downstream mine levee wall would be removed to allow for water exchange (back-flow) between the pit lake and the McArthur River during periods of seasonal high flow (i.e. a 'back-flow system').

A 'flow-through' pit lake system is also a potential strategy for the final void, which would involve:

- Once water quality within the isolated final void pit lake is demonstrated to be within acceptable levels and is consistent with modelled behaviour, a 20 m wide section of the upstream mine levee wall would be removed to allow a secondary flow path for the McArthur River. Primary McArthur River flows would permanently continue to flow down the current McArthur River Diversion Channel. Only during high flow periods (estimated to occur once or twice per year on average) would the water level rise high enough to pass over the upstream mine levee inlet and through the mine pit lake.

As outlined in the Supplementary EIS, both back-flow and flow-through systems are considered to be low risk options (compared with the option involving retention of residual reprocessed tailings in the TSF and the TSF remaining as a final landform) as this strategy reduces emplaced waste material reactivity.

Notwithstanding, in accordance with the requirements of Condition 4 of EPBC Act Approval 2014/7210, the final void will remain hydraulically separated from the McArthur River, until further approvals are obtained to pursue the preferred strategy.

The Draft and Supplementary EIS included a TSF LOM Plan including deposition strategies for the reprocessed tailings material, and other waste material, within the Open Pit. This material would include material from areas of the site that are being decommissioned during the approximate 10 year tailings reprocessing phase. These areas include areas of the West Overburden Emplacement Facility, the crushing plant, and the South Overburden Emplacement Facility and East Overburden Emplacement Facility. As part of the remediation of these areas, contaminated materials would be removed and placed within the Open Pit. These waste materials would be co-disposed with the reprocessed tailings, and would therefore be buried within the tailings.

Rapid filling of the final void would be undertaken in the first years following the cessation of material deposition to cover exposed reactive material within the void walls and minimise the oxidisation of tailings and other waste material, by submerging with water decreasing potential reactivity. This rapid filling process would occur over approximately five years, which allows for potential variations in river flow where water harvesting would not occur, to manage the risk of impact on the health of the McArthur River.

Based on final void water quality modelling, it is expected that the water quality of the isolated pit lake (i.e. with no inflow/outflow or interactions with McArthur River), would remain reasonably stable in the short-term, with deterioration to occur over time. Accordingly, it is proposed that the existing lime treatment and water treatment plants would be retained in the short-term to manage water quality. In the medium to long-term, a new water treatment plant would be designed and operated (based on pit lake water quality).

While the final void pit lake remains isolated from the McArthur River, the surrounding riparian land/edges of the final void would be designed to direct surface water flows through chutes into the pit lake, enhancing long-term wall stability. The shallower pit lake edges would be used to create features of a wetland habitat, with vegetation established on the upper alluvium batters and large woody debris installed where possible.

A detailed description of proposed rehabilitation strategies will be included in the Mine Closure Plan.

2.3.1 Final Void Closure Adaptive Management Process

The Adaptive Management Framework for the OMP, provided in Appendix R of the Supplementary EIS, includes a Final Void Closure Adaptive Management Process, which details a proposed risk-based approach for progressing through the various stages of final void closure i.e. from open pit to final void rapid filling to isolated pit lake and, potentially, to a back-flow pit lake system or a flow-through pit lake system, and then into active closure, proactive monitoring, reactive monitoring and relinquishment.

The key aspect of the Final Void Closure Adaptive Management Process is that MRM would not progress to the next final void closure stage until it has:

- formally reviewed the environmental performance of the current stage;
- developed a proposed adaptive management program for the next stage;
- finalised its proposed design for the next stage of closure (in consultation with the regulator), including contingencies in the event that MRM does not meet the set performance criteria;
- developed an environmental performance report;
- submitted the report to the regulators (and other relevant parties) for review;
- completed consultation with the regulators to progress to the next stage; and
- conducted the necessary engineering works for the next stage's commissioning.

