PORT of TOWNSVILLE

Unique North Queensland

Section 6
Hazard and risk assessment

Townsville Marine Precinct Project

Environmental Impact Statement

GHD

6. Hazard and risk assessment

6.1 Overview

A Hazard and Risk Assessment has been undertaken by GHD and is included as Appendix CC. The objective of the Hazard and Risk assessment is to provide a qualitative investigation of potential hazards and risks associated with the Project and to identify actions for mitigating or reducing these hazards and risks.

6.2 Dangerous Goods

The project will use a number of substances listed in the Australian Dangerous Goods Codes. Table 6-1 provides an indicative list of substances by chemical name, dangerous goods classification, raw and storage concentrations, UN number, packaging group and use of this substance.

Table 6-1 Indicative Lists of Hazardous Substances and Stated Dangerous Goods

Chemical Name (Shipping Name)	Raw conc., %wt	Storage conc., %wt	D.G. Class	Hazchem Code	UN Number	Packaging group	Purpose/ Use
Diesel (Diesel)	N/A	N/A	3 (Class C1)*	3[Z]	1202	III	Fuel for marine and heavy vehicle operations
Unleaded Petrol	N/A	N/A	3	3[Y]E	1203	II	Fuel for spark ignition engines
Oils (Lubrication/ Hydraulic Oils)	N/A	N/A	3 (Class C2)**	N/A	N/A	N/A	Lubricate plant and equipment and replenish hydraulic systems.
Liquefied Petroleum Gas (LPG)	Propane: 40-100% Propylene: 0-60%	Propane: 40-100% Propylene: 0-60%	2.1	2WE	1075	N/A	Fuel
Acetylene (Acetylene Dissolved)	> 98%	> 98%	2.1	2[S]E	1001	N/A	Fuel

1,1,1,2-Tetrafluoroethane (Refrigerant gas R134a)	>99%	>99%	2.2	2RE	3159	N/A	Refrigeration gas
Liquid Nitrogen (Liquid Nitrogen)	>99%	>99%	2.2	2RE	1977	N/A	Freezing application
Nitrogen gas	>99%	>99%	2.2	2T	1066	N/A	Pneumatic equipment

*: Class C1 – a combustible liquid that has a flashpoint of 150^{o}C or less

**: Class C2 – a combustible liquid that has a flashpoint exceeding 150^{o}C

N/A: None allocated

6.2.1 Construction Phase

Table 6-2 provides an indicative list of substances to be held at site during the construction phase. The table details rate of usage, indicative maximum storage at site, storage and handling details.

Table 6-2 Consumption Details of Hazardous Substances and Stated Dangerous Goods – Construction Phase

Chemical Name	Indicative maximum inventory onsite	Storage Details	Handling Details	Storage Location
Diesel (Diesel)	80 kL	80 kL aboveground storage tanks	Road transport by fuel tanker to mine site storage tanks, one trip per day. Manual transfer to vehicles on-site	Fuel farm
Oils (Lubrication/ Hydraulic Oils)	4 kL	Bulk and drums	Road transport to mine site	Fuel farm

6.2.2 Operation Phase

Table 6-3 provides an indicative list of substances to be held at site during the operation phase. The table details rate of usage, indicative maximum storage at site, storage and handling details.

Table 6-3 Consumption Details of Hazardous Substances and Stated Dangerous Goods – Operation Phase

Chemical Name	Indicative maximum inventory onsite	Storage Details	Handling Details	Storage Location
Diesel (Diesel)	75 kL	3 x 25 kL aboveground storage tanks	Road transport to site by 57 kL fuel tanker 27m B doubles type, 700 trips per year. Manual transfer to vehicles on-site	Fuel farm
Unleaded Petrol	50 kL	2 x 25 KL	Road transport to site by 57 kL fuel tanker 27m B doubles type, 700 trips per year. Manual transfer to vehicles on-site	Fuel farm
Oils (Lubrication/ Hydraulic Oils)	30 kL	Bulk and drums	Road transport to mine site by 30 kL fuel tanker 27m B double type, 6 trips per year. Manual transfer to vehicles on-site	Fuel farm
Liquefied Petroleum Gas (LPG)	1300 kg	45 kg bottles	Road transport to site by trucks. Manual transfer to storage	Store/ Work Shop
Acetylene (Acetylene)	245 m^3	35 x 7 m^3 bottles	Road transport to site by trucks. Manual transfer to storage	Store
1,1,1,2-Tetrafluoroethane (Refrigerant gas R134a)	40 kg	In standard bottles	Road transport to site by trucks. Manual transfer to storage	Store
Liquid Nitrogen (Liquid Nitrogen)	160 L	In standard bottles	Road transport to site by trucks. Manual transfer to storage	Workshop/ Store
Nitrogen gas	20 bottles per annum	190 m^3	6 x 7.2 m^3 bottles 3 x 4.1 m^3 bottles	Road transport to site by trucks. Manual transfer to storage

6.2.3 Dangerous Goods Management

Diesel

Diesel is a combustible liquid and will be used as a fuel for heavy vehicles. Diesel colour is variable – water white through to light brown/ straw colour light to fluorescent green. It has a flash point of > 61.5^{o}C, specific gravity 0.85 at 15^{o}C and vapour pressure < 1 mm Hg @ 25 ^{o}C. Contact with eyes and skin will cause irritation. Inhalation in high concentrations will result in

headache, dizziness, nausea, vomiting, drowsiness or narcosis. Time Weighted Average (TWA) National Occupational Health and Safety Commission (NOHSC) exposure standard for oil mist is 5 mg/m^3. Spills can impact flora and fauna.

