

Executive Summary

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ES.1 Background

McArthur River Mining Pty Ltd (MRM) is proposing an increase in production for the existing McArthur River zinc-lead-silver mining and processing operation located approximately 70 km south-west of the township of Borrooloola and 900 km south-east of Darwin in the Gulf Region of the Northern Territory.

The current operations were established in 1995 and at that time consisted of an underground mine and processing plant which converted the mined ore into bulk concentrate. The mine converted to an open pit operation following an environmental impact assessment process in 2005-2006. Concentrate is trucked from the mine to the Bing Bong concentrate storage and ship loading facility (Bing Bong) from where it is loaded onto ships for export to refineries around the world to be made into zinc and lead metal and alloys.

The \$270 million McArthur River Mine Phase 3 Development Project (the Project) will sustain the long-term future of MRM through extending the life of mine by nine years to 2036. This is supported by an increased ore production rate from the current approved capacity of 2.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) ore to a peak of 5.5 Mtpa.

The Project will also include improving the efficiency of the existing processing facilities which converts the ore into a bulk zinc-lead-silver concentrate (bulk concentrate). The rate of concentrate production will increase from 360,000 dry metric tonnes per annum (dmtpa) to 800,000 dmtpa.

The various technical and social studies conducted for the EIS have found the Project will generate greater benefits than first anticipated when the Notice of Intent was lodged in March 2011. These include:

- the increased life of mine
- a 67% increase in permanent employment
- greater potential numbers of local and Indigenous employees based on at least maintaining current workforce participation rates
- extended commitments to the MRM Community Benefits Trust for the life of mine
- significant economic benefits forecast to total \$5.0 billion in direct investment in the Northern Territory over the life of mine and a national boost to \$9.3 billion in industrial output.

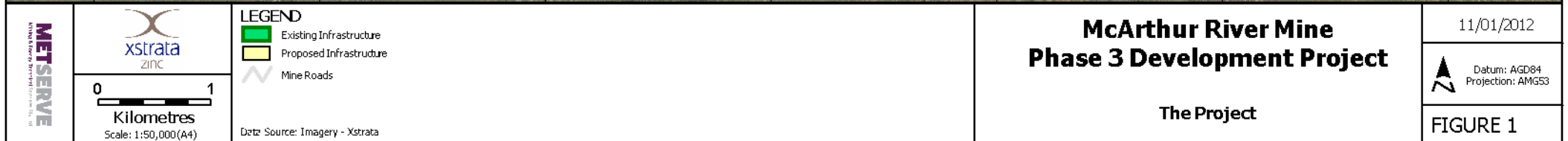
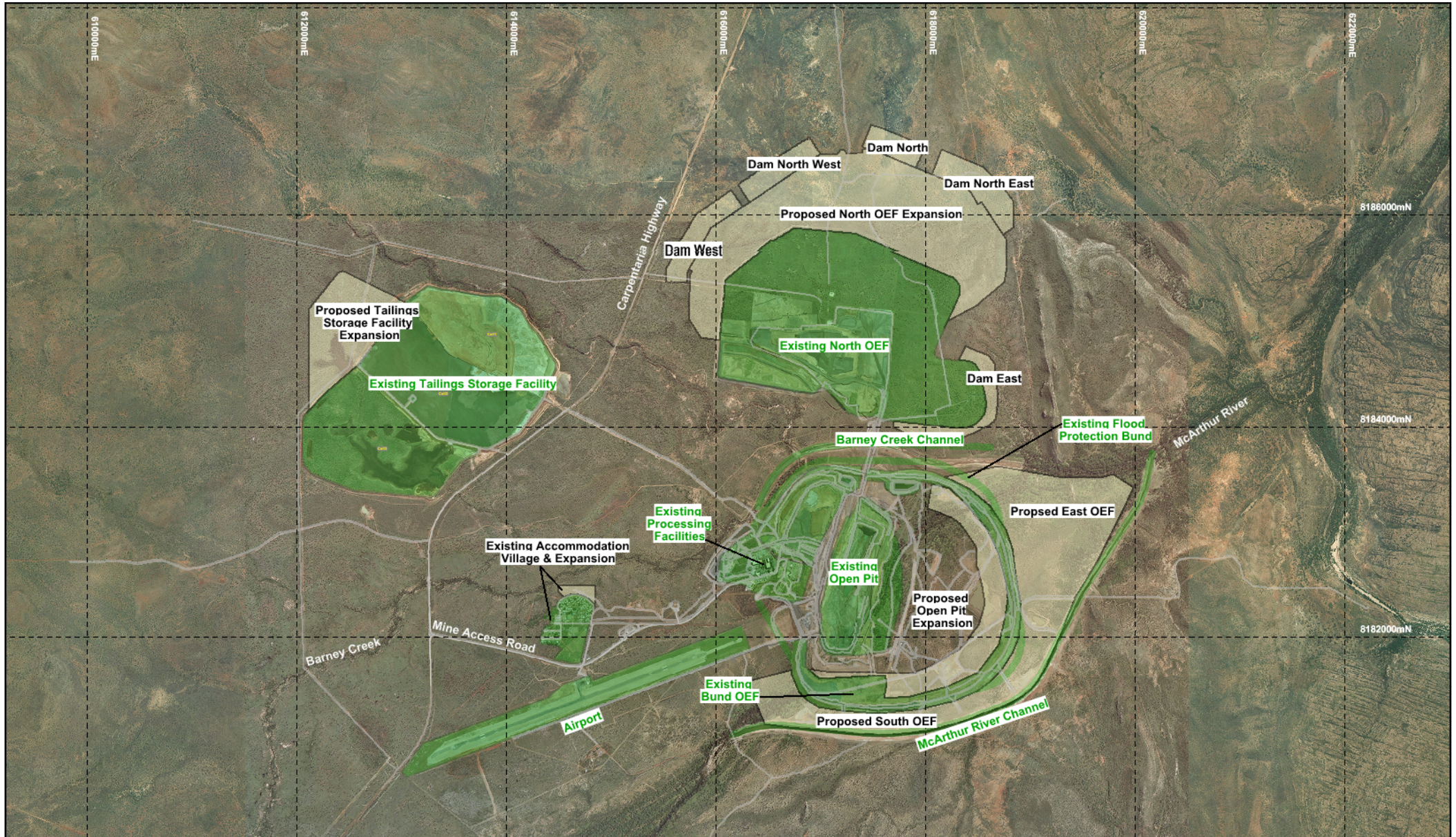
Importantly, the Project also gives MRM opportunities to introduce advances in environmental management techniques and technologies, particularly in relation to the tailings storage facility and overburden emplacement facilities. That is while also maintaining leading sustainable development and regulatory compliant strategies for all points of potential environmental impact.

