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9. Summary and Conclusions

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The McArthur River Mine (MRM) Overburden Management Project (OMP) Supplementary Environmental Impact Statement (Supplementary EIS) provides responses to the 13 formal submissions made on the Draft EIS in addition to presenting additional work that has been completed throughout 2017. The Draft and Supplementary EIS together present a robust life of mine (LOM) plan for MRM that will realise the benefits of the project whilst protecting the downstream environment from the potential risks posed by the project.

9.1 Revised Project Description and Changes

The following sections summarise the revised project description and the changes that have been made, and clarify some misconceptions that became apparent from reviewing the stakeholder submission comments on the Draft EIS.

9.1.1 Mining Operations Phase

The open cut mining operations remain unchanged, with mining planned until the end of 2037. Note that the operations proposed in the OMP are not an expansion of the Phase 3 Development Project. This OMP EIS relates specifically to the management of overburden that was included in the mining schedule as part of the Phase 3 Development Project. McArthur River Mining is not proposing an expansion of the mine footprint or output over and above previous approvals. The proposed OMP footprint is in fact smaller than the proposed Phase 3 Development Project footprint.

The use of in-pit dumping for all mine overburden mined from approximately 2032 is also unchanged. The management of wastes stored in the East Overburden Emplacement Facility (EOEF) have been clarified in relevant MRM responses.

The North Overburden Emplacement Facility (NOEF) will be operated from present until approximately 2032. A significant change has been made to the cover system. In the Draft EIS, McArthur River Mining identified the geosynthetic liner (GSL) as a potential alternative option to the compacted clay layer (CCL) for the NOEF cover system, however it was not selected as the preferred option due to some unresolved technical issues. McArthur River Mining noted stakeholder comments on the Draft EIS that were supportive of further investigation into the potential for application of the GSL on the NOEF. Following updated modelling of the NOEF, and advancements made on the outstanding technical issues, McArthur River Mining decided to replace the CCL with a world-leading-practice GSL to reduce the risk of oxidation and impacts on water. There are several viable options for the GSL that will be trialled in 2018. Most other aspects of the NOEF remain unchanged, or are minor (e.g. adjustments to the southeast extent and northern stockpile arrangement).

The change to a GSL required changes to the other components of the cover system above the liner and a revised stability assessment. Following further review, the upper NOEF batter slope has been adjusted from a 1V:2.5H slope to a shallower 1V:3H slope. This will provide an even greater factor of safety, with the added benefits of easier construction and maintenance.

The low permeability foundation layer has also been optimised as a result of the incorporation of a GSL barrier layer in the cover system. Due to the reduced net percolation through the cover system associated with the GSL, and considering the lower permeability of the base clay due to the overlying weight of the NOEF, the minimum thickness of the low permeability foundation layer has been reduced from 0.5 metres (m) to 0.25 m. This is a robust environmental/engineering approach and also addresses stakeholder feedback on this aspect of the project.

The commencement of large-scale rehabilitation of the NOEF from 2019 (subject to approvals) will provide opportunities for local employment for people not able or interested in operating heavy machinery or plant. McArthur River Mining is increasing its local recruitment and training initiatives presently. This includes the establishment of a Gurdanji Ranger group to assist in the monitoring and management of the site now and into the future. This is programmed to commence in 2018 and be built on in future years. Additionally, McArthur River Mining has also partnered with the Borrooloola School for the Pathways in Borrooloola program in order to facilitate better preparation for entry into the workforce. These training packages include the completion of Certificate 1 in Conservation and Land Management.

Following extensive consultation between, McArthur River Mining, the Aboriginal Areas Protection Authority (AAPA), Heritage Branch of the Department of Tourism and Culture and Custodians in relation to the relocation of the MRM4 heritage site, there is agreement to relocate this artefact site to the MRM3 artefact site. The MRM3 artefact site is located to the north of the NOEF and was determined to be an appropriate location which will avoid interference with the Barramundi Dreaming sacred site.

The Tailings Storage Facility (TSF) plan is unchanged from that presented in the Draft EIS, although more detail has been added to the LOM report. Tailings deposition will continue into a combined Cell 1 and 2 (Cell 1/2) with a small pond and strict water management protocols.

9.1.2 Tailings Reprocessing Phase

The planned reprocessing of approximately 95 million tonnes (Mt) of LOM tailings is unchanged from the Draft EIS. This is still planned to occur from 2038 to 2047, with the tailings deposited in the open cut void, along with rehandled EOEf, South Overburden Emplacement Facility (SOEF) and other waste materials from sites undergoing rehabilitation. Revised tailings consolidation modelling was completed, which was considered in the revised overall site surface water management strategy. Storage of the tailings in the lower benches of the open cut void for permanent subaqueous storage is best-practice, and adds further project value and employment opportunities from a 'waste' product. The economics of the reprocessing operation, although preliminary, are conservative in their assumptions.

