

Chapter 16

Health and Safety

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16 Health and Safety

This section outlines the key health and safety issues for project personnel and the public during the construction and operation phases of the project. It also outlines preventative and management measures aimed at reducing or avoiding impacts on human health and safety, as well as outlining the Emergency Response Plan.

Given the context for the KGGP project, the following will be critical to securing strong health and safety outcomes for the project:

- Critical controls in all project environments: supervision, risk assessments and communication.
- Effective contractor management, given the main body of the workforce would be contractors.

All plans will ensure a strong focus on the above elements.

16.1 HEALTH RISKS

16.1.1 Description

Health risks arising from constructing and operating the KGGP were assessed by:

- Identifying existing, or background health hazards, which occur in the pipeline region ('background hazards')
- Identifying discrete activities for each phase of the project and screening for:
 - Activity-specific health hazards ('activity hazards').
 - Potential to exacerbate exposure to background hazards.
- Assessing each activity hazard for:
 - Its potential health impact on the public and the workforce.
 - Potential exposure of the public and the workforce to the hazard, in terms of likelihood and magnitude.
- Separate lists of project-related risks were then compiled for public health and workforce health, and options for risk elimination or mitigation were considered.
- In the case of identified public health risks, the aim would be to ensure that the project, as a minimum standard, would not elevate the risk above pre-existing background levels. In the case of workforce health risk, the aim would be to reduce health risk to levels as low as reasonably practicable.

A biting insects study was undertaken specifically for the TTP project and is considered to remain relevant to the KGGP. The key findings are summarised in Chapter 4 in this Draft EIS.

16.1.2 Potential impacts of construction and operation

Potential aspects of the KGGP project that could increase public health risks if not properly managed include:

- Construction works without good drainage control during road, borrow pit and camp construction, disposal of hydrotest water and general waste management increasing the number and/or extent of breeding areas for disease vectors such as mosquitoes. This could lead to an increased incidence of vector-borne diseases such as Ross River virus, Murray Valley Encephalitis, Barma Forest virus, dengue fever and malaria.

- Inappropriate discharge of wastewater and/or chemically treated hydrotest water causing contamination of water sources used for drinking and/or irrigation. This would increase the risk of gastro-intestinal diseases arising from bacteria such as *Escherichia coli* and other water-borne pathogens.
- Spills or improper disposal of fuel and/or chemicals, which may contaminate waters that support fish and other fauna or are utilised by local communities. This could result in the loss of the food source or harm to health by ingestion of contaminated food or water.
- Improper disposal of hazardous and putrescible wastes, leaving them accessible to children, with the potential for harm by ingestion, or skin or eye contact with corrosives or irritants.
- Dust and noise from construction traffic and mobile equipment causing nuisance to local communities.

In addition, the construction workforce and personnel with operational responsibilities may be exposed to or have increased health risks arising from a number of hazards. A summary of identified risks and potential impacts on workforce health is presented in Table 16-1. The most potentially significant of these relate to heat and fatigue, biting insects and hazardous substances.

Table 16-1: Potential workforce health risks

ACTIVITY	HAZARD	POTENTIAL IMPACTS
All construction, commissioning and operations activities	Solar radiation & heat	Sunburn, skin cancers, keratoses, heat illness/stroke.
	Biting insects	Murray Valley encephalitis virus (MVEV), Kunjin virus (KUNV), Ross River virus (RRV), Barmah Forest virus (BFV). Itchy caterpillars and biting midges causing skin irritation and secondary infections.
	Soil and water-borne bacteria and parasites	Tropical diseases like melioidosis, with infection primarily caused by contact of soil or water with cuts and abrasions.
	Native and feral fauna	Venomous snakes and spiders may be encountered along the TTP route – severe illness or death may result from bites. Contact with a range of wildlife could result in the transmission of disease: Bats may carry lyssavirus (causing encephalitis), Buffalo, goats and pigs could transmit disease. Contact with Buffalo, goats, pigs, dingoes and crocodiles may also cause injury.
	Manual handling	Sprains and strains.
	Whole body or hand/arm vibration	Back pain, decreased grip strength, decreased hand sensation and dexterity, carpal tunnel syndrome.