Environmental monitoring is planned to continue during the tailings reprocessing and closure phases to validate closure modelling and to confirm that agreed closure completion criteria have been met, including:

- pit lake water quality;
- pit lake limnology;
- site water quality;
- downstream water quality;

- downstream ecology;
- landform stability;
- fluvial geomorphology;
- revegetation progress; and
- on-lease ecology.

The overarching premise of the Final Void Closure Adaptive Management Process is that the closure strategy performance is validated and approved prior to progression to the next closure stage.

If MRM were to pursue a back-flow pit lake system or a flow-through pit lake system, the Final Void Closure Adaptive Management Process including performance validation process would be implemented to demonstrate achievement of the overarching environmental objective for the Mine, that is, no impact to the health of the McArthur River and no reduction in the abundance or population health of EPBC Act listed species.

The Adaptive Management Framework for the OMP also includes a TSF Adaptive Management Process which outlines the proposed approach to progressing through the construction and operation phases of the TSF, tailings reprocessing phase, then into active closure, proactive monitoring, reactive monitoring and relinquishment.

3. Waste Material Geochemistry and Geochemical Analysis Program

3.1 Waste Material Geochemistry

Numerous (more than 15) geochemical investigations have been conducted since 2004 on Mine overburden and tailings materials as part of the MRM Open Cut Project and Phase 3 Project Environmental Impact Statements, and then as part of the OMP EIS which included a Forward Work Program for closure phase tailings geochemical analysis and numerical model development.

Comprehensive geochemical analysis and assessment of OMP waste material, including tailings, was included in the Draft OMP EIS (EIS Section 6) and was based on historical investigations, substantial geochemical testwork and for tailings a data set of over 150 monthly composite tailings samples as well as samples from TSF supernatant waters.

Geochemical testing methodologies have included acid based accounting, mineralogy testing, elemental analysis, leachate extraction and kinetic and static testing.

The OMP EIS categorises Mine overburden materials into five classes and provides predictions of abundance based on block modelling and geochemical assays. Management requirements for each material class have been developed and are outlined in Section 6 the Draft OMP EIS. The overburden material of relevance to this LTMP includes the PAF (Hangingwall [HW]) high sulfide material which has been spatially segregated for in-pit disposal and subsequent pit lake saturation at the end of mine life to minimise long-term environmental risk associated with this material.

Mine tailings have been consistently classed as potentially acid forming (PAF) in successive investigations and confirmed by the geochemical testing conducted as part of the OMP EIS. The tailings are characterised by a high sulfur content (total sulfur contents are typically greater than 12% sulfur, of which 75% is in the form of sulfide, mainly in the form of pyrite with comparatively minor sphalerite and galena [MRM, 2018]) which is somewhat offset by a high intrinsic Acid Neutralisation Capacity (ranging from 140 to 200 kgH_2SO_4/t) (MRM, 2018). Static and kinetic testing indicate the tailings typically comprise elevated contents of a number of metals including Arsenic, Copper, Lead, Cadmium and Zinc. Oxygen consumption test results indicate that the reactivity of the tailings is highly dependent on moisture content, with saturated tailings having a lower reactivity, while dried tailings have a higher reactivity. Therefore, and as outlined in the OMP EIS, maintaining high in-situ moisture content is key to mitigating tailings oxidation rates and for long-term management of Mine tailings.

3.2 Geochemical Analysis Program

In addition to the extensive geochemical testwork completed to date, MRM proposes to undertake an additional geochemical analysis program as part of the tailings reprocessing and closure phases.

This program would focus on geochemical analysis of reprocessed tailings material (and other reactive waste material proposed for disposal in the Open Pit), the results of which would be used to validate MRM's preferred closure strategy and modelling for the final void and TSF. An overview of the proposed approach for development of the reprocessed tailings and waste geochemical analysis program is outlined below.

Geochemical testwork is also planned to be undertaken as part of the site-wide land contamination assessment. This assessment would include an extensive sampling program to inform remediation requirements and would include the TSF area.

