

11

Human health and safety

11. Human health and safety

11.1 Introduction

This chapter describes the potential impacts to human health and safety from the Nolans Project. A detailed human health and safety assessment report is provided in Appendix O of the EIS.

Section 5.6 of the TOR for the preparation of an environmental impact assessment issued by the NT EPA for the Nolans Project provided the following environmental objectives in relation to human health and safety:

The EIS should demonstrate that for all stages of the project:

- *The proponent is fully aware of the potential impacts to human health and safety*
- *All identified potential impacts to human health and safety will be avoided, mitigated or minimised*

This chapter addresses the potential impacts to human health and safety associated with all stages and components of the Nolans Project. It includes risks to the workforce and the general public for the duration of the Nolans Project, including post-closure, as required in the TOR for the Nolans Project.

11.2 Methodology

A summary of the approach to human health and safety assessment is described below and more detail is provided in Appendix O.

The assessment included the following steps:

- Identification of hazards which may lead to or contribute to human health and safety risks, comprising:
 - desktop analysis, based on typical hazards encountered for an open cut mining operation and associated processing facilities
 - a risk assessment workshop.
- Qualitative risk assessment to ascertain the level of risk associated with the identified hazards.
- Assessment of the risks against the qualitative risk criteria.
- Identification of management, preventative, treatment and monitoring strategies to minimise the impacts of the Nolans Project.

The assessment did not include human health and safety risks associated with radiation exposure. These are addressed separately in Chapter 12 and Appendix P of this EIS.

The risks associated with the Nolans Project have been determined by combining the likelihood of the potentially hazardous events and the magnitude of their consequences. This is based on *AS/NZS ISO 31000:2009, Risk management - Principles and guidelines*. The process involves the combining of consequences and frequencies which provides an appropriate weight to the range between small consequence events (which could be relatively frequent) and events of major consequence (which could be very infrequent). Risk assessment methodology is discussed further in Appendix O.

The causes that could lead each hazard to becoming a risk were identified and the associated controls / safeguards were also identified. These safeguards (outlined in Appendix O) are required so that the risk scenarios are contained or at least controlled to an acceptable level.

11.3 Assessment of potential impacts

11.3.1 Overview of risks

A total of 25 hazards were identified that could result in a risk to the workforce or the general public. The only human health and safety hazard identified and assessed to have the potential to impact surrounding land users was associated with off-site transport activities. All other hazards were considered to be containable within the Nolans site.

All human health and safety hazards were assessed as having a medium or above residual risk level. This is due to the focus of the hazard identification being on the higher consequence events, to enable early identification of these events and therefore greater ability to design them out of the operations. The risk levels were generally due to the consequence categories of major and catastrophic being selected as the maximum credible outcomes.

A summary of the hazard identification results are provided in Table 11-1, showing the hazard and maximum credible consequence identified. The full risk register for human health and safety risks is provided in Appendix O.

Table 11-1 Hazards to human health and safety

Potential event (hazard)	Potential impact (maximum credible consequence)	Managed Risk Level	Residual Risk Level
External bushfire, resulting in structural failures and release of process consumables, products or ignition of gas inventory.	Personnel fatality or injury.	Medium	Medium
Mobile equipment incident off site including vehicle to vehicle impact, single vehicle incidents (rollover, vehicle over the edge, vehicle impact with structure) and vehicle to pedestrian impacts.	Consequences will vary depending on severity of impact between minor injury to fatality. Maximum credible consequence could be a multiple fatality event when multiple vehicles are involved or multiple personnel in the vehicle(s). The event may occur at any time throughout the life of the Nolans Project.	High	High
Mobile equipment incident on site including vehicle to vehicle impact, single vehicle incidents (rollover, vehicle over the edge, vehicle impact with structure) and vehicle to pedestrian impacts.	Consequences will vary depending on severity of impact between minor injury to fatality. Maximum credible consequence could be a multiple fatality event when multiple vehicles are involved or multiple personnel in the vehicle(s). The event may occur at any time throughout the life of the Nolans Project.	High	High
Personnel falling from height or into depth on site including mining, processing, maintenance and administration areas.	Consequences will vary depending on the height and location of the fall between minor injury to fatality. Maximum credible consequence would be a single fatality (multiple fatalities may occur e.g. failure of scaffold with multiple personnel on it, however the more credible outcome is assumed to be a single fatality). The event may occur at any time throughout the life of the Nolans Project.	Medium	Medium
Personnel exposed to a confined space incident e.g. engulfment, irrespirable or noxious atmosphere.	Consequences will vary depending on the situation and will range between injury to fatality. Maximum credible consequence would be a multiple fatality event as it is likely that more than one person will be within a confined space. The event may occur at any time throughout the life of the Nolans Project, however is considered most likely during the operational phase.	Medium	Medium