It is proposed to store diesel in two tanks each with a capacity to hold 400 kL of diesel. Both tanks will be above ground on impervious surfaces and located in the Fuel Farm. Designs including the bund capacities will be as per AS 1940 – The storage and handling of flammable and combustible liquids. All tank transfer operations will be on impervious surfaces with a spill collection system. An external concrete concourse has been proposed at the vehicle servicing workshop area for refuelling trucks.

Diesel is insoluble in water and incompatible with strong oxidising agents. Spillages will be prevented from entering drains or water courses. The drain valves to the bund will be designed to normally operate in a closed position. Inert absorbent material such as vermiculite, sand or dirt will be placed on the spillages. The material will be collected and placed in a labelled container for disposal. Build-up of electrostatic charges will be prevented by bonding. and grounding.

Personal protective equipment (PPE) for exposure control will consist of impervious material gloves for hand protection, safety glasses or face shield for eye protection and suitable personal clothing for body protection. All PPE will conform to relevant Australian Standards.

Suitable fire fighting systems will be provided. In the event of fire, emergency response will include the use of carbon dioxide, dry chemical or foam and personnel who engage in emergency response activities will wear breathing apparatus. Due to the properties of diesel, there is no risk of violent explosion with a diesel fire.

Petrol

Petrol is a flammable liquid and will be used as a fuel for vehicles. Petrol colour is yellow, red or purple. It has a flash point of < - 40^{o}C, specific gravity 0.73 – 0.78 at 15^{o}C, vapour pressure 35-90 kPa, LEL 1.00% v/v and UEL 8.00% v/. Contact with eyes and skin will cause irritation. Inhalation may cause irritation to the respiratory system. Prolonged and repeated skin contact may cause dermatitis. Time Weighted Average (TWA) National Occupational Health and Safety Commission (NOHSC) exposure standard for petrol is 900 mg/m^3.

It is proposed to store petrol in two tanks each with a capacity to hold 25 kL. Both tanks will be above ground on impervious surfaces and located in the Fuel Farm. Designs including the bund capacities will be as per AS 1940 – The storage and handling of flammable and combustible liquids. All tank transfer operations will be on impervious surfaces with a spill collection system.

Solubility of petrol in water is negligible. Contain the spills with sand or earth. Keep away from heat, naked flames and sparks. Use absorbent in suitable sealed containers. The drain valves to the bund will be designed to normally operate in a closed position. Inert absorbent material such as vermiculite, sand or earth will be placed on the spillages. Build-up of electrostatic charges will be prevented by bonding and grounding.

Personal protective equipment (PPE) for exposure control will consist of PVC gloves for hand protection, eye protection, PVC apron and sleeves and PVC or rubber boots. All PPE will conform to relevant Australian Standards.

Suitable fire fighting systems will be provided. Water sprays will also be provided to keep the tank cool. In the event of fire, emergency response will include the use of carbon dioxide, dry chemical or foam. Petrol is highly flammable with risk of violent explosion in fire.

Oils (Lubrication and hydraulic)

Oils are typically clear green viscous liquids with specific gravity of 1.01 to 1.03 and a boiling point of 100 – 105^{o}C. They are an irritant to eyes and skin after prolonged exposure.

Oils will be stored in bulk tanks and drums. Activities using oils will be conducted on a hard stand area, and drip trays will be provided at appropriate locations. All spillages will be prevented from entering drains or water courses. Absorbent material will be placed on the spillages which will be collected for disposal. Hand gloves and goggles will be used while handling the product.

Tarong Energy has Environment Management Procedure number T-SMP-8426 which documents action required for responding to oil spills and required clean up techniques.

Liquefied Petroleum Gas

Liquefied Petroleum Gas (LPG) is used mainly in the workshop as a fuel / heat source for miscellaneous equipment items. LPG is a colourless liquid (under pressure), colourless gas, with a pungent odour. It has a vapour pressure of 1,292 to 1,530 kPa at 40^{o}C and flash point of - 100^{o}C. Acetylene has a lower explosion limit of 2.3%. Propane and propylene which are the constituents of LPG are asphyxiant.

LPG is heavier than air and may accumulate in low lying areas such as drains where it can become a serious fire and explosion hazard. LPG is highly flammable and explosive. It will ignite on exposure to heat or an ignition source and may also ignite on exposure to a strong oxidising agent. Flashback may occur. Pressurised containers may result in a Boiling Liquid Expanding Vapour Explosion (BLEVE) situation. Emergency response will include use of water to cool closed containers to prevent pressure build-up and possible auto ignition or explosion, with personnel using full protective clothing. There is a risk of explosion with LPG releases and people will be evacuated from the workplace of the incident.

Acetylene

Acetylene is highly flammable and is used as a fuel. It is a colourless gas with garlic like odour with vapour pressure of 4700 kPa at 25^{o}C and flash point of < 23^{o}C. Acetylene has a lower explosion limit of 2.5%. It is non irritant and an asphyxiant gas with effects proportional to the oxygen displaced.