This draft Environmental Impact Statement (EIS) has been prepared to identify and assess the environmental impacts from the Project and to develop appropriate management strategies. It has been prepared in accordance with the requirements of the Northern Territory *Environmental Assessment Act (1982)* and the Environmental Assessment Administrative Procedures under which the Act is implemented.

ES.2 Project Proponent

The Project Proponent is MRM, the current operator and a company managed within the Xstrata Zinc commodity business unit of Xstrata plc.

Headquartered in Madrid, Spain, Xstrata Zinc is one of the world's largest producers of zinc and one of the commodity business units within the major global diversified mining group Xstrata plc. Xstrata's zinc and lead operations and exploration projects are located in Australia, Canada, Germany, Peru, Spain and the United Kingdom.



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Xstrata plc (Xstrata), the ultimate holding company of MRM, is a major global diversified mining group listed on the London and Swiss stock exchanges and is headquartered in Zug, Switzerland. Xstrata acquired a 70% share in MRM when it purchased MIM Holdings Limited in June 2003. It subsequently moved to 100% ownership in September 2005 by acquiring the 30% share held by joint venture partner ANT Minerals.

ES.3 Environmental Commitment

Xstrata's Sustainable Development (SD) Framework is designed to ensure each operation takes into consideration economic, environmental and social responsibility aspects in their governance structure. The world-class SD framework comprises Xstrata's Business Principles, Sustainable Development Policy, Sustainable Development Standards and an independent assurance program. This framework is complemented within the commodity businesses. Xstrata Zinc's SD Policy and MRM's site-based policy and strategy sets specific actions and targets in relation to safety and health, training, environment, community, risk management and human resources.

Xstrata is also a signatory to the Minerals Council of Australia's Enduring Value Principles for Sustainable Development. The Proponent's performance against sustainable development standards is reported annually in a detailed Sustainability Report.

MRM will take appropriate precautions to minimise any potentially adverse impacts of its activities on the environment, community and employees.

The Project is being developed with a strong focus on sustainability. In order for the social and economic benefits to be realised, the local, regional and wider environment will be considered to facilitate future generations inherit a healthy and safe environment with improved living standards.

ES.4 Legal Framework

ES.4.1 Northern Territory Environmental Assessment Process

This draft EIS has been prepared in accordance with the requirements of the *Environmental Assessment Act 1982*. A Notice of Intent (NOI) for the Project was submitted on 11 March 2011. Draft Guidelines were issued on 23 July 2011. On 19 August 2011, final EIS guidelines were received.

An 'Authorisation to Operate' the existing mine has been received in accordance with the requirements of the *Mining Management Act 2001*. This requires the mine to operate under an approved Mining Management Plan that is reviewed and updated on an annual basis, or when significant changes are proposed to existing approved operations. Approval for the proposed Project will be sought under this Act and, if granted, a revised Authorisation to Operate will be issued.

ES.4.2 Commonwealth Government Environmental Assessment Process

Under the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), developments require assessment if they have the potential to affect one or more of six matters of National Environmental Significance.

A referral under the *EPBC Act* was submitted to the Commonwealth Government Department of Sustainability, Environment, Water, Populations and Communities (SEWPAC) in April 2011. A decision was made in June 2011 that the Project did not constitute a 'Controlled Action' under the Act. As such, the Project has been assessed as not having the potential to negatively impact on any of the six matters of National Environmental Significance.

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ES.5 Project Objectives and Benefits

ES.5.1 Market Opportunities

World zinc metal output is currently constrained by zinc concentrate supply. The global market is forecast to enter a deficit period due to increasing demand from Asia, namely China. Industry forecasts predict a widening gap will emerge between known zinc mine supplies and the demand for zinc in concentrates which reflects the underlying growth in demand for refined zinc. As zinc metal output is now largely restricted to the availability of zinc concentrates in the market, global metal production is increasing moderately.

ES.5.2 Project Need

The forecast gap between known zinc supplies and the demand for zinc in concentrates provides an opportunity for MRM to increase its participation in the zinc business and to capture an opportunity in the market by developing a highly competitive operation through economies of scale. This will be achieved by increasing the production rate from 2.5 Mtpa to a peak of 5.5 Mtpa. The extra production and lower unit costs will enable an increase in the ore reserves that can be economically extracted, from 53 Mt to 115 Mt, which has the potential to generate many benefits.

Should the Project not proceed, the mining rate will be limited and mine life will not be extended by nine years. This will result in a loss of economic benefit for the Northern Territory and the premature loss of employment for the existing workforce.

ES.5.3 Project Benefits

The Project will secure a substantial and long-term mining operation which will produce significant direct and indirect benefits to the Northern Territory and Australia generally.

The benefits from the proposed Project include:

- Continued contribution to the Northern Territory and Australian economies: the Project will enable the economic benefits of the mine to continue, and increase. It is forecast to contribute approximately \$5.0 billion to the Gross State Product of the Northern Territory and \$5.5 billion to Australia's Gross Domestic Product over the life of mine
- Capital investment: The Project will result in an up-front capital investment of \$270 million
- Increased mine life: The sustainable mine life will be extended from 2027 to 2036, securing the future of the mine, its output and its employees for a further nine years
- Employment: during construction and operational phases, the workforce is expected to peak at approximately 930 and 735 personnel respectively
- Sustainable growth of the current Indigenous employment and training program and local employment initiatives: as the total workforce grows, the numbers of Indigenous and local people employed are expected to rise at a rate at least equal to the current proportion of the total workforce. At the time of preparing the EIS studies, Indigenous workforce participation was 24% and local employment accounted for 18% of the total personnel
- Local economic activity: direct purchases for equipment, goods and services during Project construction (2012 and 2013) will input more than \$191 million into the local and regional economies of the Northern Territory. During the Project's operational phase between 2014 and 2036, direct expenditure for goods and services by the project will total over \$5.5 billion supporting a wide array of business support sectors within the Northern Territory's economy.

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ES.6 Existing Operations

MRM is an open pit operation which is developing one of the largest known sedimentary stratiform zinc-lead-silver deposits. It currently produces around 360,000 tpa of bulk lead-zinc-silver concentrate for overseas and domestic markets. The total workforce is approximately 440 permanent personnel. The majority of the workforce is employed on a Fly-In/Fly-Out (FIFO) basis who while on site, live in a fully equipped accommodation village, with the remainder residing locally, including in the township of Borroloola.