Potential event (hazard)	Potential impact (maximum credible consequence)	Managed Risk Level	Residual Risk Level
Personnel struck by ground failure, rock fall or flyrock event in mining operational areas. Includes material falling from high and low walls, dumps and ramps, falling from loaded trucks.	<p>Consequences will vary depending on the size of material falling and how personnel are impacted (e.g. on foot or in vehicle) and will range between injury to fatality.</p> <p>Maximum credible consequence would be a single fatality event as it is unlikely that more than one person will be impacted by a failure.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel in contact with an electrical source (low or high voltage) resulting in electrocution or arc flash burns. This includes all electrical sources on site where exposure may occur during construction or operations.	<p>Consequences will vary depending on the type of contact and energy level associated with the equipment. This would include a range of minor injuries e.g. electric shock, through to electrocution or fatality from arc flash events.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel struck by a dropped or swinging load during lifting by a lifting device or tipping a lifting device.	<p>Consequences will vary depending on the size of the item that falls and the height from which it falls, ranging from an injury to a fatality.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel impacted by fire or explosion. This includes equipment and substance fire and explosions. This may occur during construction or operations. Mining operations fires would typically involve mobile equipment fires. Processing plant fires would typically involve fixed plant fires. This also includes the gas fired power generation plant and Amadeus Basin to Darwin high pressure gas pipeline.	<p>Consequences will vary depending on the size and type of fire and extent of exposure.</p> <p>Personnel may be impacted by smoke, heat radiation from the fire or explosion overpressure.</p> <p>Consequences may range from smoke inhalation, minor burns through to fatality.</p> <p>The maximum credible consequence is a multiple fatality event as there is potential for multiple personnel to be impacted in a large fire or explosion event.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium

Potential event (hazard)	Potential impact (maximum credible consequence)	Managed Risk Level	Residual Risk Level
Personnel impacted by an explosives incident during transport, handling, storage or use on site. Potential incidents include misfires, fly rock, person in proximity to a blast and unintended initiation of an explosion.	<p>Consequences will vary depending on the type of exposure and proximity to the event.</p> <p>Consequences may range from minor injury through to fatality.</p> <p>The maximum credible consequence is a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel impacted by a tyre or rim incident associated with mobile equipment.	<p>Consequences will vary depending on the type of exposure and proximity to the event.</p> <p>Personnel may experience projectile / pressure impacts due to tyre pressure release, burns or pressure impacts from tyre fires and crush injuries due to dropped tyres.</p> <p>Consequences may range from minor injury through to fatality.</p> <p>The maximum credible consequence is a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel exposed to a flood or inrush event into the pit or personnel exposed to flooding within the mine lease e.g. low lying vehicle crossings or dam failures.	<p>Consequences will vary depending on the extent of material released and the material being released.</p> <p>Groundwater and flooding events may result in injury e.g. due to slips, trips & falls through to fatality e.g. due to being trapped in a submerged vehicle / drowning.</p> <p>Dam failures may result in injury e.g. due to exposure to tailings products through to fatality from engulfment.</p> <p>The maximum credible consequence is a single fatality on the basis of the proximity of personnel to dams and anticipated volumes of material released.</p>	Medium	Medium