Bottles will not be stored near sources of ignition, oxidising agents, poisons, flammable liquids or combustible materials. Bottles will be kept upright, in a secure area on firm floor to prevent falling.

PPE will consist of safety boots, cotton or leather gloves and safety glasses. Where an oxygen deficiency risk exists, wear an air-line respirator. If the pressurised bottles are exposed to fire, the elevated temperatures may cause cylinders to explode. Emergency response will include use of water fog to cool the bottles with personnel using full protective clothing. For incidents involving acetylene cylinders a 200-metre exclusion zone will be establish and people evacuated from the immediate area.

Refrigerant Gas (R134a)

R134a is used as a refrigerant and is non-flammable. R134a is a clear liquid with slight ethereal odour having a vapour pressure of 665 kPa at 25^{o}C, vapour density of 1.21 and a boiling point of -26.4^{o}C. The Time Weighted Average (TWA) National Occupational Health and Safety Commission (NOHSC) is 1000 ppm. Exposure to eyes and skin will result in cold burns. When heated to decomposition, R134a may evolve toxic gases such as hydrogen fluorides and carbon monoxide. No known ecological damage is caused by this product.

Bottles will be kept upright in a secure area, on a firm floor to prevent falling. Bottles will not be kept near sources of ignition. If the cylinder is leaking, evacuate area of personnel.

PPE will include wearing of safety glasses, safety boots and leather gloves. When an inhalation risk exists, self contained breathing apparatus (SCBA) or air line respirators will be used. If the pressurised bottles are exposed to fire, the elevated temperatures may cause cylinders to explode. Emergency response will include use of water fog to cool the bottles with personnel using full protective clothing.

Liquid Nitrogen

Liquid Nitrogen has freezing applications. It is a non flammable, colourless and odourless liquid with a specific gravity of 0.967 and has a boiling point of – 195.8^{o}C. Exposure to eyes and skin will result in cold burns. Release of liquid to the atmosphere will generate a vapour fog cloud which must be treated as an asphyxiating atmosphere. Nitrogen will quickly disperse to the atmosphere. It is not toxic to plants and animals except at extremely high (asphyxiating) levels.

Liquid Nitrogen will be stored in bottles and kept upright, in a secure area on a firm floor to prevent falling. It is incompatible with oxidising agents, acids, heat and ignition sources and potentially violent with oxygen, halogens and metal halides.

Use of PPE will be specific to the situation and may include splash proof goggles or face shield, air line respirator and self contained breathing apparatus.. If the pressurised bottles are exposed to fire, the elevated temperatures may cause cylinders to explode. Emergency response will include use of water fog to cool the bottles with personnel using full protective clothing.

Nitrogen

Nitrogen is a non-flammable, colourless and odourless gas having a vapour density of 0.967 and a boiling point of -195.8^{o}C. It is a non-irritating asphyxiant gas with effects proportional to the oxygen displaced. Nitrogen is a major component of air and is non-toxic to plants.

Compressed nitrogen gas will be stored in gas bottles and kept upright in a secure area on a firm floor to prevent falling. If the cylinder is leaking, personnel will be evacuated from the area Any person affected by the gas will be removed from the area immediately by a rescuer using an air line respirator or SCBA. If the pressurised bottles are exposed to fire, the elevated temperatures may cause cylinders to explode. Emergency response will include use of water fog to cool the bottles with personnel using full protective clothing.

6.3 Natural Hazards

A natural hazard is a naturally occurring situation or condition with the potential for loss or harm to the community or environment (SPP 1/03, 2003). No snakes or other potentially venomous animals were detected during the ecological survey within the immediate construction footprint, however, there is the potential these taxa may occur and appropriate personal protective equipment is required to be worn by all visitors to the site during construction. As the Precinct is not proposed to be a clearance point for quarantine there is not expected to be a risk of introducing any diseases of concern as a result of construction or operational activities. Other potential natural hazards that could impact the facility are identified following.

6.3.1 Cyclone

Australia's tropical cyclone season is usually from November to April inclusive and affects most of the Queensland coast. Tropical Cyclone Warning Centre of the Bureau of Meteorology (BoM for Eastern region) at Brisbane issues a tropical cyclone warning when a cyclone or developing cyclone is likely to affect coastal or inland communities. The warnings identify the communities likely to be affected, the name of the cyclone, its position, intensity, severity and movement. Consequences of a cyclone can include a combination of flood, storm tide inundation, strong winds and landslide.

Selections of tropical cyclones occurring since last 100 years Source: www.bom.gov.au (accessed on 3 Feb 09) in the region of Townsville are as follows:

- On 9 February 1927, a tropical cyclone crossed the coast just to the north of Cairns. Many buildings were unroofed and 16 were totally destroyed. The sea wall at Cairns broke in several places. The tropical cyclone weakened into a disastrous rain depression. Many people drowned including one at Townsville. A total of 47 people lost lives. Several washaways of railway line and bridges occurred.
- In February 1929, two tropical cyclones crossed the coast at Townsville and Mossman, bringing heavy rain and widespread flooding. Damage in the Monto district very severe and low lying areas of Rockhampton inundated. Considerable damage to roads and bridges at Rockhampton and Mt Morgan. From the 26th to 28th February portions of Cairns were inundated and road and rail traffic severely disrupted.
- In January 1930, a non-damaging tropical cyclone crossed the coast at Mossman, bringing heavy rains and flooding to many areas of Queensland. Traffic between Townsville and Cairns completely disrupted, low-lying portions of Cairns and Mackay inundated. Other areas affected by flooding included Townsville, Cloncurry, Mt Isa, Hughenden, Winton, Longreach, Aramac, Adavale (3m of water in the streets) and Charleville. Three rail passengers drowned while being ferried across the Burdekin River and there were 3 other drowning. Cattle and sheep were drowned.
- *Tropical Cyclone Ada* was a 'Category 4' cyclone that severely damaged resorts on the Whitsunday Islands on 17 January 1970. It claimed resorts and boats on the Islands of Daydream, South Molle and Hayman, as well as homes near Proserpine where flooding also occurred. Fourteen people died and total estimated costs were $390 million (in 1970 values).
- *Tropical Cyclone Althea* was a 'Category 3' cyclone crossed the coast just north of Townsville. Three lives were lost in Townsville and damage costs in the region reached $50

million (1971). Severe winds damaged or destroyed many homes. On Magnetic island 90% of the houses were damaged or destroyed. Tornadoes damaged trees and houses in Bowen. A 2.9 m storm surge was recorded in Townsville Harbour, with a maximum storm surge of 3.66 m recoded at Toolakea, just north of Townsville. . The storm surge and wind generated waves, although occurring at low tide, caused extensive damage along Strand in Townsville and at Cape Pallarenda.

- On the night of 10 January 1998 *Cyclone Sid* dumped 549 mm of rain, the highest recording at Townsville airport. Unofficial figures from some suburbs were over 700 mm.
- In February 1999, Cyclone Rona was caused by severe flooding resulting in serious infrastructure and property damage and heavy crop losses Thousands of hectares of sugar cane and bananas in the Mossman -Townsville region were flattened or flooded. Five hundred homes were damaged injuring five people.
- *Tropical Cyclone Larry* crossed coast near Innisfail on 20 March 2006. Major damage to homes and other buildings was caused by Larry as well as extensive damage to local crops. Larry reached Category 5 for a time just before landfall. Very large storm surges (debris lines to 5 m above Mean Sea Level) were measured in the Bingil Bay area.
- *Tropical Cyclone Ellie* crossed the coast at Mission Beach, south of Cairns on 2 February 2009 and as reported till 10 February 2009, it dumped nearly 400 mm of torrential rain on parts, causing flash flooding. Nearly 250 mm of rain fell in Townsville flooding rivers and cutting roads. Ingham was worst affected with water over parts of airport runway and cutting off Bruce Highway both north and south of the town.

The TMPP is situated in a location which is historically known for cyclones and flooding. As for coastal water warnings noted below, the project proponent will monitor for such warnings and advise internally to clients at the Precinct.

6.3.2 Coastal Water Wind Warning

Coastal water warnings are issued by the Brisbane regional office of the BoM whenever strong winds, gale, storm force or hurricane force winds are expected within one or more coastal waters forecast areas. The warning attempts to provide a lead time of 24 hours and are renewed every 6 hours.

The project proponent will monitor for such warnings and advise internally to clients at the Precinct.

6.3.3 Earthquake

Earthquakes are unpredictable and strike without warning. They range in strength from slight tremors to great shocks lasting from a few seconds to a few minutes. In the last 80 years there have been 17 earthquakes in Australia registering 6 or more on the Richter scale. Australia's rate of earthquakes is about 1 every 5 five years, compared to a world average of about 140 per year. The size of earthquakes is commonly measured using the Richter scale.

The earthquakes with magnitude of 5 or greater recorded in Townsville region since last 100 years (Geoscience Australia, 2009) are summarised as follows:

- Earthquake of magnitude 5.7 was recorded at 13:54 hours on 18 Dec 1913 at Lat -20.0 and Long 147.0 which is approximately 93 km south of the Precinct.
- Earthquake of magnitude 5.0 was recorded at 09:12 hours on 01 Feb 1937 at Lat -16.5 and Long 148.5 which is approximately 333 km north-east of the Precinct in the sea.
- Earthquake of magnitude 5.0 was recorded at 10:35 hours on 01 Dec 1958 at Lat -16.5 and Long 145.5 which is approximately 326 km north-north-west of the Precinct.

Seismic hazards will be considered separately in the Precinct Development Project by the individual project proponents and POTL. Appropriate Australian Standards will be followed.

6.4 Preliminary Hazard Analysis

This section presents the assessment methodology and results for the hazards and risks associated with the construction, operation and de-commissioning phases of the TMPP through the use of Preliminary Hazard Analysis (PHA).

Following regulations, standards and guidelines are applicable:

- Australian Risk Management Standard AS 4360:2004;
- Australian Code for Transport of Dangerous Goods by Road and Rails (ADG Code);
- HB 203 2006: Environmental Risk Management – Principles and processes;
- Dangerous Goods Safety Management Act 2001;
- Transport Infrastructure Act 1994;
- NSW Department of Planning's Hazardous Industry Planning Advisory Paper (HIPAP) no 6 Guidelines for Hazard Analysis;
- NSW Department of Planning's Hazardous Industry Planning Advisory Paper (HIPAP) No 4 Risk Criteria for Land Use Planning; and
- State Planning Policy 1/03, Mitigating the Adverse Impacts of Floods, Bushfire and Landslide.

