

17 Health and Safety

17.1 Introduction

The McArthur River Mine Phase 3 Development Project (the Project) is an expansion of the existing McArthur River Mine (MRM) base metals operation. Risks posed to the health and the safety of Project employees, contractors, visitors, and the surrounding communities are similar to the existing operation.

This section describes the existing values for health and safety associated with the construction, operation and decommissioning of the Project. The necessary mitigation strategies to minimise risk to the health and safety of Project employees, contractors, visitors and the community are outlined and assessed where appropriate.

MRM has a comprehensive health and safety management system that includes:

- policies
- standards
- procedures.

All aspects of MRM's existing health and safety management system will apply to all Project phases.

The system that governs health and safety at MRM is the Sustainable Development (SD) Management System (SD System). This SD System comprises a policy, standards and procedures that are based upon Xstrata plc's Sustainable Development (SD) Framework and Xstrata Zinc's Sustainable Development Policy.

MRM's SD System is based on ISO 14001:2004–Environmental Management Systems and AS/NZS 4801:2000–*Occupational Health and Safety Management Systems* (AS/NZ 4801). Each standard has also been developed in line with the Minerals Council of Australia 'Enduring Value' Principles for Sustainable Development (http://www.minerals.org.au/focus/sustainable_development).

MRM is committed to operating in accordance with all relevant health and safety legislation and Australian Standards, which are described in Chapter 2—Regulatory Environment.

17.2 SD System Framework

MRM implements the SD System structure in line with Xstrata plc's SD Framework (<http://www.xstrata.com/sustainability/ourapproach/framework/>). Xstrata plc's SD Framework is designed to ensure that each operation and project is managed consistently to the highest international and leading practice standards and makes a commitment to maximise the benefits to society while minimising the negative impacts. This framework comprises Xstrata plc's Business Principles, SD Policy, and SD Standards.

17.3 SD System Policy and Vision

MRM's SD Policy is a key internal policy for MRM's SD System. It uses a standard content, consistent with the Xstrata Plc and Xstrata Zinc SD Policies, and local branding and information to communicate company's SD commitment to the internal and external stakeholders. This policy commits MRM to the goal of sustainable development and balanced social, environmental and economic considerations in how its business is managed.

MRM's Sustainable Development Vision is based on Xstrata Zinc's SD commitment to operate safe workplaces that are incident free. The health and safety governing principles associated with this Vision include the company's belief that all injuries and environmental exposures are preventable. The Health and Safety Vision is based on a risk management approach.

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17.4 SD System Standards

MRM's SD System structure is based on the 17 Xstrata SD Management Standards presented in Chapter 3—Project Rationale and Alternatives, Table 3-1. There are several SD standards that establish a framework for management of health and safety. Standard 5, Risk and Change Management, focuses on hazard identification, risk assessment and change management. Standard 3, Competency and Behaviour, requires promoting safe behaviour culture to prevention of incidents and injuries. Standard 9, Health and Occupational Hygiene, requires systems, plans and programs to be implemented to provide a workplace that is free from significant occupational health and hygiene hazards.

The standards have a contractor management component that includes an assessment of contractor SD performance prior to awarding the contract. Regular reviews of the contractor's performance also include performance in regards to the SD System. All contractors conducting work for MRM are required to comply with all policies, procedures and licence conditions which have been implemented.

MRM is committed to eliminating safety incidents in the workplace by identifying, assessing and, where reasonably practical, eliminating or otherwise treating and/ or controlling hazards. This is executed via risk assessments, management standards, safety systems, engineering standards and behavioural programs to ensure employees make the right decisions to remain safe as they carry out their work.

The SD System is a risk-based system, the main elements of which are:

- safety risk management procedures
- hazard identification and reduction
- job safety analysis and standard operating procedures
- risk registers.

The procedures within the current SD System will be amended and updated, as appropriate, to account for the Project during the construction and operational phases. As the Project is an expansion of an existing operation, the health and safety systems, standards and requirements for the existing mine site will be applied to all construction and operation activities, with specific systems or procedures developed and implemented where required.