Potential event (hazard)	Potential impact (maximum credible consequence)	Managed Risk Level	Residual Risk Level
Personnel struck by falling or dropped objects including structural failure.	<p>Consequences will vary depending on the size of the item that falls and the height from which it falls, ranging from an injury to a fatality.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel caught in rotating or moving equipment. This may occur during construction or operations.	<p>Consequences will vary depending on the equipment personnel are drawn into and how they are drawn in, potentially resulting in entanglement and entrapment. This may lead to crush injuries e.g. fingers, amputation of limbs or fatality.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel impacted by a high pressure release (stored energy). This may occur during construction or operations.	<p>Consequences will vary depending on the pressure at time of release, proximity of personnel to the release and the material released. This may lead to fluid injection injuries if personnel are in close proximity or they may be struck by flying debris resulting in either an injury or fatality if the object is large enough or where it strikes the person.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel drowning while working in or around liquid bodies.	<p>Consequences may include minor injuries e.g. due to trips and falls through to fatality (drowning).</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium

Potential event (hazard)	Potential impact (maximum credible consequence)	Managed Risk Level	Residual Risk Level
<p>Personnel exposed to hazardous materials via all means e.g. ingestion, inhalation or skin contact.</p>	<p>Consequences will vary depending on the material personnel are exposed to, the means of exposure and the duration of exposure.</p> <p>Consequences range from:</p> <ul style="list-style-type: none"> - irritation to skin, eyes and respiratory system e.g. due to exposure to sulfur, lime, limestone, sodium sulfate, barium chloride, sodium carbonate; - bronchitis and silicosis e.g. due to prolonged inhalation exposure to lime; - severe chemical burns and potentially fatality e.g., due to exposure to hydrochloric acid, sulfuric acid, and sodium hydroxide; - respiratory and heart failure and potentially fatality due to ingestion of barium chloride. <p>The maximum credible consequence would be a multiple fatality, for example due to a catastrophic failure of the concentrated sulphuric acid tank.</p> <p>The event is most likely to occur during the operations phase of the Nolans Project.</p>	<p>Medium</p>	<p>Medium</p>
<p>Personnel impacted by climatic extremes while working on site in adverse weather conditions.</p>	<p>Consequences will vary depending on the type of exposure, where effects may range from dehydration, sunburn, injuries from being struck by items through to fatality due to heat stroke, struck by lightning or major building / structural failures.</p> <p>The maximum credible consequence would be a single fatality as it is considered unlikely for multiple people to be impacted by a single climatic event.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	<p>Medium</p>	<p>Medium</p>
<p>Engulfment of personnel in RE materials while working on site on stockpiles, ROM or around bins, hoppers, chutes etc. Personnel may be engulfed while on foot or in mobile equipment.</p>	<p>Consequences will vary depending on the volume of material in which personnel are engulfed and the ability to self-rescue.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	<p>Medium</p>	<p>Medium</p>

Potential event (hazard)	Potential impact (maximum credible consequence)	Managed Risk Level	Residual Risk Level
Personnel exposed to hazardous flora or fauna including snakes, spiders, mosquitoes, biting insects, bees, wasps, larger animals such as dingoes / wild dogs, wild pigs etc.	<p>Consequences will vary depending on the flora or fauna to which personnel come into contact and whether or not they have an allergic reaction to bites / stings.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Unauthorised site access / security breach during construction and operation.	<p>Consequences will vary depending on the location of unauthorised access and the reason for access (e.g. if they are deliberately causing harm). Personnel may be exposed to many of the site hazards including mobile equipment movements, residue storage facilities, hazardous chemical etc.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel exposed to increased noise levels during construction and operation of the mine, RE intermediate plant and associated infrastructure.	<p>Consequences of cumulative noise exposure will be an increased risk of industrial noise induced hearing loss (NIHL).</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium
Personnel exposure to whole body vibration during operation of mobile equipment in mining operations.	<p>Consequences of whole body vibration will ultimately be muscular skeletal disorders.</p> <p>The event is most likely to occur during the operational phase of the Nolans Project.</p>	Medium	Medium
Personnel exposed to increased risks due to the remote location of the site and / or undertaking lone and isolated work.	<p>Although the initial injury may not be immediately life threatening, there is potential for the situation to escalate due to the distance and time it takes for medical aid.</p> <p>The maximum credible consequence would be a single fatality.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	Medium	Medium