ACTIVITY	HAZARD	POTENTIAL IMPACTS
	Isolation	Isolation from medical centres, particularly during construction along the pipeline corridor in remote areas may result in exacerbation of injury/illness due to time taken to obtain appropriate treatment.
	Fatigue	Increased risk of injury and illness.
Camp management Sanitation	Waste water – bacteria, viruses	Dysentery, hepatitis.
Catering	Poor food &/or water quality management	Food poisoning, gastro-enteritis.
Operating, or working adjacent to mobile plant and machinery	Noise	Noise-induced hearing loss.
Cleaning	Hazardous substances	Various.
Welding & grit Blasting	Fumes, other particulates	Respiratory disorders.
X-Ray of welds, Communications	Radiation – ionising and EMF	Radiation sickness, sterility, cancer.
Coating/repair		
Hydrotesting – water Treatment	Hazardous substances	Various
Pipeline purging	Nitrogen	Asphyxiation.

16.1.3 Mitigation response and assessment of environmental impact

The primary approach to managing the public and worker health risks arising from construction and operation of the KGGP will be to ensure construction activities do not create or expand mosquito breeding areas, to supply water and waste treatment to Australian Standards and to develop a Health Management Program and associated management plans during detailed design (Table 16-2). Specific health management measures are proposed for:

- Solar Radiation and Heat.
- Biting Insects.
- Soil and Water-Borne Bacteria and Parasites.
- Fatigue and Fitness for Work.
- Catering and Water Supply Management.
- Wastewater.
- Hazardous Substances.
- Dusts, Fumes, Mists, Vapours and Gases.
- Isolation: medical emergencies.
- Manual handling.
- Vibration.

- Noise.
- Radiation.
- Fauna encounters.

A project specific Health and Safety Management Plan will formalise these arrangements. A provisional Health and Safety Management Plan is provided at Appendix O.

Solar Radiation and Heat: Acceptable risk mitigation will be achieved by a combination of measures aimed at minimising direct exposure, providing cool water at all times and scheduling of tasks.

Biting Insects: Acceptable risk mitigation will be achieved by applying the guidance contained in the medical entomology guideline: 'Personal protection from mosquitoes & biting midges in the NT, 2011' produced by the Northern Territory Government. Avoidance will be practiced where feasible. Where avoidance is not possible personal protection such as the use of protective clothing and appropriate repellents will be used. Screening will be used at camp accommodation and lighting diversion and adult insect control will be employed if feasible. Active management of surface water will also be undertaken to reduce the risks associated with the creation or expansion of breeding sites from construction activities.

Fatigue and Fitness for Work: Managing fatigue is essential to controlling injury risk, particularly for a FIFO workforce with long swings. The fatigue management plan will address the risks associated with FIFO travel especially their travel at the beginning and end of swings, and the travel undertaken to get to the work site on a daily basis.. A fitness for work and fatigue management programme will be included in the implementation component of the Health Programme. This program will include a medical surveillance component.

Catering and Water Supply Management: Catering will be managed in accordance with recognised best practice standards. The supply of drinking water will comply with the Australian Drinking Water Guidelines 2011, as published by the National Health and Medical Research Council.

Wastewater. Potential exposure to enteric bacteria and other pathogens in sewage and waste water will be controlled by package design/purchase specification for treatment plants, and working procedures.

Hazardous Substances: All hazardous substances used on the project will be controlled and registered in accordance with a project specific Waste Management Plan (a Provisional Waste Management Plan is provided at Appendix O). Material safety data sheets will be obtained and used, in conjunction with appropriate workplace risk assessments, for development of safe handling, storage and disposal procedures. Disposal of hazardous substances will also be covered by waste management procedures designed to protect both the environment and local communities.

Manual handling: All aspects of the workplace will be assessed for ergonomics. The induction program will address manual handling hazards and correct manual handling techniques.

Vibration: Equipment will be assessed for the potential to cause whole body vibration and appropriate controls will be put in place to minimise the exposure. All hand tools will be assessed for the potential to cause hand/arm vibration and appropriate controls will be implemented to minimise exposure.

Noise: Where plant and equipment cannot be procured that operate below recommended noise thresholds, noise levels will be monitored and appropriate noise protection will be required to be used.

Dusts, Fumes, Mists, Vapours and Gases: Airborne health hazards arising from construction activities, such as welding, grit blasting, coating/repair and pipeline purging etc. will be controlled by standard

work procedures and workplace risk assessments, as set out in the implementation component of the Health Programme.

Radiation: Acceptable risk mitigation will be achieved by a combination of measures aimed at surveying and monitoring potential exposure, and minimising exposure.

Fauna: The workforce will be instructed on the fauna which may be encountered, their typical behaviours and where applicable, the hazards they present. Measures will be taken to minimise the potential for workforce-fauna contact.