Additionally, environmental monitoring programs would continue to be conducted throughout the tailings reprocessing phase, rehabilitation phase and post-closure phase, including surface water and groundwater monitoring programs. Groundwater quality (and behaviour) will continue to be sampled and analysed to inform MRM's understanding of groundwater regime surrounding the TSF and across the site. Final void pit lake water quality would also be sampled and analysed as part of the final void adaptive management process (Section 2.3.1).

3.2.1 Proposed Approach

MRM commits to engaging a suitably qualified and experienced consultant (geochemist) to prepare the geochemical analysis program. A scope of works for the geochemical analysis program will be developed by 1 November 2024.

Development of a geochemical analysis program is included in the Forward Works Program for this LTMP (Section 5).

It is expected that the scope of works would include the required sampling program, geochemical analysis methodologies (including but not limited to static and kinetic testing and acid base accounting) and reporting detailing testwork results and interpretation.

It should be noted that MRM anticipates that a works program will developed following the proposed tailings management risk assessment planned to be conducted in 2025 (refer Section 5).

4. MRM Closure Planning and Closure Risk Assessment

MRM closure planning is well progressed and is commensurate with the current phase of Mine operations.

A detailed and comprehensive Mine Closure Plan was developed as part of the OMP EIS. This Plan is intended to be built upon as the Mine progresses towards closure. Closure strategies will be formalised in the Mine Closure Plan submitted for approval 5 years prior to closure (in approximately 2045). In the interim, MRM's Unplanned Closure Plan has been developed and is incorporated as part of the Mining Management Plan.

Closure planning will continue to be guided by Glencore's global Closure Standard, independent expert review and regulatory and key stakeholder consultation. Glencore's Closure Standard and Glencore's risk management governance documents also require risk assessments to be conducted to identify, mitigate and plan for potential closure risks.

An overview of these processes is outlined within the below sections. These processes will guide mine closure planning during operations and through to closure.

4.1 MRM EIS Mine Closure Plan (2018)

A Mine Closure Plan was developed as part of the Draft OMP EIS in 2018.

The Mine Closure Plan was prepared to meet the requirements outlined in the *Terms of Reference for the Preparation of an Environmental Impact Statement: McArthur River Mine – Overburden Management Project* (EIS TOR) (Environmental Protection Agency, 2014).

The EIS Mine Closure Plan is a comprehensive plan that went beyond the EIS TOR requirements by also addressing the requirements of the former NT Department of Mines and Energy (DME) *Draft Guidelines for Mine Closure Plans* (DME, 2016).

The Supplementary EIS further clarified some closure strategies presented in the Draft OMP EIS. The closure strategies relevant to this LTMP outlined in Section 2, are consistent with those presented in the Supplementary EIS.

4.2 MRM Unplanned Closure Plan (2020)

Consistent with requirements of VOA 0059 Condition 99 and *The Mining Management Plan Structure Guide for Mining Operations* (DPIR, 2017), an Unplanned Closure Plan has been prepared for the Mine and is included as part of the Mining Management Plan (MMP) (MRM, 2020).

The Unplanned Closure Plan outlines the proposed approach for decommissioning and rehabilitation of the Mine and BBLF to address the possibility and impacts of unscheduled and unplanned termination of operations.

The Unplanned Closure Plan is updated regularly and is accompanied by a relevant security estimate and is typically appended with each MMP or MMP amendment submission.

4.3 MRM Closure Risk Assessment (2023)

A Closure Risk Assessment was undertaken for the Mine in 2023. The risk assessment involved a risk workshop held in July 2023 attended by key Glencore and MRM representatives and was facilitated by O'Kane Consultants Pty Ltd. Results of the risk assessment are documented within the report, *McArthur River Mine Closure Risk Assessment On-site and Off-site Mine Infrastructure* (O'Kane Consultants, 2023).

The objectives of the risk assessment were to identify key closure-related risks and opportunities, validate existing rehabilitation provisions, and propose suitable mitigation measures and management strategies for the Mine and BBLF domains.