Potential event (hazard)	Potential impact (maximum credible consequence)	Managed Risk Level	Residual Risk Level
<p>Manual handling injuries during manual work conducted on site across the operations.</p>	<p>Manual handling injuries may include back injuries such as injuries to nerves, bones, joints and soft tissue hernias, ruptured discs and torn back muscles.</p> <p>Other consequences may include sprains of ligaments, strains of muscles or tendons, tendonitis, spondylolisthesis, carpal tunnel syndrome and Repetitive Strain Injury.</p> <p>The maximum credible consequence would be musculoskeletal effects to bones and soft tissue structures.</p> <p>The event may occur at any time throughout the life of the Nolans Project.</p>	<p>Medium</p>	<p>Medium</p>

11.3.2 Transport related risks

The two highest risks identified for human health and safety were in relation to vehicle movements and the management of traffic on and off-site. The top two risks include:

- Vehicle incidents associated with the transport of materials and personnel off-site on public roads, including vehicle to vehicle impact, single vehicle incidents (rollover, vehicle over the edge, vehicle impact with structure) and vehicle to pedestrian impacts.
- Mobile equipment incidents on site including vehicle to vehicle impact, single vehicle incidents (rollover, vehicle over the edge, vehicle impact with structure) and vehicle to pedestrian impacts.

Although controls have been identified (refer section 11.4.3), it is not anticipated to reduce the likelihood from unlikely or the consequence from catastrophic due to the sensitivity of the qualitative risk assessment technique. Therefore, the risk level remains high.

11.3.3 Ground control risks

Inherent within a mining operation is the risk of ground failure or rock fall events. Within the project human health and safety risk assessment, ground failure or rock fall leading to a person being struck and injured was assessed as a medium risk. Although the consequence is major (potential for fatality), the likelihood is considered to be low (rare) due to the proposed controls that will be implemented and due to the fact that this type of event is more likely to occur in underground mining than in open pit mining.

11.3.4 Hazardous material exposure

The potential for personnel to be exposed to hazardous materials was identified as a risk associated with the Nolans Project, particularly for the processing facilities. Materials identified that may cause harm to personnel include sulfur, lime, limestone, hydrochloric acid, hydrogen fluoride, sodium hydroxide, sodium sulfate, sulfuric acid, barium chloride, sodium carbonate, chlorine, fire suppression chemicals, rare earth intermediate products, tailings, process residues, sewage.

All critical gaseous emissions from the process, including hydrogen fluoride and chlorine, will be captured using scrubbing systems. These are being incorporated into the engineering design.

Personnel may be exposed in a number of ways including during transport and storage or use of the materials. In the event of exposure, consequences will depend on the extent of exposure and the material, therefore it may range from minor consequences such as irritation to skin or the maximum consequence of fatalities, for example due to a catastrophic release of concentrated sulfuric acid.

11.3.5 Fire risks

Due to the presence of flammable and combustible materials, there is a potential for fire and explosion events. While the consequences may be catastrophic (fatalities), the likelihood is low (rare) due to the controls that will be implemented; therefore, this was assessed as a medium risk.

Scenarios may include equipment (e.g. mobile equipment and fixed plant fires), and substance fire and explosions, for example, diesel storage, gas fired power generation plant and Amadeus Basin to Darwin high pressure gas pipeline. There is also a potential for bushfires to occur which expose personnel to health and safety risks.

11.3.6 Climate extremes

The location of the Nolans site is in an area with high ambient air temperatures, therefore personnel may be exposed to adverse effects as a result of climatic extremes. This includes high winds, lightning, storms, hail, heat, ultra violet radiation.

When working in hot conditions, heat exposure is considered one of the higher risk scenarios which may lead to heat stress or heat stroke. Although it is considered unlikely due to the controls in place, there is a potential for fatality to occur as a result of climate extremes.

There are design features that will assist in reducing the risk of climatic extremes such as equipment design specifications taking into account wind loading, ventilation, lagging of hot surfaces, cooling systems and lightning arrestors.

11.3.7 Remote area risks

Personnel may be exposed to increased risks due to the remote location of the site and / or undertaking lone and isolated work at the Nolans site; this is due to the increased time for emergency response, potential communication failures, black spots and long travel distances. This includes personnel such as exploration crews (drillers, geologists etc.), surveyors, shot firers, pump crew, supervisors, environmental specialists and third party contractors (electrical personnel, fitters.).

Although the initial incident may not be immediately life threatening, there is potential for the situation to escalate due to the distance and time it takes for medical aid. Therefore, to reduce the risk associated with the remote location, additional control measures are identified in Section 11.4.8.