MRM is committed to the health and safety of all mine personnel, contractors and visitors to the site as well as local community members. Xstrata Zinc and MRM recognise that the safety and health of employees, contractors, visitors and local community members is a paramount and fundamental requirement of its continued operation. The SD System is subject to internal auditing by site-independent Xstrata auditors and third party auditors on a rotating schedule.

17.5 SD System Responsibilities

Clear lines of responsibility assign accountability for operational safety at MRM. For instance, the General Manager is accountable for the implementation of the MRM's SD System policy, including the provision of adequate resources and skills to achieve the stated objectives. The Health, Safety, Environment and Community Manager provides overall guidance and direction on the safety management system. Departmental Managers, Superintendents and Supervisors are accountable for the implementation of safety strategies, maintaining safety and hazard management plans, investigation of incidents, and the promotion of safety improvements in areas of their control.

Every individual is accountable for working in a manner that is healthy and safe for themselves, their workmates, persons influenced by their work, and the environment in which they work. Every person at MRM has a responsibility to identify hazards, rectify them where possible, or report them for remedial action.

17.6 SD System Representatives and Committees

The composition of MRM's SD committee, regularity of meetings and content of discussion are geared to manage and minimise emerging risks and issues, therefore maintaining currency of procedures. The SD Committee is formed by the Health & Safety Representatives (HSR's) elected by their crews, management team members, health, safety, environmental and community relations personnel and representatives of permanent contractors. Issues considered are those with site significance, which help in the development of new health and safety initiatives. Employee representatives must communicate information back to their crews, as well as gather the views of personnel on any issues being addressed. Within each department, every crew has its own SD meeting at monthly intervals.

17.7 Occupational Health Management

MRM maintains comprehensive occupational health and hygiene practices and educational programs directed at minimising and managing risks. Elements of the programs include the identification of health hazards, assessment of exposure with reference to internationally recognised monitoring standards, implementation of controls to eliminate or minimise exposure to the hazards and the provision of personal protective equipment where controls do not effectively reduce the risk exposure.

MRM also conducts a Hygiene and Health Monitoring Program which includes several education programs for employees. These programs include:

- pre-employment medicals
- exit medicals
- periodic health assessments appropriate to exposure level
- blood lead screening
- regular occupational dust monitoring
- fatigue management
- structured hygiene monitoring program
- promotion of health and wellbeing.

The key requirements of the MRM's occupational health management program are:

- first aid arrangements and access to adequate medical services, workplace occupational hygiene facilities and personal protective equipment are made available to all personnel, as appropriate to the location and nature of operations
- where appropriate, MRM personnel undergo assessment to ensure their fitness for work. Confidential medical information contained within medical records is not disclosed without the written informed consent of the employee, unless required by legislation or a court order
- arrangements are put in place to facilitate the health, safety and security of all personnel on-site and during work-related travel
- where appropriate, preventative and corrective measures are taken to control impairment (including alcohol and drug abuse) and to manage the risk of communicable diseases
- effective initiatives are in place to promote and encourage a healthy lifestyle
- effective systems are in place for the rehabilitation of employees following a work-related injury, illness or other adverse health effects
- where required, arrangements are established to monitor the impact of workplace hazards on employees' health and well-being.

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To meet these requirements MRM has:

- a dedicated first aid centre staffed by paramedics providing 24-hour coverage. The first aid clinic is equipped with some of the most advanced life support equipment and has an extensive range of medications. Being a remote location, MRM provides a service to cover non-work related illness and injury. The facility is also equipped with a 4WD ambulance
- pre-employment medical procedures
- a program of periodical medical assessments to monitor the ongoing health of employees. An exit medical program has also been established to assess the well-being of personnel leaving MRM
- a comprehensive jobfit dictionary of the physical requirements for various positions across the operation. The jobfit dictionary is used in assessing pre-employment medicals, workers compensation return to work programs and non-work related injured or ill employees wishing to return to work on alternative duties
- systems to facilitate the confidentiality of medical information
- a fitness for work procedure along with a comprehensive drug and alcohol policy and associated procedures
- personal health surveillance initiatives to allow employees to monitor their own health levels include: cholesterol screening (pre-employment and exit medicals), blood glucose screening, lung function testing and body mass index monitoring
- several procedures and policies to facilitate proper processes and systems are in place for the effective rehabilitation and return to work of injured employees
- procedures to facilitate adequate monitoring of hygiene issues. These include, and are not limited to, noise, inspirable dust, respirable dust, silica, lead, and asbestos.