Table 16-2: Mitigation measures for health risks

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION (ACTION)		ANTICIPATED EFFECT OF MITIGATION
	AVOIDANCE	MINIMISATION	
<ul style="list-style-type: none"> • Work place injury or sickness. • Public health risk from construction activity 	<ul style="list-style-type: none"> • Supply of drinking water to Australian Drinking Water Guidelines 2011. • Management of construction activities to avoid creation or expansion of biting insect breeding sites. • Personal protection and screening for insect bites. • Personal protection for noise exposure. • Provision of package treatment plants to treat waste water. 	<ul style="list-style-type: none"> • Standard work procedures and workplace risk assessments for dust, fumes and gases. • Health Program including fitness for work, fatigue management and solar radiation and heat management measures. • Workforce induction program on hygiene and immediate treatment of cuts and abrasions. • Supervision. • Risk assessment processes. • Communication protocols. • Effective contractor management. • Minimise workforce – fauna contact. • Evacuation Procedures for emergencies. • Provision of first aid training and equipment. • Establishment of medical facilities and provision of medical personnel at construction camps. • Use and disposal of hazardous substances in accordance with a project specific waste management plan. 	<ul style="list-style-type: none"> • Health risks to workers reduced to as low as reasonably practicable. • No increase in public health risks arising from the project

16.1.4 Summary – predicted environmental outcome

Once mitigation measures are applied the health risks to workers and the public from constructing and operating the KGGP will be as low as reasonably practicable. No exacerbation of public health issues in the region are anticipated arising from the KGGP Project.

16.2 SAFETY - PIPELINE FAILURE

16.2.1 Description

Pacific Aluminium is fully committed to excellence in safety, with a goal to protect and promote the safety of all personnel working on the KGGP project, or those who may be affected by the project activities.

A preliminary Risk Assessment was undertaken to assess the risks to public and worker safety associated with pipeline failure, in line with the requirements of AS 2885.1 (Australian Gas and Petroleum Pipeline Standard: Design and Construction) which calls on the methodologies outlined in AS/NZS ISO 31000: 2009 Risk Management Standards. The assessment was carried out to ensure that the route and pipeline design parameters did not involve any risks which could not be made acceptable by either design or procedural measures. The effects from worst scenario cases of failure were considered with respect to:

- Safety of the public.
- Safety of employees and contractors.

The preliminary assessment is presented at Appendix N and will provide a basis for further refinement during the design phase of the project.

16.2.1 Potential impacts of construction and operation

A series of features along the pipeline route and the threats associated with each feature have been identified in the preliminary risk assessment. Where possible, risk has been minimised through route selection and additional risk mitigation methods to be employed were assessed on the basis of reducing risk to as low as reasonably practicable in accordance with Australian Standard 2885.1 requirements and the requirements specified by Rio Tinto.

Forty five threats were systematically assessed against the Rio Tinto risk matrix. No Class IV (extreme) risks were identified from the risk assessment. The highest risks identified for the pipeline relate to interference by third parties. These were identified as having a Class III (high) level of risk as follows:

- Farming activities (deep ripping, fence posting).
- Public Developments and Maintenance (road and drain maintenance).
- Mining Development (including exploration drilling and blasting).
- Road / Highway Maintenance.

Other threats assessed as Class III (high) were:

- Earthquake damage.
- Erosion above or around the pipeline.
- Pipeline over-pressurisation.
- Excessive vehicle loading above the pipeline.
- Escalation of consequences of damage to and from the pipeline for sections in close proximity to the refinery.
- Loss of containment at the compressor station.

- Loss of containment at the Gove Gas Let Down Station.
- High pressure at the Gove Gas Let Down Station.
- Evacuation in respect of above ground equipment in a remote location.
- Caustic and alumina fall out at the Gove refinery.
- Damage to above ground equipment and compressor station from bushfires.

16.2.2 Mitigation response and assessment of environmental impact

The application of proposed control and mitigation measures will reduce the residual risk of the forty five assessed threats and hazards to no higher than Class III (high) risks. Recommendations have been raised in the preliminary risk assessment (Appendix N) which will be addressed in the design phase of the project to further clarify and reduce safety risks. Mitigation measures and anticipated effect on risk are summarised in Table 16-3.