11.4 Control measures and monitoring

11.4.1 Engineering and operational controls

The engineering controls identified within the human health and safety risk register (refer Appendix O) will be built into the design of the site and associated infrastructure as the Nolans Project progresses. Operational controls will be developed during the design and construction phases and implemented for hand over to operations.

11.4.2 General administrative controls

A health and safety management system will be implemented and used as the basis for the management of all aspects of human health and safety for the Nolans Project. The structure of the management system will be based on guidance provided by WorkSafe Australia and AS/NZS 4801:2001 Occupational Health and Safety Management Systems; and will include the following elements:

- monitoring
- auditing
- review
- improvement cycles.

Risk management procedures will be prepared. Maintenance of a site specific risk register will be required to identify and assess risks to human health and safety throughout the Nolans Project lifecycle to ensure those risks are minimised. The risk register will be a live document, formally reviewed on a regular basis to assess the operations and put in place appropriate control measures to prevent and / or mitigate the risks.

A hierarchy of control will be established and implemented to its fullest extent. During the design stages, control strategies higher in the hierarchy can be applied to eliminate, substitute, isolate or engineer the site, infrastructure and equipment to reduce the risks so far as is reasonably practicable.

An incident management system will be established and implemented which will identify the hazards and system deficiencies to prevent an incident reoccurring through an investigation and corrective action process. An incident management process will be implemented to enable:

- On-going identification of hazards and reporting of incidents by any site personnel
- Investigation of all reported incidents
- Follow up and close-out of identified corrective actions
- Communication of incidents across the organisation and statutory reporting, if required,
- Use of findings from incident investigations to improve systems, processes and procedures.

An emergency response strategy will be established (See also Appendix X, Emergency Response Management Plan). This will incorporate the emergency response systems, procedures, scenario specific emergency response plans and resources. The emergency response strategy will be managed by the site emergency response team consisting of dedicated staff. All personnel within the emergency response team will undergo regular training and participate in regular mock and desktop exercises.

A regular audit program will be implemented to confirm compliance with the health and safety legislative requirements and company / operations specific processes and procedures. This will also include independent external authorities conducting audits as necessary.

It is intended that emergency response planning will also incorporate actions to manage incidents that might occur off the Nolans site. This would relate to incidents where reagents in transit to the site may have spilled or leaked or as the result of a vehicle accident resulting in a loss of containment. The ERP will provide direction and advice to emergency response personnel who may have statutory responsibility for the clean-up actions for these incidents to ensure they are aware of the hazards associated with the product with which they are dealing.

11.4.3 Transport related controls

To manage the vehicle related risks 'so far as reasonably practicable', the proposed control measures that will be implemented for the Nolans Project were identified as:

- Design features such as:
 - Segregation between vehicles and vehicles / pedestrians e.g. road access restrictions, dedicated walkways
 - Road design to relevant standards
 - Dedicated laydown / hardstand areas
 - Vehicle design specifications and associated procurement management
 - Vehicle decals and flags, flashing lights
- Traffic Management Plan which details:
 - Authorisation process for vehicles to enter site
 - Access restrictions to operational areas e.g. through the use of barricades;
 - Site speed restrictions
 - Vehicle maintenance program including pre-start inspections and routine maintenance

- Road maintenance program, including dust suppression
- Change management
- Equipment and task specific procedures / work instructions
- Equipment and task specific training and competency assessment (including ongoing refresher)
- Fitness for work management system including hours of work, drug & alcohol policy, medicals, fatigue management.)
- High visibility PPE.

In addition to the above controls, further systems and processes will be implemented to manage off site vehicle related risks. These include:

- Audit of service provider during selection process to encourage competence and professionalism;
- Transport study and associated management systems
- Journey management plans (including minimising travel during dusk / dawn)
- Contractor management system
- National Heavy Vehicle Regulator Scheme accreditation
- Speed limiting on heavy vehicles
- Community consultation and awareness program.

The transport of dangerous goods will be conducted in accordance with the *Northern Territory Transport of Dangerous Goods Act (2015) & Regulations (2011)* and *Australian Dangerous Goods Code 7.3*.