ES.6.1 Mining

The mine has two distinct activities within the one pit: overburden removal and selective ore mining. The existing processes are similar for each activity; however the scale and type of equipment used may differ.

To maximise the value of the ore-body, the mining operation separates ore and waste (overburden and interburden) so that a relatively clean ore can be fed to the processing plant. The ore mining fleet uses smaller machines to enable more detailed separation of these ore and waste bands, with ore being delivered to the processing plant and the waste being sent to an Overburden Emplacement Facility (OEF). A bulk mining fleet using larger and more productive equipment has the task of efficiently removing the overburden for placement in the OEFs.

The open pit will be developed in a number of stages over the mine life, which is currently scheduled to be completed in 2027.

ES.6.2 Processing

The crushed ore is processed in the concentrator by removing impurities and converting it into a bulk concentrate. The processing operation consists of the following basic steps:

- secondary/tertiary crushing
- Heavy Media Plant separation to pre-concentrate low grade ore types
- primary grinding
- rougher flotation and pre-cycloning
- regrinding
- cleaner flotation
- thickening and filtration.

ES.6.3 Concentrate Storage and Handling

Concentrate from the processing plant is stored in a concentrate storage shed prior to road transport to Bing Bong.

Road-trains with covered, side-tipping trailers are used to transport concentrate from the mine site to Bing Bong which is on the coast approximately 120 km north of the mine site. The road is a two-lane highway which bypasses the township of Borroloola.

ES.6.4 Tailings

Tailings are the fine solid materials that remains after the mineral bearing component of the ore has been extracted during processing. The tailings stream from the flotation circuit is pumped to thickeners. The waste water and solids from the thickener are pumped to and contained within the Tailings Storage Facility (TSF) which currently features three cells.

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Cell One, closest to nearby Surprise Creek, has been decommissioned and is now undergoing rehabilitation. Cell Two is used for tailings deposition with water re-drawn to the processing plant and recycled for use. Cell Three is used as a water management dam for freshwater and as an overflow point for Cell Two.

ES.6.5 Bing Bong Loading Facility and Bulk Carrier

The road-trains deliver the concentrate to a storage shed at Bing Bong. A shallow-drafted bulk carrier (MV Aburri) is used to transport concentrate from Bing Bong to sea-going vessels which anchor at a designated off-shore deep-water transfer zone. A feature of the Aburri is its ability to self-load (from a single shore mounted loading chute) at an average rate of 900 to 1,000 tonnes per hour (tph) and then discharge at an average rate of 900 to 1,000 tph into the ocean-going vessel.

ES.7 The Project

ES.7.1 Overview

MRM proposes to increase the production of ROM ore from 2.5 Mtpa to a peak of 5.5 Mtpa. The Project will also include improving the efficiency of the existing processing facilities which converts the ore into a bulk zinc-lead-silver concentrate (bulk concentrate). The annual rate of concentrate production will increase from 360,000 dmtpa to 800,000 dmtpa. All operations will take place within the existing Mineral Leases.

A comparison of the key components of the existing operation and how they will change with the Project is given in the following table, with more detailed discussion of these changes below.

Component	Current Operations	Project Operations
Resource	53 Mt Reserve	115 Mt Reserve
Mining Rate	2.5 Mtpa of ROM ore	Up to 5.5 Mtpa of ROM ore
Mine Life	Until 2027 (at 2.5 Mtpa)	Until 2036 (at 5.5 Mtpa)
Mining method	Open pit mine using conventional drilling, blasting, loading and haulage methods	No change
Tailings	Tailings discharged to tailings storage facility	Currently planned Cell Four to be expanded to support the Project.
Pit Dimensions	Length – 1,500 metres Width – 800 metres Depth – 210 metres Overall footprint – 145 hectares (within the existing approved bunded area)	Length – 1,750 metres Width – 1,500 metres Depth – 420 metres Overall footprint – 210 hectares (within the existing approved bunded area)
Waste rock	Stored on surface in OEF – capacity 185 Mt	Stored on surface in existing and new OEFs – an additional 530 Mt
Processing	Heavy Media Plant under construction to treat ore in a pre-concentration phase. Flotation process producing concentrate (46% Zn concentrate grade)	No change in method. Increase in processing capacity
Power	Gas fired turbines producing 20 MW. Fired with natural gas delivered to site via a pipeline from Daly Waters	No change in method. Gas power station capacity increased to 45-50 MW

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Component	Current Operations	Project Operations
Product	360,000 dmtpa of lead-zinc-silver concentrate (166,000 tonnes of zinc in concentrate)	800,000 dmtpa of lead-zinc-silver concentrate (368,000 tonnes of zinc in concentrate)
Transport	Concentrate trucked 120 km to Bing Bong concentrate storage and ship loading facility, transferred to barge, barged to offshore loading area onto bulk carriers	No change in method. Approximate doubling of concentrate volume trucked to Bing Bong concentrate storage and ship loading facility (up from 9 truck movements per day to 18) and barge movements (up from 110 to 250 per year)
Water Management	Bore fields water supply Mine water collected and utilised in the process Evaporation from on-site dams Water discharge licence granted	To continue. No creek/river diversions necessary Existing water management structures to be upgraded Irrigation scheme for beneficial use of excess water to be investigated with adjoining pastoral lease.
Workforce	Approximately 440 permanent staff and contractors	Construction phase workforce peak at approximately 930 Operational phase workforce peak at approximately 735 permanent staff and contractors

ES.7.2 Construction

The construction phase will be undertaken over a two year period, with the majority of activities taking place during the dry seasons. An extra 400 persons will be required for the Project construction works and will be accommodated in a construction camp to be built adjacent to the existing accommodation village.

ES.7.3 Mining Activities

Expansion of the Project would result in lower unit costs, enabling mining to be extended deeper than the current planned final pit, which has the pit bottom at 210 m below ground level. The Project would result in the amount of ore mined being increased from the current Reserve of 53 Mt to 115 Mt from a pit that would extend down to 420 m deep, mining out much of the old underground mine. To enable the extra ore to be mined, an extra 530 Mt of overburden would also be removed. This would extend the mine life by 9 years, out to 2036.

The mining techniques and equipment used would be similar to that planned for the current operations, though the peak annual mining rate would increase from around 35 Mt per year to 60 Mt per year. This will require more equipment and personnel.

ES.7.4 Processing

The existing processing plant will be upgraded to treat the 5.5 Mtpa of ore that will be mined to produce 800,000 dmtpa of concentrate. This will require expanded crushing facilities, and additional grinding mills, flotation cells and thickeners. The Heavy Media Plant currently under construction meets current market needs and has sufficient capacity to support the proposed expanded rate of production.