The risk identification and assessment methodology used for the risk assessment was based on established standards, including the Australian and New Zealand Standard AS/NZS ISO 31000:2009 and Glencore's Risk Management governance procedure (G-NQ-HSEC-GOV-Risk Management (119000)) and used matrices consistent with those used for the assessment of hazard and risks associated with the OMP in the Draft OMP EIS (Chapter 18, Hazard and Risk Management).

Key risks were identified by rehabilitation domain, as well as management and mitigation actions and identified opportunities.

The outcomes of the closure risk assessment will be used to further inform closure planning and to inform the MRM Mine Closure Plan (Section 4.4).

4.4 MRM Mine Closure Plan (~2045)

A Mine Closure Plan is planned to be prepared 5 years prior to the planned closure of the Mine in approximately 2045, and will finalise the closure strategies described in the Unplanned Closure Plan and would be informed by relevant supporting studies as required by MRM's various environmental approvals.

It is acknowledged that planned closure of MRM operations is not currently scheduled until approximately 2050, however MRM intends to complete the additional supporting studies during the operational phase to build on the comprehensive work completed as part of the OMP EIS Mine Closure Plan.

The Mine Closure Plan would detail proposed decommissioning and rehabilitation activities and ongoing monitoring programs to be undertaken during the closure phase.

The Mine Closure Plan would be developed in consultation with each independent panel (including NOEF Panel, TSF Panel and the MRM Closure Panel), relevant regulatory authorities and key stakeholders (including the Community Reference Group). In accordance with internal Glencore requirements, the Mine Closure Plan would be subject to annual internal reviews.

4.5 MRM Closure Panel

MRM is required to provide assistance to DITT to establish an independent Closure Panel consisting of mine closure experts.

MRM anticipates that this panel would be set up before the end of 2024.

The Closure Panel would review all closure related management plans, including this LTMP and the MRM Mine Closure Plan.

4.6 Glencore's Closure Standard

Glencore's *Closure Standard (GRP-STD-HSEC-019-v1.0, 2021)* requires each operational asset to develop and implement a Closure Plan established on a knowledge base, an assessment of final land use options, a risk assessment of these options and a cost estimate of the preferred closure option, and utilising output from physical, environmental and socio-economic closure studies.

Glencore's Closure Standard is an element of the Glencore Health, Safety, Environment and Community (HSEC) framework, standards and procedures: Environment Standard, Energy and Climate Change Standard, Human Rights Standard, Social Performance Standard, Tailings Storage Facility and Dam Management Standard, HSEC&HR Management Standard, Enterprise Risk Management Standard.

The Closure Standard has been designed and developed to incorporate the *International Council on Mining and Minerals (ICMM) Sustainable Development Framework* (ICMM, 2020).

The mine closure process will continue to be undertaken in accordance with Glencore's Closure Standard, and both MRM's Unplanned Closure Plan and the Mine Closure Plan, and this LTMP, will be prepared in consideration of the Standard.

4.7 Glencore TSF Risk Management

Glencore's *Tailings Storage Facility Framework* requires independent technical review of the design, construction, operation, management and closure of Glencore TSFs. The independent reviewers are required to be third party who are not, and have not been, directly involved with the design and operation of the TSF.

Glencore's *Tailings Storage Facility and Dam Management Standard* requires a multidisciplinary risk assessment, impact assessment and Dam Safety Reviews for Glencore TSFs. MRM conducted a multidisciplinary risk assessment for the Mine TSF in April 2023 including subject matter experts with expertise in the areas of risk, social performance and the environment, as well as tailings and process engineers. MRM's ITRB also participated in the assessment risk assessment.

A TSF risk register has also been prepared for the Mine TSF that documents the risk assessment process and identifies credible failure modes, controls and critical controls (preventative and mitigating).

MRM's TSF will continue to be managed, during operations and the tailings reprocessing and mine closure phases, in accordance with Glencore's Tailings Storage Facility Standard.

5. LTMP Forward Works Program

The Forward Works Program provided in Table 3 outlines proposed works which aim to further progress long-term tailings management planning.