Continual health surveillance and occupational hygiene monitoring of identified personnel across the site provides evidence of the effectiveness of existing controls, newly introduced safeguards and data to assist in the identification of new health issues and developing trends.

17.8 Behavioural Safety Management

The key requirements of the MRM's behavioural safety management are:

- initiatives will be implemented and maintained to promote safe behaviour by personnel, through the understanding of the importance of safety and of the relevance of human factors, motivation and behaviour in relation to safe behaviour. These initiatives include the following, as minimum:
 - ongoing education and responsibility of all personnel in contributing to a safe culture (values and beliefs) and how human and behaviour affects safety
 - observations of behaviours in the workplace
 - identification of critical at risk behaviours and safe behaviours practiced
 - immediate feedback to reinforce safe behaviours and correct at risk behaviours
 - collection and analysis of workplace safety related behaviour data and the application of the appropriate corrective action.
- all managers will actively support the involvement and participation of personnel in the development, implementation and review of behavioural safety processes. Agreed activities will be included in the performance goals of all line managers
- personnel will receive appropriate training to recognise, understand and control potential risks and hazards associated with these behaviours and situations.

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To meet these requirements MRM:

- conducts training for supervisors and other identified personnel on hazards identification, risk management and incident management
- adopts Workplace Safety Observations (WSOs) to identify potential workplace hazards and at risk behaviour
- implements regular Workplace Inspections by health and safety staff in all operational areas
- integrates routine safety meetings, which facilitate feedback
- adopts the Stop. Look. Assess. Manage (S.L.A.M.) focus to site behavioural safety.

17.9 Induction and Training

All staff and visitors that enter MRM must complete a site induction. The induction covers environmental, cultural, health and safety aspects and rules that must be adhered to on-site. Induction requirements may differ, depending on the proposed activities being conducted by the staff member or visitor and the site areas accessed. All visitors, contractors and subcontractors are required to sign in and out at the MRM site security office. Alternative sign in and out procedures are used for remote workers. MRM has a standard induction which covers all visitors, contractors and subcontractors. The content of the induction includes:

- The Sustainable Development Policy
- Environmental Management
- Operating Philosophy
- Safety Requirements:
 - fitness for work
 - incident / hazard reporting and investigation
 - site induction
 - power tools and ancillary equipment
 - site driver's licence
 - traffic rules
 - Housekeeping
 - pre-start meetings / toolbox talks
 - communications
 - motor vehicles including mobile equipment
 - pre-start inspections
 - working at heights
 - authorisation to operate equipment
 - electrical equipment
 - modification of plant and equipment
 - permit to work
 - isolation systems
 - lifting equipment
 - rigging and slinging requirements
 - personal protective equipment
 - emergency procedures.

17.9.1 Employees

Safety training for employees commences through the site general induction and then into area specific inductions. All employees at supervisor level and above are required to undertake incident investigation and risk management training. Job skills training is the responsibility of the individual department while site-wide skills training is centrally organised. Each department has appointed a training specialist who is responsible for identifying training needs and requirements.

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Fitness for Work Standards and associated procedures are implemented to address the risk posed by fatigue and the abuse of alcohol and other drugs to the safety and work performance of MRM employees, site contractors and visitors. The implementation of the Fitness for Work Standards is in line with other Xstrata operations in Australia.

Ultimately, it is the responsibility of all individuals to ensure their own safety and health at work and to avoid adversely affecting the health and safety of any other person.

17.9.2 Contractors and Visitors

All permanent and casual contractors and visitors on-site are required to comply with all MRM standards and procedures, and must have undertaken the appropriate induction. All visitors receive a visitor's induction and must be escorted at any time they enter an operational area. When staying in the camp facilities, accommodation inductions are also completed.

17.9.3 Hazard Identification

The S.L.A.M. program is contained in the general site safety induction for new employees and contractors. Workplace Safety Observations training is provided to the nominated staff throughout the year. Personnel are trained to identify any hazards that may be present in the work area and appropriately manage that hazard. Hazard reporting is conducted through an electronic incident reporting process (Site Safe System) and remedial action requirements are emailed to the relevant personnel.