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ES.7.5 Concentrate Transport

As is the current practice, the concentrate will be trucked to Bing Bong for export. The existing loading facilities at Bing Bong have sufficient capacity and will require minimal upgrades.

ES.8 Infrastructure

ES.8.1 Accommodation Village

The accommodation village will be expanded to the north in stages to accommodate the Project's increased operational workforce. Estimates indicate the Project requires an extra 30 permanent rooms in 2012, with a further 80 rooms built in advance of the operational workforce peak in 2020.

A temporary camp of up to 300 rooms will be required for the Project's construction period, which will be decommissioned once all construction activities are complete.

ES.8.2 Water Supply

As is the current practice, the majority of the Project's process water will be sourced from recycled water with makeup water sourced from groundwater bores as required. There is also utilisation of dirty and contaminated surface water runoff from the site's surface water management system. The Project's site water management system is expected to result in the mine becoming a net producer of water.

There will be no changes required to the existing accommodation village water supply system as a result of the Project. The potable water used in the accommodation village for human consumption and sanitary purposes is sourced from groundwater bores in the Mimex borefield.

Water used at Bing Bong is sourced from the Federation groundwater bore. There will be no change in water demand at Bing Bong as a result of the Project.

ES.8.3 Sewerage

The existing accommodation village and mine, including shower, toilet and crib room facilities, has a reticulated sewerage system which has been recently upgraded. There will be no further changes required to the permanent sewerage system as a result of the Project.

During the construction phase, a packaged sewage treatment plant will be utilised to cater for the construction camp. Treated effluent from the plant will be irrigated in the same manner as the existing sewerage plant effluent.

ES.8.4 Traffic and Transport

There will be a change in traffic patterns during the Project's construction and operations stage.

An increase in traffic numbers will occur during the construction phase due to the transportation of new milling equipment and components for the Project.

During Project operations, the haulage rate between the mine site and Bing Bong will increase in line with the growth in annual concentrate production. The frequency of truck movements will increase from approximately 18 truck trips per day, seven days per week, up from nine trips per day currently. The impact from this increase in traffic volumes on the existing road system is considered relatively minor due to the existing low traffic numbers utilising the network.

The assessment of the Project's transport task, provided in Chapter 8 – Traffic and Transport, concluded that the Carpentaria Highway currently requires reconstruction works and if these works were undertaken, the resulting pavement is likely to be sufficient to avoid any further pavement maintenance works for the life of the Project.

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ES.8.5 Power

Electricity for the existing mine is generated on-site in a gas-fired power station. There will be an increase in the power demand with the Project, and hence an expansion to the existing power facilities is required from the current capacity of 20 MW to 45-50 MW. The existing pipeline has the capacity to fulfil these requirements.

ES.8.6 Airport

There is an existing single sealed runway at MRM: 2,500 m in length and 23 m in width with sealed and paved turning areas at each end. The airport will continue to be used by the Project's workforce and there will be no requirement to change the existing facility. The frequency of flights will increase in line with the increased FIFO requirements, potentially making more seats available for the general public.

ES.9 Waste Management

ES.9.1 Overburden

Over the life of the Project, approximately 530 million tonnes (Mt) of additional overburden waste rock will be removed from the open pit. As per current operations, the overburden will be divided into the following categories to define its potential environmental impact: Potentially Acid Forming (PAF) and Non-Acid Forming (NAF) material (which includes acid neutralising or acid consuming material). PAF overburden has the potential, in the presence of air and water, to generate acid water, soluble metals and salts that could impact the environment. NAF overburden is chemically stable with low potential for generation of environmentally significant products. Some NAF overburden also has the capacity to neutralise runoff and seepage from PAF material. As a normal part of mining, geochemistry assessment programs will continue to be undertaken to further verify the quantities of overburden categories over the life of mine.

The existing North OEF (NOEF) will be expanded to cater for most of the mined Project overburden, expanding from 375 ha to 860 ha, with a height increase from 55 m to 80 m. This height limit will result in the NOEF being no higher than the adjacent ridge. As is current practice, in the North OEF, PAF overburden will continue to be encapsulated within clay cells and layers of NAF waste above the 100 year ARI flood level to ensure that there is no acidic seepage generated by the facility. The expanded NOEF will require additional drains, sediment traps and dams to manage both surface water runoff and seepage. Materials to be used for OEF rehabilitation, including topsoil, clay and NAF overburden will be stockpiled to enable stable and safe landforms to be created both during and at the end of the mine life.

The existing bund OEF inside the wall and the mine flood protection bund will be expanded to fill in the vacant area between the bund and the McArthur and Barney Creek channels. This will result in the footprint expanding from 120 ha to 270 ha, with an increase in height from approximately 15 m to up to 80 m. The base of the OEFs allow at least 75 m to the crest of the channels to preserve a corridor for flora and fauna, and to maintain flood levels and water flow velocities to acceptable levels that will minimise erosion of the channels. Development of these OEFs will be staged so that habitat and fauna in the old McArthur River that is now cut off by the flood protection bund is preserved until suitable replacement habitat is created in the channels.

Additional monitoring around the expanded footprints will be conducted to manage the potential impacts of these facilities.

ES.10 Tailings Storage Facility

The existing and approved tailings storage facility (TSF) footprint will be utilised for the Project, with the use of a new cell, Cell 4, which is planned for construction in 2012. Cell 4 will be a converted water management dam that is required for the current operations to adequately manage water in the open pit and old underground workings. This new water management dam, which will be joined to the western side of the existing TSF facility, will be converted to a TSF to store Project tailings from 2032 as current capacity is utilised.

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This new water management dam is currently being considered under the annual Mining Management Plan process pursuant to Section 40 of the *Mining Management Act 2001*. Cell 4 will be designed and constructed to enable conversion to tailings storage at a later date, and so will have several features designed to ensure safe and environmentally sound storage, including; suitable design of foundations and walls that are stable under all expected conditions, including seismic loading; a low permeability liner; under-drains to collect any seepage; and drains for surface water management. Predicted impacts on groundwater will be modelled as part of the detailed design. Impacts are expected to be low due to the range of seepage prevention and mitigation measures proposed. Cell 4 has been located at an increased distance from Surprise Creek to minimise the risk of impact to the creek.

The final level of Cell 4 would be 61 RL, which is 7 m lower than the final height of the currently approved cells 2 and 3. As such, it will not be visible from the Carpentaria Highway at the end of mine life.