TABLE 3 LTMP FORWARD WORKS PROGRAM

Proposed Work/Study	Summary Scope Description	Expected Outcome	Anticipated Resourcing	Timing
Tailings management risk assessment	Key objectives of Tailings management risk assessment: • Identify the key risks associated with tailings reprocessing activities and tailings disposal proposal. • Identify the key technical studies required to address risks and to adequately plan for/manage implementation of tailings reprocessing phase (e.g. TSF geotechnical study for tailings reprocessing period). • Identify potential opportunities associated with tailings management at MRM (i.e. early tailings reprocessing).	Tailings management risk assessment to provide a formal structure and tool for development of long-term tailings management strategy that has been developed by relevant subject matter experts. Identification of technical studies required.	Internal resources. Relevant external specialists, including MRM's ITRB and TSF Panel members.	By March 2025
Geochemical Analysis Program	Consultant (geochemist) scope of works to be developed by 1 November 2024.	To validate MRM's preferred closure strategy and modelling for the final void and TSF	External consultant	Geochemical Analysis Program to be developed 1 year prior to commencement of tailings reprocessing operations

It is expected that a forward works program would also be developed prior to and to inform the MRM Mine Closure Plan to be developed by approximately 2045.

6. Review and Revision of this LTMP

The triggers for review and revision, if necessary, for this LTMP include:

- a review of the Plan by the ITRB, TSF Panel or Closure Panel;
- finalisation of MRM's Closure Objectives (as determined by the MRM Closure Panel);
- preparation of an updated Unplanned Closure Plan; and
- finalisation of the MRM Mine Closure Plan.

7. References

Commonwealth of Australia (2014) *Environmental Management Plan Guidelines*.

Department of Mines and Energy (2016) *Draft Guidelines for Mine Closure Plans*.

Department of Primary Industry and Resources (2017) *The Mining Management Plan Structure Guide for Mining Operations*.

Environmental Protection Agency (2014) *Environmental Impact Statement: McArthur River Mine – Overburden Management Project*.

International Council on Mining and Minerals (2020) *Sustainable Development Framework*.

McArthur River Mining Pty Ltd (2018) *McArthur River Mine Overburden Management Project Draft Environmental Impact Statement*.

McArthur River Mining Pty Ltd (2020) *Mining Management Plan McArthur River Mine, January 2020, Version 1.0*.

O'Kane Consultants (2023) *McArthur River Mine Closure Risk Assessment On-site and Off-site Mine Infrastructure.*

8. Attachment A: Tailings Management Plan Requirements and Relevant Background to this LTMP

Tailings Management Plan Requirements

EPBC Act Approval 2014/7210 Requirements

Condition 13 of EPBC Act Approval 2014/7210 requires:

> *13. Within five years of the date of the approval the approval holder must submit a management plan for the management of the Tailings Storage Facility after mining ceases to the Department for approval by the Minister. This plan must include:*
>
> *a) a commitment to reprocess all material within the Tailings Storage Facility within 15 years of the end of mining;*
>
> *b) a commitment to undertake geochemical analysis of the material (including bore water) within 50 m of the Tailings Storage Facility footprint. The plan will determine disposal options for contaminated materials commensurate with the type and level of contamination, including disposal within the mine pit; and*
>
> *c) a program for geochemical analysis of the reprocessed waste material to identify the level and type of contamination that would likely impact on meeting the requirements of condition 1(b). The plan must include, but may not be limited to, the option of encapsulating waste material before deposition within the mine pit.*
>
> *The approved management plan must be implemented.*

For context, Condition 1(b) of EPBC Act Approval 2014/7210 requires (emphasis added):

> *1. To minimise impacts to EPBC Act listed species, the approval holder must:*
>
> *a. Meet the objective of no impact to the health of the McArthur River as a result of the mine.*
>
> *b. Meet the outcome that the action does not cause impacts to the McArthur River that reduce the abundance or population health of EPBC Act listed species.*