A risk register has been developed encompassing all high level business, health, safety, environmental and community risks. The top ten risks of this register are reviewed monthly and reported to Xstrata Zinc and Xstrata plc. The remaining risks within this register are reviewed annually. Control verification for all catastrophic hazards and selected high hazard activities is conducted twice per annum. Each department is responsible for maintaining their own risk registers for departmental specific risks.

17.9.4 Job Safety Analysis and Standard Operating Procedures

Job Safety Analysis (JSA) is undertaken as required for specific tasks. JSAs are used in the development of Standard Operating Procedures (SOPs). SOPs are developed to maximise compliance with the MRM SD System Standards.

An MRM intranet webpage and internal drive allow access by all employees (including contractors) to all JSAs, SOPs, risk assessments, training packages and related information. This system allows ease of access to all documentation for all personnel and has been established to facilitate effective document control. Updated versions of procedures will be maintained through the intranet and MRM's document control system.

Hard copies are also available. Supervisors are given access to electronic copies of policies and procedures and are to ensure their personnel have the most recent update of relevant procedures. These procedures, and any changes to them, are reinforced through inductions and safety meetings.

17.9.5 Communications

Communication at MRM is managed via SD Standard 4 Communication and Engagement. The following means of communication are employed to maximise effective two-way interaction with employees and contractors:

- safety/tool box meetings
- SD Committee
- memorandums
- regular presentations by the General Manager
- shift change meetings

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- Intranet and electronic mail
- webpage and notice boards
- other published materials.

17.9.6 Accident/Incident Reporting and Investigation

Site Safe is used to report all injuries and serious incidents at MRM. All relevant information is documented in the incident reporting forms which also incorporate a risk assessment matrix, hierarchy of control and action plan. Any high potential risk incidents that occur are reported immediately to Xstrata Zinc and Xstrata plc.

17.9.7 Traffic Accidents

MRM utilises an extensive fleet of vehicles and mobile equipment that operates within the pit, on haul roads and internal road networks: haul trucks, light vehicles (including four-wheel drives), shovels, excavators, bulldozers, scrapers and rollers.

Comprehensive measures are undertaken to facilitate maximum safety in the operation of all mobile vehicles and machinery and are incorporated into procedures and practices to avoid traffic incidents. Safety of transportation is guided by Xstrata Light Vehicle and Surface Mobile Equipment Standards adopted at MRM and internally developed Traffic Management Plans. For example, contractors and mine personnel must be trained, assessed and authorised prior to operating vehicles on-site. Another example is the authorisation restrictions on drivers of light vehicles interacting with heavy equipment and vehicles. SOPs regarding driver safety (including speed limits) and dust control are also implemented. Appropriate signage indicates speed limits around MRM. Roads and access areas are watered to suppress dust where required, in order to maintain maximum driver visibility. Adequate lighting installed on-site maximises safety of night driving and operating conditions. Vehicle inspection checks are undertaken as part of the routine maintenance program. All vehicles are required to carry two-way radios.

Operational employees are also transported by bus between the accommodation village and their workplace to reduce the number of light vehicles on MRM's road network.

Licensed transporters operating in compliance with the Commonwealth's *National Transport Commission (Model Legislation-Transport of Dangerous Goods by Road or Rail) Regulations 2007* undertake the transport of dangerous goods to MRM on approved transport routes for the movement of hazardous goods. The transport of ammonium nitrate is undertaken in compliance with the requirements of AS 1678.5.1.002:1998: *Emergency procedure guide–Transport–Ammonium Nitrate*.

17.9.8 Physical Interaction with Machinery

MRM implements a range of SOPs that reduces the risk of injury of personnel to themselves or others through interaction with moving machinery and vehicles. Induction and training programs that outline procedural requirements are also utilised to reduce risks in this category.

For example, where practicable, pedestrians are segregated from light and heavy vehicles traffic areas, and light vehicles from heavy vehicles traffic areas, to reduce the likelihood and exposure to collision risks. All vehicles are maintained and serviced on a regular basis so they are operating in accordance with their design. SOPs regarding the control of energised equipment and machinery are implemented incorporating lock-out/tag-out safety systems to reduce the likelihood of exposure to sudden releases of energy.