9.1.3 Closure Phase

Mine Pit Lake Options

As per the Draft EIS the plan for the partially backfilled open cut void is to rapidly create a deep mine pit lake. Only sustainable quantities of river water will be harvested to facilitate open cut final void filling. This process is therefore expected to take between five (5) and 13 years, depending on variations in river flows. The modelling of lake filling and stratification, groundwater interactions, surface water interactions and downstream water quality were all updated as part of this Supplementary EIS, with updated technical reports provided in the appendices.

Additionally, a concise description of the process and required management for transition between the isolated lake, backflow mine pit lake and flowthrough mine pit lake stages has been provided in this Supplementary EIS Report. It was evident from the Draft EIS submission comments received that there were some stakeholder misconceptions as to the nature of the connection between the McArthur River and the final mine pit lake, in particular for the preferred flowthrough scenario. Several comments seemed to imply that McArthur River Mining was proposing to completely direct the McArthur River through the mine pit lake to achieve a flowthrough lake. This is not the case. In all scenarios proposed, both as part of the Draft EIS and Supplementary EIS, the McArthur River Diversion Channel remains the primary flow path of the river. The connections to the mine pit lake are only a secondary flow path active during high flow events, with only a minor portion of river flows flowing through the mine pit lake each year. The vast majority of the flows still bypass the mine pit lake through the McArthur River Diversion Channel.

The flowthrough scenario presents the most sustainable mine pit lake option, with modelling indicating it produces the best water quality and results in the most favourable environmental outcomes both within the lake ecosystem and downstream, as well as the possibility of facilitating beneficial uses in the future, such as recreational activities. The stratification of the lake will result in good water quality in the upper lake levels that interact with the receiving environment.

The concerns of tailings being re-suspended by the flowthrough option are not evidence based. The tailings will be over 150 m below the surface of the filled lake, which is deeper than the deepest natural lake in Australia. Water modelling identified that even in an extreme hypothetical event of a cyclone, combined with a 1:1000 year flood and failure of both levee sections (upstream and downstream), the deposited tailings would not be re-suspended.

Note that the final void closure sequence will be subject to ongoing modelling and confirmation of water quality, therefore if the monitored performance does not match the model and progressing to the next stage would result in unacceptable risks to the environment and the MRM closure objectives, then it will not occur. Additionally, if a step is taken and then an unexpected event(s) occur, remediation options have been identified.

Long-term Site Management

The Draft EIS introduced a conceptual timeline for Closure that extended for 1000 years at the request of the Northern Territory (NT) Government. The project will not require a continuous active presence for 1000 years, nor does this period mean that the site will take 1000 years to rehabilitate. In fact, site rehabilitation is anticipated to be well established within approximately 25 years after decommissioning and closure. McArthur River Mining was instructed to assess the project for 1000 years as part of government consultation conducted in 2015 with the former NT Department of Mines and Energy (DME), now referred to as the NT Department of Primary Industry and Resources (DPIR). Project evaluation over this timeframe can be considered leading practice for a metal sulphide mine.

After 25 years, vegetation should be self-sustaining and the modifications made to the landforms over that period will mean the landform is robust. The nature of maintenance to the site will be intermittent and of low intensity. The skill sets and equipment required to undertake the expected works (such as filling of erosion gullies, weed management, and maintaining monitoring instruments and key pumps) will be consistent with those required in communities and livestock stations in the region. The costs and resources required are not expected to be onerous.

9.2 Potential Impacts of Project Description Change

A number of improvements and refinements have been made to the assessment models utilised in the Draft EIS. The results of these are presented in this Supplementary EIS as an update and validation of the modelling work completed in the Draft EIS.

The revised assessment is primarily associated with water resources and the resultant influences on aquatic ecology. Similar to the methodology implemented for the Draft EIS, the assessment of potential impacts on water resources utilises a series of integrated modelling software packages to predict mine site water characteristics over time and the influence this has on the downstream environment. The models address water flow and quality evolution within the NOEF, resultant seepage from the NOEF, flows and water quality within the groundwater system, and interaction with the constructed and natural surface water systems. Evaluation of the surface water system incorporates assessment of mine pit lake stratification and water quality, and the interaction of the mine pit lake with the broader surface water environment. The potential risks to aquatic ecology are reassessed in the context of the revised surface water modelling results.