Condition 4 of EPBC Act Approval 2014/7210 is also material to this LTMP. Condition 4 outlines the Commonwealth Department of Climate Change, Environment, Energy and Water's (DCCEEW's) requirement for the open pit to remain hydraulically separated from the McArthur River until MRM can demonstrate the either of MRM's preferred systems can comply with Condition 1(b) of EPBC Act Approval 2014/7210. Condition 4 of EPBC Act Approval 2014/7210 requires:

> *4. To minimise impacts to EPBC Act listed species, the proposed pit lake, if developed, must remain hydraulically isolated from the McArthur River and its floodplain as there is not sufficient understanding of the potential risks associated with opening the proposed pit lake to the McArthur River. If in the future the pit lake is again proposed to be hydraulically connected to the McArthur River, a referral may be required for a decision to be made by the Minister under the EPBC Act.*

Therefore, and in accordance with Condition 4 of EPBC Act Approval 2014/7210, this LTMP reflects that the Mine's open pit is currently planned to remain hydraulically separated from the McArthur River. MRM's preferred closure strategy for the open pit is described in Section 2.3.

VOA 0059 Approval Requirements

Condition 24 of VOA 0059 requires:

> *24. Within five (5) years of the date of authorisation of the Overburden Management Project, the Operator must submit a strategy to the Department that details the long-term disposal management of tailings into the mine pit void, submerged under a suitable depth of pit water. The plan must:*
>
> *a) include strategies on the tailings reprocessing and assessment of residual chemical contaminants that may likely impact on meeting the requirements of Condition 16;*
>
> *b) be reviewed by the relevant independent panel.*

For context, Condition 16 of VOA 0059 Approval includes requirements relevant to the measurement and management of total loads of lead and zinc in the McArthur River and for annual loads to not exceed loads discharged from 2017-2018.

Conditions of Approval Reference Table

Table A-1 outlines where the requirements of both Condition 13 of EPBC Act Approval 2014/7210 and Condition 24 of VOA 0059 are addressed in this LTMP.

TABLE A-1 REQUIREMENTS OF CONDITION 13 OF EPBC ACT APPROVAL 2014/7210 AND CONDITION 24 OF VOA 0059

Approval & Condition Number	Condition Requirement	Section of this LTMP
EPBC Act Approval 2014/7210 Condition 13	*13. Within five years of the date of the approval the approval holder must submit a management plan for the management of the Tailings Storage Facility after mining ceases to the Department for approval by the Minister. This plan must include:*	This LTMP
	a) *a commitment to reprocess all material within the Tailings Storage Facility within 15 years of the end of mining;*	Section 2.1
	b) a commitment to undertake geochemical analysis of the material (including bore water) within 50 m of the Tailings Storage Facility footprint. The plan will determine disposal options for contaminated materials commensurate with the type and level of contamination, including disposal within the mine pit; and	Section 3.2 and Section 2.2.2
	c) a program for geochemical analysis of the reprocessed waste material to identify the level and type of contamination that would likely impact on meeting the requirements of condition 1(b). The plan must include, but may not be limited to, the option of encapsulating waste material before deposition within the mine pit.	Section 3.2 and Section 2.2.2
	The approved management plan must be implemented.	
VOA 0059 Condition 24	*24. Within five (5) years of the date of authorisation of the Overburden Management Project, the Operator must submit a strategy to the Department that details the long-term disposal management of tailings into the mine pit void, submerged under a suitable depth of pit water. The plan must:*	This LTMP
	a) include strategies on the tailings reprocessing and assessment of residual chemical contaminants that may likely impact on meeting the requirements of Condition 16;	Section 2.2.1 and Section 3
	b) be reviewed by the relevant independent panel.	Attachment B

Relevant Background to this LTMP

NT EPA Assessment Report 86 – Relevant Recommendations and Commentary

Recommendation 12

Recommendation 12 of the NT EPA's Assessment Report 86 is relevant to long-term tailings management at the Mine.