Maintenance and working around conveyors are covered by site SOPs and included in induction training where required.

17.9.9 Hazardous Substances and Dangerous Goods

As detailed in Chapter 18 – Hazard and Risk, a risk management plan encompasses the handling of hazardous substances and dangerous goods used at MRM. The range of hazardous substances and

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dangerous goods includes: fuel (predominantly diesel), detergents, lubricants, oils, solvents, degreasers and domestic cleaning agents.

MRM has established standards and procedures for the storage and handling of hazardous substances and dangerous goods. A full external hazardous substance audit is conducted annually. The hazardous substances and dangerous goods system includes an electronic hazardous substance and dangerous goods register, and a hard copy register. Any area of the operation that holds hazardous substances or dangerous goods also holds the appropriate Material Safety Data Sheets (MSDSs).

MSDSs for all substances held on-site are made available to employees through access to ChemAlert database and hardcopies are located in the immediate area of chemical storage with copies readily available to operators in appropriate locations around MRM. A chemicals information program is used so that personnel can quickly reference electronic versions of the MSDSs.

All chemicals are managed in accordance with MRM's hazardous material management system, incorporating the provision and use of the respective MSDS. Training also includes site induction and chemical awareness training programs. Before new chemicals are introduced to MRM, a risk-based process is used to determine appropriate control measures to decide if admission is accepted or not.

Hydrocarbons are stored and handled in accordance with AS 1940:2004–*The Storage and Handling of Flammable and Combustible Liquids* (AS 1940). In bulk storage areas tanks are suitably located to minimise the risk of chemical spills and potential environmental harm. Inspections of all new storage facilities are included in the regular SD System inspection. Currently, regular inspections are conducted and spill response and management procedures are in place.

SOPs address the refilling of fuel storage tanks. Maintenance and spill responses have also been implemented.

For example to minimise the hazards associated with diesel leaking during tanker unloading, the following controls are implemented to reduce risks to health and safety of MRM personnel and potential adverse environmental impacts:

- equipment inspection and testing programs are undertaken to maintain reliable performance of fuel tanks and associated bunds
- operator training are provided in the safe operation of the equipment and knowledge of emergency response procedures in the event of diesel leakage
- spill containment equipment are maintained and available to manage any spillage of liquids
- clean storm water is diverted away from the bunded fuel storage areas
- sumps are constructed to collect any spillage and allow recovery
- ignition sources are strictly monitored and managed to avoid fire
- appropriate fire fighting facilities and suppression systems are installed, maintained and available to extinguish fires
- an approved fire protection system is installed and maintained around hydrocarbon storage areas.

These controls would be implemented throughout the life of the Project.

17.9.10 Explosive Handling, Blasting and Misfires

Blasting is currently undertaken at MRM. When required and depending on the location, blasting can pose a number of potential risks, most notably flyrock, dust, noise (overpressure) and vibration.

All blasting activities are strictly regulated, are authorised by designated personnel and are undertaken under MRM operating procedures. These procedures cover activities such as transport, loading and firing of explosives, and the management of explosive misfires.

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A number of mitigation measures are currently in place at MRM, including control of access to blast areas and ensuring blasts are undertaken by suitably qualified personnel with appropriate knowledge and skill.

Explosives are stored on-site and used in accordance with AS 2187.2:2006–*Explosives–Storage and use–Use of explosives*. Relevant staff are trained in the storage and handling of these products. Explosives are stored on-site in magazines that are isolated and protected from other activities on the site and any natural incidents such as flood, fire and lightning.

The explosives storage facility poses minimal risk to human safety and is located at an appropriate distance from all operational areas.

17.9.11 Power Infrastructure and High Voltage Exposure

The principal infrastructure is in place to provide power to the Project with a power station upgrade required to accommodate the necessary increase in power supply. Any tasks involving the upgrade and operation of power infrastructure will be undertaken by qualified contractors who will employ appropriate procedures and standards.

MRM has standard isolation and tagging procedures across the entire operation. These procedures are continually reviewed and modified to ensure they are appropriate to operational requirements and protect all personnel.