The risk assessment carried out in this study assumed that the safety assessment process will continue throughout the life cycle of the project to refine the outcome of the development approval/ environmental risk process.

The PHA includes:

- All relevant hazards, both natural and technological;
- The possible frequency of potential hazards, accidents, spillages and abnormal events occurring;
- Indication of cumulative risk levels to surrounding land uses;
- Life of any identified hazards;
- Effects of hazardous substances to be used, stored, processed, produced or transported;
- The rate of usage of substances; and
- Type of machinery and equipment used.

The key components of Preliminary Hazard Analysis are detailed further in Appendix CC and include the following:

- Stage 1: Hazard Identification;
- Stage 2: Consequence and Effect Analysis;
- Stage 3: Frequency Analysis; and
- Stage 4: Risk Reduction.

The Port of Townsville Risk Matrix used to rank each of the hazards and the definitions of each frequency and severity increment is enclosed in Appendix CC.

The PHA study identified a number of potential project improvements or areas for further study and/or investigation. The Risk Register is enclosed in Appendix CC. Matrix risk assessment of the 35 hazards resulted in 12 high risks, 15 substantial risks, five medium risks, three low risks before mitigation measures. After mitigation measures, it resulted in 1 high risks, three substantial risks, 13 medium risks and 18 low risks.

Key risks identified are summarised in Table 6-4. Item numbers in the table correspond to item in Risk Register for the Project enclosed in Appendix CC.

Table 6-4 Key Risks Identified for the TMPP

Item Number	Potential Hazardous Event Description Potential	for Offsite Impact
	High Risks	
6	Dredging channel - mobilisation of heavy metals	Yes
7	Dredging channel - mobilisation of nutrients	Yes
8	Dredging channel - light attenuation/ increased turbidity	Yes
9	Under scenario where all potential construction projects occur simultaneously accommodation/ services and social infrastructure in south Townsville may not be adequate (insufficient for workforce during both construction and operation phase). This is unlikely if Precinct construction proceeds on timeline disconnected to other potential developments.	Yes
13	Member of public accessing the site	Yes
16	Increased traffic along Benwell road	Yes
24	Poor acidic sulfate soil management	Yes
26	Inadequate hygiene/ quarantine practices for vessel mobilisation (e.g. vessels coming in for repairs)	Yes
27	Increased vessel traffic due to improved facilities	Yes
28	Vessel collision	Yes
31	Damage due to tropical cyclone	Yes

Item Number	Potential Hazardous Event Description Potential	for Offsite Impact
32	Damage due to Tsunami	Yes
	Substantial Risks	
1	Storage and handling of hazardous materials and fuels	No
2	Fire at the marine workshop due to ignition and spreading due to appropriate wind conditions.	No
3	Increased traffic during construction and operation phase.	Yes
5	Construction and operation waste	Yes
11	Negative publicity	Yes
12	Construction workplace accidents	No
15	Noise from project activities	Yes
17	Discharge outside of license limit due to inadequate water management or inadequate system capacity or equipment failure.	Yes
22	Abrasive blasting	Yes
23	General Flora and fauna	Yes
25	Maintenance of offshore structures	Yes
29	Events such as floods, storm and natural fires	Yes
30	Seismic event causing damage to facilities	Yes
34	Vessel falls during lifting operations at ship lift	No
35	Fire and explosion on vessels anchored	No

The recommendations / additional controls are shown in Table 6-5 and below. These correspond to the mitigation measures identified, which resulted in ranking of risk after mitigation measures. The item number corresponds to the item for which the recommendation / additional control was generated (see the Risk Register in Appendix CC). Responsibilities/ delegations have been assigned to each of these items as per TPA Risk management Guidelines and a signoff should take place to ensure that they are actioned appropriately. Item numbers in Table 6-5 and Table 6-6 correspond to items in the Risk Register for the Project.

Table 6-5 Summary of Mitigation Measures identified for High Risks

Item	Recommendations/ Additional Control	Implementation Stage	
		Construction	Ope ration
6	Implement control measures identified from the dredging studies – heavy metals	√	√
7	Implement control measures identified from the dredging studies – nutrients	√	√
8	Implement control measures identified from the dredging studies - turbidity	√	√
9	Interact with other projects and local government to enable appropriate construction timeline scheduling to mitigate impacts. Liaise with local Government to provide required infrastructure as needed.	√	√
13	More secure fences to prevent access to Precinct area.	√	√
	Increased patrols.	√	√
16	Implement recommendations of traffic study.	-	√
	A new road and rail link is proposed to be built over the mouth of Ross River.	-	√
	Conduct road safety audits.	-	√
24	Develop and implement suitable ASS management plan (QASSMAC Guidelines, 1998)	√	√
26	Implement proper monitoring mechanism for quarantine practises.	-	√
	Provide training to the persons responsible for monitoring.	-	√
27	Monitor traffic and if required explore possibilities of harbour access control.	-	√
28	Emergency response plan for spill control and medical emergencies	√	√
31	Emergency response plan.	√	√
	Trained staff to respond during emergencies.	√	√
	Liaison with Local government, QFRS, QAS, and SES	√	√