ES.11 Operational Waste

Waste management at MRM is an integral component of the site's Sustainable Development system. Waste management practices aim to reduce waste production through recovery, re-use and recycling and through encouraging efficient utilisation of resources. MRM aims to promote best practice disposal of waste products both on-site through appropriate maintenance of waste disposal areas and off-site through utilising environmentally responsible waste disposal companies. The site's existing waste management system will continue with the Project.

ES.12 Air Quality

There will be no significant air quality impacts from the Project.

The main fugitive emissions to air from the current mining activities are particulate matter (dust) from exposed areas, stockpiles and vehicle movements. There are also emissions of particulates from the ore crushing and handling operations. With the Project, these same emission sources will continue, which include stripping, drilling and blasting, and grading. The existing power station will be upgraded from 20 MW to 45-50 MW capacity, increasing the point source emissions from the site.

Modelling of air emissions from the Project operations has demonstrated that at the nearest sensitive receptor (the accommodation village) there will be no exceedence of air quality standards under any meteorological conditions.

The main sources of greenhouse gas (GHG) emission from the site are the gas-fired power station and diesel for the mining fleet. Natural gas will continue to be used as the energy source for electricity generation. This results in significant reduced GHG emissions compared to the alternative energy sources of coal or oil. With the Project, the annual GHG emissions (CO₂ equivalent) will increase to an average of 265,190 t CO₂-e per annum – which is made up of 62,528 t CO₂-e per annum of Scope 1 (direct) emissions and 202,662 t CO₂-e per annum of Scope 2 (indirect) emissions.

Xstrata Zinc is a signatory to the Greenhouse Challenge Plus program, and is committed to demonstrating an improvement in net greenhouse efficiency of mine operations by decreasing the greenhouse gas emissions on a per tonne mined basis.

ES.13 Noise

The main sources of noise generation from the Project will include mining and blasting activities, crushing and grinding, power generation, and traffic.

Modelling of noise emissions from the Project operations has demonstrated that at the nearest sensitive receptor (the accommodation village) there will be no exceedence of noise standards under any meteorological conditions. Thus there will be no significant noise impacts from the Project.

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ES.14 Groundwater

ES.14.1 Existing Aquifers

Historically, groundwater has formed an important component of mine process water and potable supply especially during the dry season. Aquifers in the mining area occur as a result of both intergranular and secondary permeability. There are two main aquifer types as follows:

- Alluvium – sand and gravel deposits in the major river channels and associated palaeochannels
- Bedrock – secondary structures (such as faults, shear zones and joints) in the upper weathered bedrock and the lower fresh bedrock.

A network of groundwater monitoring bores has been established to monitor the impacts of the current mining operations on the groundwater resources of the area. MRM routinely completes a monthly sampling program in the local groundwater monitoring bores around the plant site and the tailings storage facility.

ES.14.2 Pit Dewatering

The current open pit operations are being affected by groundwater inflows. The mine currently has a range of mitigation measures proposed in the annual Water Management Plan and Mining Management Plan process pursuant to Section 40 of the Mining Management Act 2001. These include a cut-off trench under the mine flood protection bund to block palaeochannel water, and a series of dewatering bores inside the bunded area to remove groundwater that would otherwise flow into the pit.

Extraction of groundwater before it enters the disturbed areas will maintain the natural qualities of the groundwater so that it can be put to beneficial use, as well as enhancing the stability of the open pit walls. The deeper and larger footprint of Phase 3 would require deeper and more numerous dewatering bores than the current final pit.

The rate of groundwater inflow has been estimated to average 17 ML per day, which is not significantly above extraction rates predicted to be required for the current final pit. The groundwater quality is expected to meet ANZECC standards suitable for irrigation and livestock. As the predicted volumes of groundwater are in excess of the operation's requirements, the groundwater must be used in other ways. Groundwater extraction would occur year round, with the water stored in the existing cell 3 Water Management Dam (WMD) at the TSF.

Where flows in the McArthur River allow (usually in the wet season after large rains), the excess groundwater would be discharged into the river at a rate that will not have any impact on downstream ecosystems, as agreed to with the government in a documented Discharge License. For periods when discharge is not possible, the water will be sent to dams and irrigation fields on the McArthur River Station, enabling the growth of improved pastures and trees. This will provide both feedstock and drinking water for livestock, thereby improving the productivity of the land. The fields selected will have a soil profile suitable to prevent any salinity impacts due to irrigation. Some groundwater may also be evaporated, if there is capacity in the dams.

ES.14.3 Drawdown

As a result of groundwater extraction required for mine dewatering, groundwater levels are modelled to be lower in the immediate area of the open pit. By the end of mining, the total drawdown will be approximately 380 m below the groundwater level. However, because of the generally low permeability of the bedrock surrounding the open pit, the very large drawdown that occurs around the open pit will quickly reduce with distance from the mine.

Groundwater levels will reach a dynamic equilibrium (fluctuating between about 11 m below ground level in the dry season and about 8 m below ground level in the wet season), 1.5 years after the cessation of mine dewatering.

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ES.14.4 Djirrinmini Waterhole

Lowering of groundwater levels in the superficial sediments has the potential to affect water levels in Djirrinmini Waterhole which is a permanent pool in the McArthur River approximately 1 km upstream of the McArthur River Channel. While Djirrinmini Waterhole is filled by stream flow on a seasonal basis each wet season, during the dry season when the stream flow reduces, groundwater inflow from the surrounding aquifers plays an important role in maintaining water levels.

Djirrinmini Waterhole is located on low permeability weathered bedrock, but the banks at the upstream end of this pool are in alluvium, underlain partially by a palaeochannel. The groundwater model predicts drawdown in 2036 of 0.7 m which may result in a decrease in the depth and extent of the pool at the end of the dry season, prior to being replenished in the following wet season. This reduction will not occur until after 25 years of mining and prior to this, the drawdown will be significantly less. The existing groundwater monitoring network will allow for the confirmation of the predicted effects and provide an early warning of potential environmental impacts allowing management of such impacts.

In the event that the monitoring program indicates that drawdown levels are significantly greater than expected, mitigation measures such as sustaining upstream river flows from suitable existing bores will be considered.

ES.15 Surface Water

ES.15.1 River Hydrology

Streamflow throughout the McArthur River catchment is highly variable as a result of thunderstorm, cyclone or monsoonal rainfall. The greatest flows occur during the wet season which generally extends from October to March. River flow in the vicinity of the mine typically dries up to a series of large isolated pools during the dry season between August and September. No-flow periods are typically one to two months and can last up to six months.