17.9.12 Working at Heights and Falling Objects

Rigid height safety requirements are enforced across MRM to ensure that no person will be at risk when working from heights. All height safety equipment is required to undergo regular inspection by trained personnel and annual inspections by external accredited contractors. Employees identified as exposed to this risk are trained accordingly.

MRM plans activities to maximise work at ground level and where practical, minimises the requirement to work at height. However, where working at heights is unavoidable, SOPs are used to control this risk. By using fixed platforms and safety harnesses to create a safe working area, the possibility of a fall or falling objects is minimised.

Mandatory personal protection equipment (PPE) must be worn at all times including safety glasses, metatarsal protected steel cap boots, long pants, long-sleeve shirts and hard hats, which provide some protection against objects falling from heights.

Adapted in-pit specific procedures limit exposure to rocks falling from the pit wall and interacting with potential worker locations. The area below the pit wall is managed to reduce access from other personnel in the work area.

A permit to Work system recently introduced at MRM requires completing of a JSA and obtainment of a permit to work for any task conducted at height.

17.9.13 Manual Handling

All new employees and contractors receive training in manual handling during the induction process. The MRM Injury Prevention Advisor conducts regular manual handling training designed for specific tasks.

Wherever possible, manual handling is avoided and lifting aids are used to reduce the risk to personnel. Job tasks have been completed for positions throughout MRM and these are used during the pre-employment process and return to work programs to ensure new and injured employees are physically capable of performing their tasks, thereby minimising the possibility of manual handling injuries.

17.9.14 Confined Space

MRM has specific and well established confined space procedures including a confined space permit system and training to employees exposed to this work environment.

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17.9.15 Heat

The effects of heat are managed by provision of suitable working environments, equipment and protective clothing. MRM personnel are continually made aware of the signs and symptoms of overexposure to heat and the effects thereof, including dehydration.

17.9.16 Noise

All equipment (both fixed and mobile) will comply with AS 1259.1.2 *Occupational Noise* in regard to design and operating noise levels. It is the duty of the supplier to ensure equipment is compliant with safe levels of noise and vibration and must provide documented proof of compliance, such as test results.

The SD System provides for hearing conservation standards and procedures to ensure employees and contractors do not suffer adverse health effects from workplace noise. These standards and procedures cover, amongst other things, the identification and evaluation of occupational noise hazards and development of noise monitoring control programs to minimise noise levels and protect employees and contractors from adverse exposure. Where required, the use of suitable hearing protection equipment will be provided and is to be worn by all personnel while in hearing protection areas.

All areas of MRM have had noise mapping completed, with those areas that may potentially pose a threat to personnel being designated as mandatory hearing protection areas. MRM maintains an ongoing occupational health and safety noise monitoring program.

17.9.17 Odour

The Project is not expected to produce any odour that may be detrimental to the health and safety of employees, visitors or the general public. The risk of odour impacts during the construction and operation phases of the Phase 3 Development Project is considered to be low.

17.9.18 Particulates and Gases/Vapours

MRM's SD System provides for the standards and procedures for particulate and gas/vapour exposure. This applies to dust, fibres, mist, fumes (i.e. particulates), gas and vapour exposure in the workplace. The standards and procedures cover, amongst other things, evaluation of particulate and gas/vapour hazards, and development of a control program to ensure all employees do not suffer adverse health effects in the work environment.

Where required, the dust control program includes engineering controls (e.g. air conditioning filters, dust suppression systems, vacuum cleaners and fume extraction systems) on conveyors and at transfer points in the expanded processing plant and use of respiratory protection devices where required.

MRM uses the National Standard for the *Control of Inorganic Lead at Work* (NOHSC:1012) and the National Code of Practice for the *Control and Safe Use of Inorganic Lead at Work* (NOHSC:2015) as a guide for the control of blood lead levels in all employees. Elevated lead in blood is a matter taken seriously by MRM. Strict protocols are in place to reduce the risks of employees' exposure to lead in the workplace including strategies of dust suppression, enforcement of correct personal hygiene practices such as showering and changing into non-contaminated clothing prior to consuming food, adequate PPE for high risk areas, and a closely monitored biological lead testing schedule.