Item	Recommendations/ Additional Control	Implementation Stage	
		Construction	Ope ration
32	Emergency response plan.	√	√
	Trained staff to respond during emergencies.	√	√
	Liaison with Local government, QFRS, QAS, and SES.	√	√

Table 6-6 Summary of Mitigation Measures identified for Substantial Risks

Item	Recommendations/ Additional Control	Implementation Stage	
		Construction	Operation
1	Spill control kits. Drain valve of bund always in closed position. Ensure proper disposal through qualified contractors.	√	√
2	Increase more awareness amongst staff/workers.	√	√
	Contractors to include adequate fire fighting provisions while working at site.	√	-
3	Consider use of bus for carrying people to and from the worksite, which will reduce chances of fatality.	√	-
	Manage deliveries outside shift change timings.	√	√
	Conduct Road safety audit.	-	√
	Traffic controls to be part of construction management plan.	√	-
	Monitor and repair roadways.	-	√
	Consider installing crash barriers between roadways and infrastructure	-	√
5	Avoid generation of wastes, consider reuse of wastes, consider recycling and ensure proper disposal.	√	√
	Implement controls identified in the waste management plan	√	√
11	Continue consultation	√	√
12	Monitor and ensure compliance with WH&S requirements.	√	-
	Implement Safety plans	√	√

Item	Recommendations/ Additional Control	Implementation Stage	
		Construction	Operation
15	Implement Management Procedures identified in Noise Assessment section of this EIS.	√	√
	Match operations to noise limits during the day.	√	√
	Provide Hotlines to receive complains from people.	√	√
17	Consider pumping out of all waste waters, storm waters.	√	√
22	'Enclosed area for abrasive blasting over land	-	√
23	Implement control measures identified from the studies for protection of flora and fauna	-	√
25	Employ all controls. Comply with licence conditions for abrasive blasting	-	√
29	Emergency response plan.	√	√
	Trained staff to respond during emergencies.	√	√
	Liaison with Local government, QFRS, QAS, and SES.	√	√
30	Suitable emergency response plan.	√	√
	Trained response workers.	√	√
	Liaison with QFRS and QAS	√	√
34	Training to staff. Standard operating procedures.	-	√
35	Monitoring and control by each vessel operator	-	√

6.5 Management plans

6.5.1 Risk Management Plan

A risk assessment and management approach at the EIS stage has a major advantage. Safety studies can be used in a complementary way from the initial planning for the project and selection of a site, through to its construction and operation. It is fundamental to safety planning that all hazards are identified and appropriate safeguards employed to address them during different stages of the project. The components are discussed in following sections. The management of Precinct will also develop a management structure for safe operations at the precinct.

6.5.2 Hazard Analysis

High risks identified for the project include dredging impacts, strain on existing infrastructure, member/s of public entering the site intentionally to cause harm, increased traffic, PASS, vessel collision, tropical cyclone related hazards. Opportunities to manage these potential risks include development of a suitable Dredging Management Plan, liaision with local government regarding infrastructure upgrade requirements, , development of an acid sulphate soil management plan and an Emergency Management Plan to deal with situations related to intruders, vessel collision and tropical cyclones.

Substantial risks identified relate to hazardous materials, fire at workshops, increased traffic, waste generation, abrasive blasting, fire and explosion at vessels anchored, flooding and seismic hazards. Management of these risks will be achieved through continued liaison with community and local government and development, in accordance with POTL standard operating procedures, of suitable procedures for hazardous substance handling and an Emergency Management Plan to deal with situations related vessel collision fire and explosions and natural hazards.

6.5.3 Emergency Management Plans

6.5.3.1 Emergency Response Team

An Emergency Response Team will be provided by the Developer at the Precinct to ensure that adequately trained and equipped personnel are readily available in the event of an emergency. The team will consist of volunteers from each operations shift from the Developer staff plus the on-duty Essential Services staff. Each team will be adequately trained. Training will include the following aspects:

- Fire fighting for potential on-site and on vessels incidents;
- Oil spill;
- Dangerous goods spill (other than oil);
- Utility failure;
- Rescue situations such as person fallen in water;
- Use of air lines and self contained breathing apparatus;
- Confined space rescue;
- First aid; and
- Other aspects as deemed necessary due to operations at the Precinct.

6.5.3.2 Emergency Response Plans

A number of Emergency Response Plans will be prepared for the Precinct to guide those responding to a variety of potential emergency situations. These plans are discussed below and will be regularly reviewed during the life of the project.

Chemicals and Fuel Spill Emergency Response Plan

The Developer will prepare a suitable spill containment and cleanup procedure for the proposed Precinct. This plan will detail the specific planning, training and response requirements for oil spill management.

The plan for oil spill emergency responses will include reporting of the oil spill to the Emergency Controller. The oil spill will be assessed to identify the type of oil, location of the spill source, the quantity of oil and the environment, marine life, community, health and safety impact. The Emergency Controller will undertake immediate steps for spill containment/control, recovery of spill material, waste management, and for community communications and media management. Recovery operations will then be commenced, which includes provision of welfare, reconstruction/clean up and replenishment of material stocks.

The management plan detailed below will be followed:

Chemicals and Fuels Management Plan	
Elements	Spillage or leakage of chemical and petroleum products and regulated wastes to land or waters.
Management Objectives	To minimise contamination of land or waters from spilled chemicals and fuels.
Performance Criteria	Correct storage of fuel or chemicals including updated MSDS. Implementation of bunding, spill response training and spill response kits.