Table 16-3: Mitigation measures for safety – pipeline failure

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION (ACTION)		ANTICIPATED EFFECT OF MITIGATION
	AVOIDANCE	MINIMISATION	
<ul style="list-style-type: none"> • External or internal factor affecting pipeline integrity with consequent risks for public safety or the environment. 	<ul style="list-style-type: none"> • Depth of cover to AS2885 assessed against current and potential land use. • Design in conjunction with respective parcel stakeholders. • Process for installation – (Horizontal Directional Drilling, HDD under major watercourses) to preserve riparian vegetation and river bank integrity. • Rock armour restoration for significant open-cut water course crossings (non HDD). • Selection of location remoteness to high activity areas within refinery boundary. • Additional depth of cover within refinery and conveyor corridor. 	<ul style="list-style-type: none"> • Dual redundancy in pressure regulation and instrumentation. • Design thickness and material in areas of known earthquake potential. • Sub-level concrete barriers between pipeline and road drain inverts. • Danger tape mid cover across open cut road reserve crossings. • Design for environment – no aluminium instrument components within refinery. • Above ground facility perimeter fence and firebreak margins. • Above ground facility options of egress. • Signage. • Registration (of easement and pipeline licence). • Inspection. • Periodic pipeline integrity testing utilising intelligent pig runs to AS2885. • Refinery excavation permitting procedures. • Maintenance of firebreaks around above ground facilities. 	<ul style="list-style-type: none"> • No extreme risks to public or worker safety. • Risks reduced to as low as reasonably practicable.

16.2.3 Summary – predicted environmental outcome

A preliminary risk assessment has been conducted in accordance with AS2885.1. No extreme risks to public and worker safety from pipeline failure have been identified. Seventeen high level risks have been identified. These and lower risks are the subject of recommendations that will be addressed in the design phase. Implementation of these recommendations is anticipated to reduce risks further to as low as reasonably practicable.

16.3 PUBLIC AND WORKER SAFETY – CONSTRUCTION AND OPERATION

16.3.1 Description

The KGGP will be designed in accordance with Australian Standards for pipelines, in particular AS2885. The established design processes ensure that all stages are checked and verified through a number of reviews, including specific Environment Health Safety (EHS) reviews, Hazard and Operability study (HAZOP) and risk assessments. These reviews will identify EHS hazards, assess the risk and implement control measures in accordance with the following hierarchy of control:

- Elimination.
- Substitution.
- Engineering control.
- Administrative control.
- Personal protective equipment.

16.3.2 Potential impacts of construction and operation

The workplace hazards for field work to construct and operate the KGGP include:

- Travelling in remote areas including aviation safety.
- Vehicle interactions (Light vehicle to Light vehicle, Light Vehicle to foreign object including fauna, Light Vehicle to Heavy Vehicle, Heavy Vehicle to Heavy Vehicle, Light or Heavy Vehicle with person).
- Extreme weather (lightning strikes, cyclones, intense tropical downpours, flooding).
- Wild fire.
- Falls, trips and other work hazards.
- Communications failure (may be satellite phone or radio system).
- Use of mobile equipment.
- Use of plant, equipment and tools.
- Manual handling.
- Electrical safety.
- Cranes and lifting.
- Trenching and excavation safety.

16.3.3 Mitigation response and assessment of environmental impact

Safety of the project will be delivered through the use of industry accepted methods and controls and compliance with the relevant Pacific Aluminium's OH&S policies and procedures; and Northern Territory legislation (Table 16-4). The project will comply with the latest revisions of AS/NZS 4804 Occupational Health and Safety Management Systems – General Guidelines on Principles, Systems and Supporting Techniques, and AS2885 Pipelines – Gas and Liquid Petroleum. A project-specific Safety Policy will be issued as part of the Pipeline Licence application.

Table 16-4: Mitigation measures for public and worker safety

ENVIRONMENTAL IMPACT	PROPOSED MITIGATION (ACTION)		ANTICIPATED EFFECT OF MITIGATION
	AVOIDANCE	MINIMISATION	
<ul style="list-style-type: none"> Accidents or incidents leading to injury or death of worker or member of the public 	<ul style="list-style-type: none"> Adherence to Pacific Aluminium OH&S policies and procedures, and NT legislative requirements. Compliance with AS/NZS 4804 Occupational Health and Safety Management Systems 	<ul style="list-style-type: none"> Preparation of Safety and Operating Plan (SOP) as required under AS2885 Pipelines – Gas and Liquid Petroleum, Part 3 – Operations and Maintenance. Project specific Safety Management Policy and Safety Management Plan Site induction arrangements. Supervision. Risk assessment processes. Communication protocols. Effective contractor management. Corridor restrictions. 4WD training. Travel management plans. Procedures and equipment to minimise vehicular accidents. Preparation of Emergency Response Plan (ERP). Provision of first aid training and equipment. Establishment of medical facilities and provision of medical personnel at construction camps. Provision of emergency equipment including EPIRBs 	<ul style="list-style-type: none"> Safety risks to the public and workers involved in constructing and operating the KGGP will be as low as reasonably practicable.

Safety Management Plans will be implemented to address the specific aspects of each stage of the project. The plans will be approved prior to the work commencing. The plans will ensure that all risks and threats are identified, and that all appropriate resources, measures and procedures will be in place to reduce the risk rating to low or negligible, and ensure that a risk level of ALARP is achieved.