Female employees of non-reproducing capacity and male employees with blood-lead concentration levels of 36 µg/dL or greater must be removed to low lead risk areas until concentrations are equal to 24 µg/dL. Females of reproducing capacity with blood lead concentration levels greater than 10µg/dL shall be removed to low lead risk areas until their levels are equal to 5 µg/dL, which exceeds the standard of 20 µg/dL. Pregnant employees should not have a blood-lead concentration that exceeds 10 µg/dL, which is lower than the national standard for pregnant women set at 15 µg/dL. The controls in place for lead exposure management are also relevant to potential sulphur dioxide emissions produced by bulk concentrate in the storage sheds located at the mine and Bing Bong concentrate storage and ship loading facility (Bing Bong).

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MRM's experience has demonstrated dust has not been a significant issue. Dust from heavy equipment is controlled by dust suppression measures such as watering of roads and work areas.

17.9.19 Use of Process Water

Process water is recycled through the processing facilities and is also used for the watering of haul roads. A water management system encompassing all mine affected water is current and there is regular monitoring of water quality, including heavy metals, to ensure any potential impacts are identified.

Further discussion of the proposed water management system is provided in Chapter 10 – Water Resources.

17.9.20 Groundwater Quality

The potential for impacts on groundwater quality is assessed in Chapter 10—Water Resources. In summary, the risk posed to groundwater quality is considered low as there is low potential for hazardous waste seepage to groundwater aquifers (refer to Chapter 9—Waste). The potential of chemical spills and wastes to infiltrate into groundwater will be minimised, as outlined in Chapter 9—Waste.

17.9.21 Surface Water Quality

Sewage is treated and contained by a sewage treatment plant with the treated effluent disposed of by pond storage, evaporation or irrigation. All sewage facilities follow the Northern Territory Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent.

Mobile crib rooms contain their own sewage treatment system. No sewage effluent is discharged to waterways, minimising the potential for the spread of bacteria.

17.9.22 Potable Water Supply

Raw water is sourced from nearby borefields and treated on-site. Potable water quality is regularly tested as part of the existing monitoring program.

The groundwater borefields are located more than 100 metres away from the effluent drainage system and other water bodies as required by the Northern Territory Code for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent.

17.9.23 Waste

Waste generated is managed to avoid adverse impacts on the health of MRM personnel and to minimise risk of environmental impact. Small amounts of waste generated includes: scrap metal, wood, concrete, general waste, recyclable waste and some oily waste from the operation and maintenance of equipment and machinery.

Food scraps and recyclables (paper and cardboard) are disposed in a series of clearly labelled bins that are strategically located throughout MRM to segregate and collect the waste materials generated on-site. Waste materials known to attract pests and vermin are stored and handled in a responsible manner to limit access and attraction of pests. Food scraps and other organic waste are burnt in a putrescible waste landfill while other non-contaminated waste is disposed in a clean waste dump where green waste is separated. Cardboard and paper, scrap metal, aluminium cans, and waste oil are recycled externally.

Small quantities of hazardous wastes such as hydrocarbons and hydrocarbon contaminated products (grease, oil filters and batteries, amongst others) are stored in accordance with AS 1940, and disposed of in accordance with applicable regulations.

Contaminated waste from operational areas is disposed at the contaminated waste landfill located within the Tailings Storage Facility boundaries.

Clinical waste such as drug and alcohol testing kits and sanitary waste are disposed of in accordance with guidelines provided by the Department of Health. Appropriate safety glasses and gloves are worn while handling of these types of waste. Clinical wastes are kept in a secure location.

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Existing standard procedures for the storage, containment, disposal and spill response for potentially hazardous waste materials minimises potential impacts associated with these materials/substances. These procedures would be implemented throughout the life of the Project.

More information is shown in Chapter 9 – Waste.

17.9.24 Food Hygiene

Areas involved with the provision and supply of food, such as meal rooms, operate in compliance with current food and hygiene legislation. Appropriate food handling and storage facilities are provided to minimise risk to human health.

17.9.25 Pest Management and Disease Vectors

If significant areas of weed infestation or other declared pest species (either flora or fauna) are identified and pose a significant risk to mine personnel, visitors, surrounding landholders, the environment or the operation, appropriate eradication and management measures are undertaken.