Implementation Strategy	**Responsibility**
Retain only the minimal required quantities of chemicals, fuels, oils etc at construction sites or contractor laydown areas at any particular time. Purchase the products on an 'as required' basis in accordance with the provisions of the *Workplace Health & Safety Act 1995*.	Construction Contractor
Store fuels, lubricants and chemicals in appropriate containment facilities away from water storage areas and at a distance of 100 m from natural or built waterways.	Construction Contractor
Undertake maintenance and servicing of vehicles at Contractor laydown areas or other appropriate facilities. Daily servicing only may be undertaken on site; however such activity will be undertaken at a minimum separation distance of 100 m from drainage lines or waterways.	Construction Contractor
Ensure safe handling techniques during refuelling to prevent spillage.	Construction Contractor
Immediately clean up petroleum product spillages with dry absorbent materials or sand or have the area remediated.	Construction Contractor

Chemicals and Fuels Management Plan	
Place absorbent materials used in the clean up of hydrocarbons or other chemicals in an appropriate container marked 'regulated waste' and consign to a waste contractor licensed to receive such waste.	Construction Contractor
Chemicals and fuels will be stored in accordance with AS:1940 – The storage and handling of flammable and combustible liquids.	Construction Contractor/ Developer's Project Manager
Locate Material Safety Data Sheets (MSDS) at the Site Construction Office / Site Administration Office for all hazardous and dangerous goods stored and used.	Construction Contractor/ Developer's Project Manager
Ensure temporary chemical storage is in accordance with Material Safety Data Sheets (MSDS) and store non-compatible chemicals separately, as required.	Construction Contractor/ Developer's Project Manager
Clean up spills in accordance with relevant Material Safety Data Sheets and Australian Standard AS:1940.	Construction Contractor/ Developer's Project Manager
Isolate chemical spills that occur in bunded areas from the trade waste system and ensure that the contaminated wastewater is removed by a licensed contractor.	Construction Contractor/ Developer's Project Manager
Contain and collect spills of hazardous materials for treatment at a licensed waste disposal facility.	Construction Contractor/ Developer's Project Manager
In the case of a spill to ground, initiate clean up immediately and seek the advice of a qualified professional to minimise the risk of groundwater contamination.	Construction Contractor/ Developer's Project Manager
Ensure spill kits including containment and treatment equipment and materials are available near storage areas of hazardous materials.	Construction Contractor/ Developer's Project Manager
Provide totally enclosed containment for all waste.	Construction Contractor/ Developer's Project Manager
Ensure persons handling dangerous chemicals wear appropriate PPE and receive appropriate training in its use.	Construction Contractor/ Developer's Project Manager
Monitoring	◗ In the case of a spill or other accident, monitoring of the receiving environment shall be undertaken by an experienced professional.

Chemicals and Fuels Management Plan	
	◗ The Construction Supervisor or Workplace Health & Safety Officer shall regularly inspect all temporary chemical and petroleum product storage areas for leakages and release any clean stormwater accumulated in temporary bunded areas, after each rainfall event. Environmental Representative shall also audit the contractor's procedures to check for compliance.
Reporting	◗ Daily or weekly reports (as appropriate) will be completed on-site and reviewed by each Supervisor. ◗ In the case of environmental nuisance or harm, Environmental Representative is to report the incident to EPA and local council. ◗ If a spill occurs, a report detailing corrective actions and monitoring requirements shall be prepared.
Corrective Action	◗ The Construction Manager and the Environmental Representative are to be notified in the event of non-compliance. ◗ Redesign control measure if inadequate. ◗ Investigations/corrective actions undertaken as a result of complaints will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. ◗ Construction Manager to identify sources of contamination and arrange for affected areas to be re-mediated in consultation with EPA. ◗ Immediately clean up any spilt chemicals and fuels and replace any spills kits. ◗ In the event of contaminant release to land or water that has the potential to cause environmental harm, the Construction Manager shall immediately arrange for any necessary works to contain the contaminant and control/stop the source of the release. The Construction Manager will notify the Project Environmental Representative and Project Manager. The Project Environmental Representative will advise the EPA as may be necessary. The following constitute an incident or failure to comply in relation to chemical and dangerous goods management: – significant chemical spill

Chemicals and Fuels Management Plan	
	– storage areas not meeting Australian Standards – chemicals stored in areas not containing suitable bunding – release of chemicals or dangerous goods to the environment Should an incident occur, a selection of the following corrective actions will be undertaken as appropriate: – contain and clean up spill material immediately and remediate or appropriately dispose of contaminated material – repair bunds – relocate chemicals to appropriately bunded or approved storage areas – in the case of a significant chemical spill, the Site Emergency Plan will be followed and the EPA and local Council notified as soon as possible

POTL has Draft Emergency Response Procedure[2] which can be activated in case of spills at the request of the Developer: This procedure applies to managing spills on the road or within the containment ponds. Spills: Hydrocarbon, chemical, metal concentrate, fertiliser, manure, herbicide or miscellaneous spills.