The main stages of the project are design, pre-construction, construction, commissioning and operation. At each stage, project work is carried out in both office and field locations. Inductions, work procedures and project safety requirements apply to both locations.

The project Safety Management Plan will be revised regularly to reflect the activities to be conducted during each phase of the project, and will address the following main categories:

- Policy.
- Legal and other requirements.
- Hazard identification and risk management.
- HSEQ Management improvement planning.
- Organisational resources, accountabilities and responsibilities.
- Training, competency and awareness.
- Supplier and contractor management.
- Documentation and document control.
- Communication and consultation.
- Operational control.
- Management of Change.
- Business resilience and recovery.
- Measuring and Monitoring.
- Non-conformance, incident and action management.
- Data and records management.
- Performance assessment and auditing.
- Management review.

During the construction and commissioning phases of the project the following operational controls will be well developed and monitored:

- Vehicles and driving.
- Working at heights.
- Cranes and lifting.
- Confined spaces.
- Corridor access management.
- Permit to work system.
- Plant and equipment.
- Welding.
- Hydrotesting
- Trenching and excavation.
- Electrical safety.

A Safety and Operating Plan (SOP) is required under AS2885 Part 3 – Operations and Maintenance. The plan will become the umbrella document that draws together the engineering and operation details and will be the key document for managing safety risks.

Site induction arrangements will be established for visitors and the workforce. The induction will outline the project requirements and the hazards and control measures inherent in the project operations, including; travelling in remote areas, communications, maps and contact details. Induction will also require the project workforce to demonstrate competency in the application of the risk management processes to be used. Corridor restrictions will be imposed including prohibited activities and items, such as pets, firearms and illegal drugs. Speed limits and safe driving will be reinforced.

Due to the remoteness and rough terrain, all drivers requiring access along the corridor will be required to attend a suitable recognised off-road driving course. Work groups will be required to include a senior first aid person and all vehicles will be equipped with first aid kits, fire extinguishers and radio or satellite

phone communication. A travel management plan with daily communications schedule will be implemented.

Potential contractors transporting equipment and material on-site would be required to fulfil pre-qualification requirements and checks will be performed to ensure that safe procedures and practices are used. A specific focus here will include 'loading and unloading' procedures for the transportation of pipe and other goods to and from the site.

Risks of accidents arising from the trenching techniques (where the pipeline crosses roads) and the increased number of vehicles and trucks on the public roads during construction will be managed by:

- Encouraging the use of full occupancy or multiple person vehicles for travel to and from worksites, to reduce the number of work vehicles.
- Using Horizontal Directional Drilling to cross sealed and main road crossings.
- Carrying out road/track crossing excavation as quickly as possible.
- Maintaining public thoroughfare at all times during the work.
- Avoiding night traffic, where possible.
- Implementing a traffic management plan, including safety signs and flagmen, in compliance with road authorities.
- Installing warning signs and restricting speed on both the corridor and the road/track, approaching the crossing.
- Erecting barriers to restrict public access to the corridor.
- Planning equipment and material transport routes and storage areas in consultation with local and state authorities to minimise disruption to the public.
- Using a dedicated crew to coordinate the movement of traffic across a public road or track.
- Enforcing appropriate speed limits on sealed and unsealed roads, access tracks and along the construction corridor.
- Ensuring appropriate first aid training for key workforce personnel.

Medical facilities will be established at each construction camp and a medical officer stationed on each spread, with a 4WD ambulance and medical equipment.

All work vehicles will be fitted with satellite phone or radio communications. Emergency Position Indicating Radio Beacon (EPIRB) units will be issued to personnel, where appropriate.

In accordance with AS2885 Part 3, an Emergency Response Plan (ERP) will be implemented for all stages of the project. All foreseeable potential emergencies will be identified, both safety and environmental, and appropriate response procedures and training developed. Measures will be put in place to ensure that relevant personnel and resources will be available in the event of an incident. Part of the ERP will include details of the nearest medical facilities and methods of transporting an injured person from site. An injured person will be transported offsite using helicopter, light plane, ambulance, or using the services of the RFDS, depending on the nature of the injury and location of the incident.

16.3.4 Summary – predicted environmental outcome

All incidents will be investigated utilising the appropriate level of investigation method. The goal of all investigations will be to identify the root causes with mitigation actions defined, appointed and completed to prevent reoccurrence of the incident.

After mitigation measures have been applied, the safety risks to the public and workers involved in constructing and operating the KGGP will be as low as reasonably practicable.