Floods in the McArthur River are large and highly variable. Peak flows of up to 6,200 m³/s were recorded during floods in February 1975 near the mine site. Flooding in the vicinity of the mine is influenced by a narrowing of the floodplain at the Bukalara Range, 3 km downstream of the mine.

ES.15.2 Existing Surface Water Quality

The current McArthur River system is considered to be 'slightly to moderately disturbed' relative to ANZECC water quality guidelines for fresh and marine waters.

Surface water quality in the vicinity of MRM is affected by strong seasonal stream flows and naturally elevated levels of heavy metals due to the close proximity of mineralised zones to the surface.

Salinity, pH and sulphate levels are also strongly related to stream flows. Salts tend to accumulate during the dry season as a result of evaporation, and then salt concentrations drop dramatically during the wet season due to dilution and flushing from high flows.

The metals, copper, lead and zinc show the opposite trend to salt. Concentrations tend to increase during the wet season when turbidity levels are highest, and consistent with strong metal-sediment attachment properties.

ES.15.3 Surface Water Management

The overall philosophy and objectives of the MRM surface water management system will remain the same as existing operations. Clean water will be diverted around disturbed areas. Water runoff from operational areas that could only contain sediment (such as from NAF areas of the OEFs, or newly rehabilitated areas) will be directed to appropriately sized sedimentation traps. All traps will be designed to appropriate standards and

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sized in accordance with calculations from the site water balance model. Final designs will be engineered as per regulatory requirements. Water that could contain adverse chemistry would be managed in separate water management systems, where any water that could not be re-used would be evaporated.

Changes to the existing surface water management measures will be required to accommodate the proposed changes to the mine site layout (e.g. increased open pit area, extended OEFs, TSF Cell 4). The key additional facilities include:

- Clean water diversion structures are shown in plans for TSF Cell 4 and the NOEF.
- Sediment traps have been designed around the new footprints of the OEFs.
- The South and East OEFs have an engineered Erosion Protection Bund constructed in advance to protect water management structures from erosion and damage.
- Additional dams for holding potentially contaminated water at the NOEF will be constructed in stages as the footprint expands.
- TSF Cell 4 would continue to be used for evaporation of excess contaminated water pumped from the pit and underground workings, as per the current operations.
- Additional groundwater and surface water monitoring points have been planned around the expanded footprints of the TSF and OEFs.

The passage of the McArthur River and Barney Creek will be unaffected by the Project.

ES.16 Nature Conservation

ES.16.1 Terrestrial Flora

Four distinct vegetation communities occur within the Project area. The riparian and floodplain communities are common and widespread. While the sandstone plateau vegetation types have some local ecological value, they have no declared conservation value and will not be affected by the Project. No plants with declared endangered or threatened IUCN threat status were found during the site surveys.

The main areas to be developed for the Project are the open pit, North OEF, South OEF and East OEF. Cell 4 of the TSF will be a converted water management dam. The area associated with this new water management dam is currently being considered under the annual Mining Management Plan process pursuant to Section 40 of the *Mining Management Act 2001*. None of the vegetation species to be cleared in these areas have declared conservation significance.

The South and East OEFs will be in close proximity to the Barney Creek and McArthur River Channels, which includes development of portions of the old McArthur River. Buffer zones in excess of 70 m between the proposed OEFs and the channels will be mapped and maintained, and designed to maintain a riparian corridor for native fauna. Revegetation of the main channel will continue and a diversity of plants will be established in conjunction with intensified revegetation efforts.

Where practicable, final landforms will be contoured to resemble the original local topography to include hill slopes and rocky drainage lines. This will provide a structure to facilitate the establishment of a variety of habitat types. An extensive revegetation program will be continued on site, with monitoring and remediation program continued until rehabilitated areas are considered to be ecologically stable.

The site's existing weed and fire management programs will be expanded to incorporate the Project.

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ES.16.2 Terrestrial Fauna

Previous surveys and a search of the EPBC Act Protected Matters database identified six threatened species of national conservation significance as being potentially present, or that their habitat is likely to occur, in the Project area. They include three bird species, one mammal species, one reptile species and one fish species. In addition to the Commonwealth listed threatened species, 15 migratory species have been identified as potentially occurring in the area.

No endangered fauna species have been confirmed as occurring within the proposed Project area. None of the migratory species are likely to be significantly affected by the Project. By their nature, migratory species are wide ranging, and in the absence of important habitats in the Project area, they will be largely unaffected.

The new OEF areas will occupy an additional area of approximately 635 ha of land. Clearing of vegetation for these OEFs is to be staged. Monitoring of riparian birds, aquatic fauna and other species of conservation significance will occur as clearing progresses in line with existing bird monitoring programs.

The extended life of Cell 4 at the TSF as a water management dam, before conversion to a tailings dam, is not expected to cause any deleterious impact on terrestrial fauna. The existing TSF is already used by many species of waterbirds, including listed migratory species and will continue to provide this habitat. Project TSF water quality will be similar to the existing operation. The current bird monitoring program has not recorded any bird deaths or other deleterious effects to birds using the site.

Without appropriate mitigation measures, encroachment of the East OEF area within close proximity to Barney Creek and the McArthur River Channel may have negative impacts on terrestrial fauna. The old McArthur River channel, both upstream and downstream of the current bund wall, is currently a functioning ecosystem that provides a terrestrial fauna refuge and corridor. The riparian corridor is currently disrupted by the present open pit, as there is no functioning riparian vegetation corridor along the channels. To mitigate the potential impacts, where practicable, development of the OEFs over the old McArthur River path will be delayed, until the ecological value of the McArthur River Channel has been enhanced through revegetation activities. Buffer zones of at least 70 m between the OEFs and channels will be maintained and kept free of cattle.

The feasibility of a program to relocate populations of purple-crowned fairy-wrens and buff-sided robins from within the pit area and the two old McArthur River channel sites will be investigated by suitably qualified ecologists. These local populations have been subject to long-term monitoring and without appropriate management (relocation/reestablishment of alternative habitat areas) would be significantly impacted by the Project.

Increasing the cattle exclusion areas along the McArthur River channel and expanding these into woodland habitats will mitigate removal of habitat for purple-crowned fairy wrens, Australian bustards, Merten's water monitors and other threatened species. The high biodiversity values and environmental benefits of the cattle-free areas are already demonstrated in the area. Fencing will be rapidly maintained following each wet season to minimise potential for cattle to enter the exclusion areas.

Continuation of the current riparian bird program will require some modifications to capture any potential additional impacts of the Project. MRM will continue monitoring of riparian bird fauna.