The updated impact assessment modelling broadly determined that the proposed project changes will have a negligible to positive influence on the modelled potential impacts presented in the Draft EIS and therefore are predicted to have a negligible impact on the downstream environment.

9.3 Project Benefits

There are a range of socio-economic benefits which will result from continued sustainable development of the mine over the next 30 years. These include both direct and indirect job opportunities with MRM and its goods and services suppliers (including the Mawurli and Wirriwangkuma Aboriginal Association (MAWA) through their joint venture operation of the Aburri), funding for the Community Benefits Trust (CBT), and taxes and royalties paid to the governments in Australia. Specifically these benefits include:

- Contributions to government revenue over the operational period (30 year duration), including an estimated:
 - \$117.4 million in total payroll taxes paid to the NT Government;
 - \$435 million in royalties paid to the NT Government; and
 - \$1.038 billion in corporate taxes paid to the Commonwealth (subject to change based on commodity price changes, future production levels or official tax rates).
- Creation of significant employment opportunities and long-term job stability. MRM is also expected to reach its stated target of 20% Indigenous employment on site which is amongst the highest in the Territory. The creation of these employment opportunities will result in:
 - payment of an estimated \$261.5 million directly to McArthur River Mining's employees in the Borroloola/Gulf area; and
 - injection of an estimated \$177.1 million directly into the local Borroloola/Gulf area from income paid to local employees.
- Ongoing opportunities for local and regional businesses to engage with MRM.
- Provision of support for youth training and employment, including a continuation of MRM's partnership with Borroloola School to encourage education outcomes and pathways to employment.
- An extension of the McArthur River Mining's CBT for the life of mining, which currently receives in excess of \$1.25 million per year in direct investment by McArthur River Mining.

- Increased opportunities for Custodians/Indigenous leaders to be involved in the rehabilitation process and other cultural heritage management activities.
- Increased frequency and scope of environmental monitoring.

9.4 Environmental Performance

McArthur River Mining acknowledges that there are concerns in the community about its environmental performance; therefore it continues to actively engage with the local community, particularly in regard to the current environmental performance of the mine.

The Supplementary EIS has provided details on historical issues and how they have been managed, including the following:

- The NOEF experienced episodes of highly visible spontaneous combustion in 2013 and 2014. The NOEF batters were largely remediated from 2015-on; with recent temperature monitoring indicating the average temperature of identified “hot spots” in the NOEF has decreased significantly. The surface of the NOEF is now free of hotspots as a result of ongoing remediation.
- Some elevated lead levels were identified in some small fish in 2012. This issue was confined to a small pool of water directly under the main haul bridge on the mine site, and was addressed through the removal of sediments and additional changes to water management. During the 2016 late dry season monitoring period, no samples (muscle or liver) taken from the monitoring sites were found to have a lead concentration exceeding relevant limits. There is no scientific evidence linking metals in fish in the McArthur River or downstream environment to the McArthur River Mining operations. An independent report for the NT Government stated that the risk to human health posed by consumption of fish from the McArthur River system was considered to be “low”.
- In 2014 an isolated incidence of high lead levels in a number of cattle was reported. This has been addressed through regular fence maintenance and mustering in line with an updated cattle management plan.
- The design and operation of MRM’s TSF was reviewed by an independent specialist review board and the revised LOM plan and operations was endorsed.
- Two separate Independent Reviews have confirmed that there is no significant groundwater contamination at MRM which requires urgent remediation and that the current management strategies in place will manage potential groundwater risks.

MRM is an established mine site that maintains a proactive program of stakeholder consultation and engagement as part of day to day operations. McArthur River Mining welcomes open and transparent engagement with a broad range of stakeholders on its mining operation and has established numerous mechanisms through which community members and other stakeholders can engage with MRM personnel and management.

For the purpose of the project, MRM stakeholder consultation and engagement program included one-on-one meetings, open town meetings, engagement at public events, meetings with local groups and site visits. MRM stakeholder groups included both indigenous and non-indigenous residents and community members, government and non-government representatives and a wide range of technical specialists.

McArthur River Mining is very aware of the technical nature of the project and has adapted its consultation approach to ensure the form and method of stakeholder communication was suited to each individual or group to ensure key concepts and aspects of the project were understood.

During the course of the MRM project consultation process, the following was achieved:

- 566 individuals consulted;
- 297 local people were consulted accounting for 53% of total individuals consulted;
- 263 dedicated consultations on the project;
- over 1227 points of contact; and
- 188 people were consulted more than once, with one person being consulted 38 times.