The water management system, which aims to maximise water recirculation between dams and processing areas, is not expected to result in any health issues such as the transmission of bacteria or insect breeding (e.g. mosquitoes and biting midges). Mosquito prevention and management measures are in place and are according to the Northern Territory Department of Health Guidelines for Preventing Mosquito Breeding Sites Associated with Mining Sites.

MRM already has in place a mosquito monitoring system, which commenced in 2009, that is conducted in consultation with the Medical Entomology Unit of the Northern Territory Department of Health. The results suggest that the two main pest mosquitos at the mine site are both temporary ground pool breeders, therefore the best method of control is residual bifenthrin barrier insecticides. Spraying programs have previously been undertaken on adult populations. At Bing Bong, large populations of mosquitos can occur after high rainfall and high tides. To date, control at Bing Bong has been limited to coils and spray cans. However during future wet seasons, large scale spraying will be investigated for the mine site.

Experience at MRM and Bing Bong over 15 years has demonstrated that pest management and disease vector issues are negligible.

17.9.26 Wildlife

In terms of health and safety, snake bites pose the highest health risk from wildlife. MRM personnel are made aware of the risk of snakes through the site induction process and are provided with appropriate training for treatment of snake bites. The potential risk to human health from wildlife hazards such as snake bites is assessed as low.

Due to the amount of traffic using MRM's haul/access road and the extent of activity at MRM's infrastructure area, it is unlikely that wildlife will inhabit active work areas. Consequently, the frequency of exposure to these hazards is deemed to be low. Further discussion of interactions with wildlife is provided in Chapter 18 – Hazard and Risk.

17.9.27 Security and Personal Protection Equipment

Suitable fencing encloses appropriate areas at MRM to maintain a restricted level of access. Prior to being granted access to MRM, visitors are required to complete mandatory registration and an environmental, operational, health and safety induction. Blood alcohol content testing and random testing for drugs are carried out in accordance with current practices.

All areas of MRM that require any form of PPE are clearly sign-posted to identify what PPE is mandatory in that area. New employees and contractors are trained in the use of PPE during the induction process. All PPE provision complies with the appropriate Australian Standards.

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MRM employees, contractors and visitors are supplied with the relevant and appropriate PPE for the tasks to be conducted on-site. Visitors are authorised, registered and suitably attired with the following mandatory PPE:

- safety helmet
- metatarsal protected steel cap boots
- cut resistant gloves
- safety glasses
- high visibility clothing.

These items are required to be worn during particular activities and in designated areas, as indicated by safety signage. By wearing the appropriate PPE and adhering to safety procedures and systems, the residual health and safety risks to personnel and visitors is low.

17.9.28 Decommissioning and Rehabilitation

The potential risks associated with decommissioning the Project at the end of mine life are similar to those associated with the construction and operational phases, in terms of heavy vehicle movements, waste and chemical management and potentially hazardous working environments.

The Mine Closure Plan (Appendix E4) for the Project addresses the following, in accordance with the SD Mining Management Plan, and considers the implications for health and safety as part of this work:

- stakeholder involvement
- landform stability (e.g. Overburden Emplacement Facilities, Tailings Storage Facility, pit)
- land use limitations
- water management
- infrastructure management (e.g. removal of equipment, demolition of structures and removal of redundant material from site)
- surrounding and impacted community.

Rehabilitation strategies planned involve decommissioning and rehabilitation of dams, in a manner that prevents environmental harm and risk to human health. Unless a post-mine usage is agreed with the relevant landholder, dams are to be decommissioned to ensure they become stable landforms, no longer containing flowable substances. Any dangerous goods or chemicals are to be removed from site and any contaminated areas managed and rehabilitated.

Controls to protect the community include warning signs, fencing of hazardous areas and safety rills to prevent travel over embankments. The risk to community safety is considered low, given that the area is located on privately owned property and located in an isolated region.

Mine closure planning will occur throughout the life of the Project as required by relevant Government departments. The closure strategy provides for the site to be left in a sustainable condition without the risk of causing harm to the community or the environment.

17.10 Management Plan

A draft health and safety environmental management plan for the Project is located in Chapter 19—Environmental Management Plan.