ES.16.3 Aquatic Ecology

The known freshwater fish fauna of the McArthur River system consists of about 27 species. All species are naturally occurring and there are no introduced or translocated species recorded from the catchment. Most species are common and widespread across northern Australia. Freshwater crocodiles (*Crocodylus johnsoni*) are also common in the McArthur River.

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The old McArthur River channel, both upstream and downstream of the current bund wall, remains operational as a functioning ecosystem, with some relevance for the maintenance of aquatic fauna diversity. There are a number of mitigation strategies to manage the impact of disturbing the old river channels:

- Should ecological values within the old channel areas exist immediately prior to disturbance of this area, surveys of aquatic fauna will be undertaken to identify their relevance as dry season refugia and wet season resting areas, as well as to inform the management of the potential impacts of this Project component.
- Where practicable, development of these two areas will be delayed until riparian ecosystem functionality of the surrounding channel has been enhanced.
- When the South and East OEF is established, banks will be stabilised by increased planting of the diversion batters, direct seeding and planting of established trees to help prevent excessive erosion due to elevated flow rates and provide slow back-waters to aid upstream fish migration. Building additional baffling on the western diversion wall to reduce erosion will be implemented if erosion appears.
- Coarse woody debris will be retained as habitat piles adjacent to and within the McArthur River Channel to provide refugia, disrupt stream flow rates and provide heterogeneity of habitats.

ES.17 Cultural Heritage

The region in which the mine is located has long been, and continues to be, an area of importance to Aboriginal people. While many Aboriginal people still live in the general region of the mine, no-one lives in the immediate vicinity of the mine.

In June 2011, archaeological surveys of the Project area were undertaken to verify the results of previous findings. The Project will have a varying impact on identified cultural heritage sites within the Project area. These are related to the expansion of the North OEF, the TSF and the accommodation village. Some sites of low to moderate archaeological significance will be impacted.

There are a number of registered and recorded sacred sites in the vicinity of the Project area. The Aboriginal Areas Protection Authority (AAPA) has issued authority certificates for the majority of the Project areas in accordance with Section 22 of the *Northern Territory Aboriginal Sacred Sites Act 1989*. New Certificates will be applied for if required. The AAPA certificates include requirements for protecting nearby sites during the Project's construction. MRM and its employees and contractors will adhere to these AAPA requirements.

There are no native title issues which affect the Project.

ES.18 Social and Community Effects

A comprehensive Social Impact Assessment (SIA) was conducted to identify and analyse intended and unintended social consequences, both positive and negative, of the proposed Project and how these may affect the future vision of the area.

The SIA developed a profile of the community as one with a significant Indigenous population (around 75%), a high density of children and youth, and low rate of population growth. The community has a demand for social and economic infrastructure and need for job creation activities to replace the current employment under Commonwealth Development Employment Projects (CDEP) Program which will terminate during 2012. Targets have also been established for improved living standards and education performance in line with Australian average measures.

All levels of socio-political governance are committed to similar visions and objectives for this region to become a vibrant, healthy, thriving community with Borroloola targeted for development as a Northern Territory Growth Town.

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Since its establishment in 2007, the MRM Community Benefits Trust has already committed \$7 million towards programs supporting the region's development with a heavy focus on enterprise and job creation as well as education initiatives. A further \$930,000 has also been invested in community-based sponsorships and donations over this period.

The Trust has been established for the life of mine and so will automatically be extended with the Project's implementation. Subject to periodic reviews, this will increase the total commitment of the Trust from in the order of \$32 million (by 2027) to \$43.3 million by 2036.

Detailed consultation identified community perceptions regarding a range of potential risks and opportunities associated with the Project. These have been fully considered within the risk management planning for the Project and mitigation or optimisation strategies developed.

ES.19 Community Consultation

Almost 300 people have been reached through 130 points of contact in a comprehensive consultation program conducted as an input to the Social Impact Assessment. The consultation found genuine interest in and support for the Project and support for the methodology undertaken to equitably involve a large number of stakeholders representing a diverse range of local, regional and cultural interests. Consultation aimed to share information in an open, equitable, all-inclusive and comprehensive way and to encourage community feedback and input into the process.

This study found there is a clear and determined sense of empowerment in the community – that they can drive and play a key role in their future and the future of their town. This attitude contributed to the success of this consultation program in engaging with a large number of stakeholders and community members as they wanted to be part of the consultation process. Their feedback reflected a future-focussed town looking to capitalise on opportunities.

The outcomes of discussions revealed a number of topics of common interest: job opportunities and community benefits were the most frequently raised subjects and were recognised as ways MRM is positively contributing to the region. Comments and questions were also raised in relation to traffic conditions (specifically the state of the local roads), rehabilitation of the McArthur River, environmental monitoring at Bing Bong, economic opportunities for local procurement, and to a lesser extent, the TSF's purpose and performance and OEF rehabilitation.

ES.20 Health and Safety

MRM currently has a Sustainable Development (SD) Management System structure, based on the Xstrata SD standards that cover Health, Safety, Environment and Community issues. If required, the procedures within the current system will be amended and updated as appropriate. The construction and operational phases of the Project will be incorporated into the SD Management System.

ES.21 Risk Management

The risk management process used by MRM has various levels or stages which correspond to the stages of Project development with an ongoing process of risk assessment and management consistent with *ISO 31000 Risk Management – Principles and Guidelines*.

A preliminary hazard study was undertaken during the Project feasibility study to identify the safety, health, environmental and business risks associated with the Project. Controls or management strategies to avoid or mitigate these risks were identified and will be implemented.

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ES.22 Rehabilitation and Closure

The main objectives of the MRM rehabilitation program are to:

- plan the placement of materials in a strategic manner to facilitate rehabilitation and to minimise material handling costs
- conduct monitoring that will enable effective techniques to be implemented when carrying out rehabilitation
- carry out rehabilitation works that will, at the completion of the Project, result in a stable, vegetated landscape having minimal impact on the surrounding environment.

The rehabilitation strategy will remain flexible and will be amended as new rehabilitation techniques emerge and as environmental investigations progress, or when MRM's Mine Management Plan is modified. To achieve the objectives above, MRM has established:

- an Unplanned and Life of Mine Completion Plan (LOM)
- rehabilitation requirements, plans and timelines
- security and decommissioning life of mine costs which are calculated annually
- rehabilitation accrual
- post-mining land use objectives
- rehabilitation trials to develop the site rehabilitation requirements and potential success of any rehabilitation programs.

Closure criteria for the site are aimed at reaching long-term stability of the site and the minimisation of off-site impacts. They have been used as the basis for environmental and mine planning strategies outlined in MRM's Mining Management Plans. This plan aims to ensure that the site is left in a condition that reflects government and community expectations.