9.5 Key Considerations for Closure

Immediate closure and back filling of the mine void has been suggested by some stakeholders as the preferred approach to address any potential environmental risks at the mine site. Based on specialist technical advice and comprehensive modelling, McArthur River Mining does not believe that immediate closure and back filling of the mine void is the best approach nor would it necessarily result in a better environmental outcome given all scenarios would require some level of ongoing management (for example maintenance or water management).

Continuing operations, coupled with the proposed MRM mine closure strategy enables collection of more information while the site is still operational and enables the site to adapt to any changes as required. This presents a lower risk to closure. This additional information will be as a result of the following:

- the progressive rehabilitation of the NOEF enables the cover design to be adjusted and fine-tuned based on the performance of earlier stages;
- the collection of many more years of ground and surface water monitoring data will provide invaluable information to support McArthur River Mining's understanding of site wide water movements, enabling improved calibration of modelling and optimisation of any seepage mitigation requirements; and
- closure at the completion of mining and tailings reprocessing allows further work to be completed on the inputs into the mine pit lake modelling and stratification, increasing the confidence in the connected lake cases.

Some stakeholder comments have called for backfilling of the open cut mine void, presumably on the basis that the site will be returned to its pre-mining condition. While cost is one consideration, it is by no means the only factor MRM considered when assessing a range of closure scenarios around the mine void. It is important to note that due to swell factors of broken rock, backfilling the open cut mine void with a view to returning the site to pre-mining conditions cannot physically be achieved and raises a number of other environmental risks.

If a complete or largely backfilled open cut was to be established, this would require backfilling through zones of rock where groundwater movement occurs. There is insufficient benign material in the Overburden Emplacement Facilities or known quarry sites to place in this 'active' zone. Therefore, a substantial perimeter of the open cut would require permanent waterproofing in order to isolate the non-benign waste. In addition, there would be no viable way of repairing the seal if water seepage was to occur. This would result in an increased risk of groundwater and downstream surface water contamination. This scenario poses a higher risk than the NOEF and TSF closure proposals, as described in the project description.

A substantial difference between the ‘close now’ and the proposed project description cases is opportunity. The proposed project description has an operations phase with a revenue stream extending until 2047. This presents 30 years of economic activity encompassing direct jobs with MRM, indirect jobs with MRM suppliers of goods and services, funding for the regionally-oriented CBT, and above all, taxes and royalties paid to the governments in Australia. The ‘close now’ case clearly misses this opportunity.

9.6 Conclusions

The MRM OMP Draft EIS and Supplementary EIS together present a robust assessment of the LOM plan for MRM. Through the EIS process, a significantly greater knowledge of site-wide environmental processes and the associated interaction with mine infrastructure has been developed including:

- geochemistry, including additional static testing, kinetic testing based on multiple methods and mineralogy, resulting in a robust waste classification system;
- the NOEF, including internal temperature and gas monitoring, internal architecture and composition, spontaneous combustion management, and three dimensional unsaturated modelling for seepage water quality and quantity estimations;
- groundwater, including improvements in site wide geological controls, hydrogeological conceptual model and groundwater numerical modelling;
- surface water, including site water balance and numerical modelling of surface water quality estimations;
- final mine pit lake, including updated geochemical modelling and hydrodynamic modelling of the mine pit lake;
- development of a site wide Source – Pathway – Receptor conceptual model integrating all domains; and
- revised understanding of a realistic closure timeline for a large metal sulphide mine as presented in the closure plan.

MRM has also developed an overburden placement methodology that has been demonstrated to effectively manage the hazards of reactive waste rock. This includes the adoption of a tailored placement methodology in order to provide a degree of geochemical control and the safe storage of a range of overburden types within separate zones in a chemically stable structure.

In addition, MRM’s proposed tailings reprocessing phase will result in the recovery of added value from the asset and remove any potential liability from the TSF footprint by storing processed tailings subaqueously in the open cut final void in a landform with no geomorphic risks and no oxidation potential. This provides both environmental and economic benefits.

These abovementioned improvements to site knowledge and methodology have facilitated the development of robust mitigation and environmental management measures presented in both the Draft EIS and the Supplementary EIS. An Adaptive Management Framework that provides key decision making processes for the future development, management and closure of key site infrastructure has also been developed and will guide environmental management on site into the future. This framework facilitates ongoing consultation and focussed analysis of environmental performance.

This Supplementary EIS incorporates a number of project improvements that have been developed with the input of project stakeholders, technical specialists and government agencies. MRM believes the project as described in this Supplementary EIS represents the preferred path forward and that it addresses all stakeholder concerns.

The proposed project provides an optimum solution to achieve the MRM closure objectives including a stable and safe NOEF landform, the complete removal of the TSF and over time, development of a sustainable mine pit lake system.