Additionally, the NT EPA's Assessment Report 86 also provides the following commentary which provides context to, and the rationale behind, Recommendation 12:

> *As discussed previously, the most significant measure for the control of long-term, ongoing contamination of groundwater as a result of the tailings domain is considered to be the Proponent's preferred closure strategy, the disposal of tailings in the mine pit void. The IM (2017)* (the Independent Monitor appointed by NT DPIR) *indicated that it strongly supports the re-processing and in-pit disposal option proposed in the Draft OMP EIS, which would ensure that the tailings remain inundated in the long term, thereby preventing further sulfide oxidation and providing a much more secure closure outcome than would be achieved for a TSF with a cover system. This view is also supported by Noller (2017), the ITRB, and the EDO, ECNT and NLC.*
>
> *In consideration of the PAF(HC) classification and potentially high reactivity of tailings when desiccated, the NT EPA considers that above-ground tailings storage at MRM into the long term constitutes an unacceptably high risk to the McArthur River and its catchment given the risk of structural failure and consequent potential for contamination. The NT EPA is of the view that depositing the tailings in the pit void using appropriate placement methods and a water cover is absolutely critical to meeting its overarching environmental outcome for the McArthur River in the long term. The NT EPA would prefer that the tailings are reprocessed to remove additional metals prior to in-pit disposal.*

Recommendation 12 from NT EPA Assessment Report 86 provides:

> *Recommendation 12*
>
> *As soon as practicable after cessation of mining, tailings and other contaminated earthen materials from the Tailings Storage Facility shall be deposited in the mine pit void using contemporary best-practice placement techniques, then protected with a water cover. Tailings shall preferably be reprocessed before in-pit disposal.*
>
> *The intention of these measures is to protect the McArthur River water quality and aquatic ecosystems from surface or groundwater contamination consistent with the NT EPA's overarching environmental outcome in Recommendation 3. Any requirement to vary these measures will need approval from the relevant regulator and notification to the NT EPA in accordance with Recommendation 2. These measures should only be varied on the basis of further information to inform leading practice.*

For context, Recommendation 3 from NT EPA Assessment Report 86 provides:

> *The Proponent shall ensure that the commitments and safeguards listed in the EIS for the McArthur River Mine Overburden Management Project and recommended in this Assessment Report 86 are implemented in a manner and to the extent that ensures the health of the McArthur River is protected along its whole length at all times from mine related impacts. This is the overarching environmental outcome that is required to be achieved in respect of the Proposal and all future stages of the mine.*
>
> *…*

Relevant Commentary from NT EPA Assessment Report 86

The NT EPA also provides commentary in Assessment Report 86 regarding the finalisation of closure strategies for the Mine (emphasis added):

> *Consolidating the tailings and non-benign waste rock towards the end of mining into one facility for complete inundation is, in current terms, the most secure, long-term management approach for these materials. However, the understanding of the long-term geochemical behaviour of the open cut relies solely on the KCB pit water quality modelling, which in turn relies on inputs from other models. Therefore, there are significant uncertainties associated with the hydrodynamics and geochemistry of the pit lake that need to be clarified during the mining operation.*
>
> *Further investigation, monitoring and continual modelling review will be needed to determine the optimum closure strategy for the pit void. Proposed strategies will need to be reviewed by an independent panel of experts provided for in Recommendation 23 of this Report. The views of a range of stakeholders and the broader community will also need to be canvassed and taken into account.*
>
> *The NT EPA considers that pit closure cannot occur for 20 years or more if the Proposal is authorised, and thus it is not necessary or appropriate to make a judgement on the best closure option in this Report. At present, all options for the pit lake proposed by the Proponent are too uncertain, particularly the back flow and flow through scenarios. If at some point in the future back flow and flow through scenarios are to be considered, then referral to the NT EPA will be required for an assessment decision.*
>
> *…*

The NT EPA has therefore elected to reserve its judgement on particular closure strategies presented in the EIS on the basis that decisions on long-term sustainability of some options cannot be made at this point in time and improved options may become evident as relevant information is obtained by the Proponent. New technologies and management techniques are likely to emerge in the mining industry during the ensuing 20 years offering potential solutions to some of the more challenging problems at the site. Closure options should be finalised three to five years prior to planned closure based on leading-practice contemporary requirements that meet the expectations of regulatory authorities, key stakeholders and the community.