Materials balances for key materials required in rehabilitation (including topsoil, clay and NAF overburden) have been completed, with sufficient quantities available to fulfil the closure obligations.

ES.23 Environmental Management Plan

MRM currently has a SD Management System that applies at the site, which is compliant with Xstrata's Health, Safety, Environment and Community (HSEC) Management Policy and Standards as well as *ISO 14001 (International Environmental Management Standard)* and *AS 4801 (Australian Standard for Health and Safety Management)* requirements.

For each identified area of impact from the Project, a draft environmental management plan has been developed. These plans are strategic and define a framework for environmental management by identifying proposed mitigation measures and monitoring and reporting activities together with corrective actions.

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Summary of Existing and Proposed Phase 3 Development Project Component and Effects

Component	Existing Operation	Proposed Phase 3 Development	Effects (after mitigation and/or management)
Mining method	Open pit	Open pit – expanded operations	Optimum resource recovery, and increasing the mine life
Ore Production Rate	2.5 Mtpa	5.5 Mtpa	Improved efficiency and extraction
Processing	Crushing, grinding, flotation, thickening, and filtration.	Processing operations will remain the same and will be expanded.	The processing facility requires upgrade
Product	360,000 tpa of bulk concentrate	800,000 tpa of bulk concentrate	Increase in product
Concentrate storage and handling	On-site storage shed	No change	No change
Transport to Bing Bong Port	Road-trains with covered, side-tipping trailers	No change but number of trips to Bing Bong to increase from 9 to 18 per day	Increase in truck movements
Bing Bong and Bulk Carrier	Bing Bong loading facilities are utilised. The bulk carrier Aburri transports concentrate to sea-going vessels	No change but number of Aburri trips to export vessel to increase from 110 to 250 per year	Increase in bulk carrier movements
Overburden Emplacement Facility (OEF)	North OEF – capacity of 185 Mt	Extra 530 Mt of overburden. Increased capacity of North OEF, and new OEFs containing NAF only (East and South OEFs) will be built to the east of the mine area	No significant vegetation to be cleared PAF to be encapsulated in North OEF as is current practice Runoff and potential seepage controlled
Tailings Storage Facility (TSF)	Central thickened discharge at TSF	Existing approved TSF to be used with capacity to be increased by adding an additional compartment, Cell 4	Upgraded TSF increasing footprint by 73 ha. Runoff and tailings water to be reused Seepage controlled
Flood Protection Bund and McArthur River Channel	Built around pit to provide flood protection	East and South OEFs added to the flood protection bund	Provides 500 year ARI flood immunity No significant change to existing flows
Workforce	440 operational workers who live on site and FIFO	Peak of 400 construction workers for 2 year construction phase, for a total of 930 personnel on site 735 operational workers	Temporary on-site camp for FIFO construction workers Existing on-site accommodation village to be used and expanded for FIFO operational workers
Water Supply	Sourced from groundwater bores and surface water reuse	No need to source bore water except for potable supply	Increase in use of potable water

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Summary of Existing and Proposed Phase 3 Development Project Component and Effects (cont)

Component	Existing Operation	Proposed Phase 3 Development	Effects (after mitigation and/or management)
Sewerage	Reticulated sewerage system	No change for the project. During construction a package sewerage treatment plant will be installed	No change for operations
Power	Gas-fired on-site power station	Doubling of capacity from 20 MW to 45-50 MW	Change in point source air emissions
Air quality	Fugitive emissions (dust) from mine exposed areas, stockpiles, materials handling and vehicles. Stack emission from gas combustion at power station	Additional fugitive emissions from Project mining operations and additional stack emissions from expanded power station	No significant air quality effects at accommodation village or off-site
Noise	The main source of noise is open-pit mining, traffic, process plant and power station	Additional noise sources from Project operations	No significant noise effects at accommodation village or off-site
Groundwater	Groundwater used for water supply and dewatering. Expanded groundwater blocking and extraction systems required.	Open pit will need to be dewatered. Groundwater only required for potable uses. Excess groundwater from mine dewatering will be subject to a hierarchy of release, irrigated to land or stored.	Groundwater extraction system would be deepened and expanded. Dams, pipes and pumps would require extra capacity. Groundwater levels will be drawn down around the pit No significant effect on surrounding vegetation Drawdown of 0.7 m at Djirrinmini Waterhole at the end of the dry season in 2036 Additional groundwater monitoring bores
Surface Water	Site water management system contains and reuses stormwater with a licensed emergency discharge. Construction of TSF Cell 4 required for use as an evaporation dam.	Same surface water management system with the addition of new dams for new Project areas. Licensed emergency discharge to remain	Extra contaminated surface water would be contained in TSF cell 4 and extra dams at the NOEF. Additional sediment traps required for dirty water treatment before release. Additional surface water monitoring sites.
Flora	Nine vegetation communities present within mine area. No threatened plant species present	Clearing of some habitats for pit and expansion	No significant species affected Cleared areas will be rehabilitated progressively or at mine closure
Fauna	No endangered species have been recorded within mine area 15 migratory bird species recorded	Clearing of some habitats for pit and expansion	Increased footprint Use of TSF by migratory birds to continue

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Summary of Existing and Proposed Phase 3 Development Project Component and Effects (cont)

Component	Existing Operation	Proposed Phase 3 Development	Effects (after mitigation and/or management)
Aquatic ecology	Species of conservation significance in McArthur River: Freshwater Sawfish and Snapping Turtle	East and South OEF construction near McArthur River Channel	No significant change to environmental flows or quality
Cultural Heritage	Existing registered and recorded sacred sites in region Existing AAPA Certificates Previous archaeological surveys found site to be of low-moderate significance	AAPA authority certificates issued for the Project if required	AAPA certificate conditions to be implemented Archaeologist to be available during construction in sensitive areas
Social and Community Effects	MRM is active in pursuing partnerships and agreements with local community	Construction workforce on site for two years on FIFO arrangement Increased operational workforce also on FIFO arrangement	No significant changes to current effects on local community services Existing community partnerships and agreements to continue
Economics	Existing operations provide a considerable boost to the NT and Australian economies	Both the operational and construction stages of the project will continue to provide economic benefits	Continuation of economic benefits to the NT and Australian economies Project avoids loss of economic benefits
Rehabilitation and closure	Rehabilitation is an ongoing process for the life of the mine. Mine closure strategy developed in Mining Management Plans	Existing rehabilitation strategy to incorporate Project Existing mine closure strategy to incorporate Project	Mine site will be left in a stable and safe condition with minimal off-site impacts