Additional controls have been identified for both vehicle and mobile equipment incidents. This includes in vehicle monitoring systems to track driver behaviour, proximity detection systems and alarms, accident/incident investigation protocols and quarterly road safety briefings.

11.4.4 Ground control risks

The following controls will be implemented to manage risks identified from the mining operation such as ground failure or rock fall events:

- Mine design (including review and sign-off processes)
- Mine modelling and mapping (hydrogeological, geological, exploration data etc.)
- Mine geological and geotechnical monitoring e.g. Global positioning system (GPS) tracking of faults, daily inspections, ground monitoring systems (prism, extensometers, radar, piezometer, survey)
- Geotechnical hazard maps
- Trigger action response plans
- Mine drainage design and systems
- Water management plan
- Blasting design including blasting management and clearance
- Blast vibration monitoring
- Equipment and task specific procedures / work instructions

- Equipment and task specific training and competency assessment (including ongoing refresher)
- Falling object protection systems (FOPS) on mobile equipment
- Access restrictions to pit ramps, slopes and crests
- Hazard reporting.

No further controls were identified for implementation other than those already planned, therefore the risk remains as medium, However, through the ongoing risk management process, if any new technologies or processes are identified that may reduce the risk, these will be considered.

11.4.5 Hazardous material exposure

Controls have been identified to reduce hazardous material exposure risk, including controls that will be taken into account within the design of the facilities. The Hazardous Substances Management Plan (See Appendix X, EMP) provides a framework for the management of hazardous substances and will include:

- Hazardous substance storage and handling system design specifications
- Plant process control
- Storage, handling and spill management requirements as specified in the Safety Data Sheets, ChemAlert database and legislative requirements for the *Northern Territory Transport of Dangerous Goods Act (2015) & Regulations (2011)* and *Australian Dangerous Goods Code 7.3*
- Inspection and maintenance of hazardous substance storage systems
- Spill kits
- Procedure for transport and storage of hazardous substances
- Equipment and task specific procedures / work instructions
- Equipment and task specific training and competency assessment (including ongoing refresher)
- Isolation procedure and associated training
- PPE (eye protection, breathing apparatus, gloves etc.)
- Signage / labelling of equipment containing hazardous substances
- Site induction.

11.4.6 Fire risks

Controls to minimise fire risk will be developed during the design stage of the Nolans Project. Additional controls will be developed and implemented throughout operations. Some control strategies include:

- Fixed plant and mobile equipment design specifications and associated procurement management
- Hazardous substance storage and handling system design specifications
- Fire detection and suppression systems, fire extinguishers and firefighting training
- Lightning arrestors

- Fixed plant and mobile equipment maintenance program including pre-start inspections and routine maintenance
- Gas pipeline design and SMS (AS 2884)
- Inspection and maintenance of hazardous substance storage systems
- Electrical protection systems
- Thermographic monitoring
- Operational procedures including transport and storage of hazardous substances, isolation, excavation / dig permit; hot work procedure and permit
- Signage and demarcation of gas pipeline
- Fire breaks, cool-season controlled burns, vegetation reduction program and
- Fire management plan.

11.4.7 Climate extremes

In addition to the design features that will assist in reducing the risk of climatic extremes (Section 11.3.6), there will also be a number of administrative controls used during operations to reduce the effects of climate extremes such as:

- Fitness for work management system including hours of work, drug and alcohol policy, medicals, fatigue management)
- Adverse weather procedure (including weather monitoring and stop work requirements)
- Trigger action response plans (actions to be taken if the monitored parameter is above the trigger value, with escalation processes for increasing trigger values)
- Lone and isolated workers' procedure
- Heat reducing PPE
- Heat stress / hydration monitoring and provision of camel backs / electrolyte replacement drinks
- Scheduling work to avoid hottest time of day
- Communication protocols.

11.4.8 Remote area risks

Although the initial incident may not be immediately life threatening, there is potential for the situation to escalate due to the distance and time it takes for medical aid. Therefore, to reduce the risk associated with the remote location the following controls will be implemented:

- Controls listed in Section 11.4.7
- Journey management plans
- Communication equipment suitable for the area and activity
- Vehicles fitted with recovery equipment, first aid kits, water supply etc.
- Emergency response procedures, team and equipment, specifically incorporating the limitations associated with the remote location
- Man-down alarms.