9. Attachment B: Independent Review Requirements for this LTMP

Independent Panel Review

TSF Panel

Condition 24(b) of VOA 0059 requires this LTMP to be reviewed by the *relevant independent panel*. The independent panels considered relevant to this LTMP are the TSF Panel and Closure Panel.

At the time of writing, the MRM TSF Panel has not yet been established.

Once established, this LTMP will be submitted to the TSF Panel for review, and the Plan reviewed and revised, if necessary, to address any comments received.

Closure Panel

The MRM Closure Panel has not yet been established. Once established, this LTMP will be submitted to the Closure Panel for review, and the Plan reviewed and revised, if necessary, to address any comments received.

MRM's Independent Tailings Review Board

Consistent with VOA 0059 Approval Condition 50, MRM has established an MRM Independent Tailings Review Board (MRM ITRB).

MRM's ITRB includes members who are independent geotechnical, tailings and groundwater specialists, including:

- Dr David Williams (Director of Geotechnical Engineering Centre, The University of Queensland School of Civil Engineering);
- Dr Bruce Brown (Director, Bruce Brown Consulting Pty Ltd) (43 years' experience in geotechnical engineering and mine waste management, including 25 years Principal of Knight Piésold Consulting and 13 years as Rio Tinto Chief Adviser, Tailings and Dams, Technology and Innovation); and
- Dr Tammie Weaver (Technical Fellow and Partner, ERM) (Master and PhD in hydrogeology, with over 30 years' experience as a hydrogeologist and hydrogeochemist).

A key function performed by the MRM ITRB includes:

- endorsement any future modifications of the MRM TSF , including but not limited to:
  - review and endorsement of studies and/or trials to inform future construction and/or operation of the structure; and
  - review and endorsement of the TSF Operations, Maintenance and Surveillance (OMS) manual, including updates to the Trigger, Action and Response Plan (TARP) relevant to changes to the structure that may impact on its stability and performance.

Independent Expert Review

Condition 16 of EPBC Act Approval 2014/7210 requires all plans prepared under the Approval to be reviewed by an independent expert. EPBC Act Approval 2014/7210 also requires the independent expert to be approved/endorsed by Commonwealth DCCEEW.

Given MRM's ITRB includes experts in tailings management, hydrogeology and geotechnical engineering, MRM has requested DCCEEW for approval of Dr David Williams, member of MRM's ITRB, to be the 'relevant independent expert' for review of this LTMP.

Dr Williams has reviewed this LTMP and his comments have been addressed where relevant. A reconciliation table outlining how Dr Williams' comments have been addressed has been submitted to DCCEEW with this plan.

Glencore's TSF Independent Review Board

Glencore's Tailings Storage Facilities Independent Review Board (ITRB) is a board that provides independent technical review of the design, construction, operation, closure, and management of Glencore tailings storage facilities.

Glencore's ITRB is international engineering, geoscience, and environmental consulting firm, Klohn Crippen Berger (KCB). Glencore's ITRB members from KCB are third parties who are not, and have not been, directly involved with the design or operation of the particular tailings storage facility. The expertise of the Glencore ITRB members reflects the range of issues relevant to the facility and its context and the complexity of these issues.

The Glencore ITRB conducts reviews:

- as part of Glencore's Health, Safety, Environment and Community (HSEC) Audit process;
- periodically, triggered by an ITRB request from a Glencore Asset/Department; and
- following:
  - Major Asset expansions requiring additional TSF storage and/or significant changes to life of mine (LOM) tailings plans.
  - Change in the adopted external loading design criteria or consequence classification.
  - Material changes in design or risk.
  - Design and planning for and declaration of safe closure.
  - A request for specific technical advice to ensure closing out Audit Findings or Observations.

Glencore's *Tailings Storage Facilities Independent Review Board (ITRB) Procedure* governs the board's roles and responsibilities, functions and member qualifications.

MRM's TSF is subject to reviews by Glencore's ITRB as per the above process.

Glencore's ITRB is separate from and has no tie to MRM's ITRB.

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