Fire/Explosion Emergency Response Plan

The plan for emergency response to a fire or explosion includes immediate actions of raising alarms and taking life saving actions. An assessment is made of the situation including the environmental impact and access control to the site. Planning is then initiated for a containment plan, plan for dealing with casualties and a survey for effects on the environment. The emergency is then responded to for issues including fire management and containment, rescue, casualty management, and environmental impact actions. Recovery operations are then initiated which include the restoration of essential services, provision of welfare, clean up, reconstruction and replenishment of stocks consumed during the emergency response.

The Developer will prepare a suitable fire/ emergency response plan for the proposed Precinct. This plan will detail the specific planning, training and response requirements for fire/ explosion emergencies and will also list contact details for state emergencies personnel.

The following procedures will be provided by the Developer and will be activated in the event of an emergency.

- Building Emergency Fire Procedure: This Handbook will provide emergency contact numbers and assists Fire Wardens by providing a step by step summary of actions required in the event of any building emergency;

[2] The Draft Emergency Response Procedure, EPBC Reference 2003/1011 Supplementary IAS Report Attachment D, Townsville Port Access Project – Eastern Access Corridor

- Emergency Notification System: The purpose of this document will be to inform all Precinct Users, Contractors, Staff and all other relevant parties, within the Precinct status and requirements in the event of an emergency and /or the requirement to evacuate part or wholly the Precinct area; and
- Whole of Precinct Evacuation Plan: The aim of this whole of Precinct evacuation plan is to identify arrangements for the relocation of Precinct employees, other users of the precinct, contractors, visitors and related personnel from a dangerous or potentially dangerous area to safer areas.

Total Power Outage Emergency Response Plan

The plan for response to a total power outage will include start-up of the diesel generators and ensuring that the emergency power is available. The plan to be developed will include steps for an assessment on the cause for the outage and how long it will take to restore full normal power. Recovery steps will involve pre-start tests and then re-establishment of power supplies from the state power supply grid.

Natural Hazard Emergency Response Plan

The plan for response to a flooding event includes immediate actions of providing an alert, monitoring of flood levels, and monitoring of road access. The emergency is then assessed for electrical, process, and environmental impact due to overflows of sewage, oil or any other substances and access to required areas including evacuation if required. Response to emergencies could be through activation of power cuts, chemical or fuel spill emergency response, access restrictions, and monitoring road conditions. Procedures for these will be developed. Closeout to emergency response will involve required clean ups, repair of damaged equipment and repair of infrastructure.

The TMPP is in a known cyclone prone area. The Developer will prepare an Emergency Response Plan for Cyclone Emergencies. The procedure will be developed to ensure the maximum protection of people and assets against the effects of tropical cyclones. The strategy adopted will be in:

- Responsible housekeeping and appropriate preparation;
- Timely assessments of a developing cyclonic event; and
- Effective responses.

The priorities in an emergency situation are the safety of employees and port users, the minimisation of damage to Precinct infrastructure and protection of the environment.

This procedure will detail the preparatory steps to be taken by Developers employees to ensure readiness in the event of a cyclone; the actions to be taken when a cyclone threatens the Precinct and the recovery activities necessary to resume normal operations as soon as possible after the cyclonic event has passed.

In a worst case scenario that the facility was impacted by a cyclone, the largest inventory available to be spilled would be from the petrol or diesel storage tanks. If this were to occur then the bunding system would be easily able to contain a spill. Another scenario could be spillage of hydrocarbons into the water in which case the Fuel Spill Management Plan will be activated.

Other Emergency Response Plans

Included here is the relevant response to terrorist or bomb threat. The following procedures will be developed by the Developer for the Precinct and will be activated as required.

- Security Personnel Procedure for Precinct; and
- Emergency Response Plan Bomb Threat.

6.5.3.3 Emergency Services

The Developer of the Precinct will provide regular training to staff members on first aid, other safety courses and conduct seminars. For any major incident, additional support will be provided from PoT and other facilities in Townsville as required.

Townsville is covered under the northern region of the Queensland Fire and Rescue Services (QFRS). Northern Region has 20 urban fire stations and an operational staff of 165 full-time and 215 auxiliary firefighters. Northern Region Headquarters, Fire Communications Centre and functional area managers are located in Townsville. The permanent station of the QFRS is located at Morey Street in Townsville, which is close to the proposed Precinct.

Townsville is the Queensland Health tertiary referral centre for North Queensland. Northern Region plays an active role in the Queensland Emergency Medical System (QEMS), with involvement in numerous retrieval and primary response tasks with The Townsville Hospital, Queensland Rescue and the Royal Flying Doctor Service. Appropriately qualified Townsville officers respond to retrievals on the Queensland Rescue helicopter service. The Communications Centres receive calls via 000 and also through direct contact with the centre on listed numbers. Any 000 call made to the centres gets directed to the most appropriate (closest) centre for response. Townsville Communications Centre has Caller Line Identification (CLI) systems installed so that callers to 000 have their address displayed on a computer screen. This provides an advantage to Communications staff if information regarding location of an emergency is difficult to obtain, eg if caller is panicking or unable to speak due to illness, or if the call is lost. The CLI only provides location for landlines, not for mobile phones.

A Police Station is also located close to the proposed Project Area.

6.5.4 Construction and decommissioning safety

The construction phase of a development, as well as de-commissioning, is critical to overall safety in two important respects: (a) the hazards which arise in the construction and decommissioning process can result in significant levels of risk to surrounding land uses, and (b) for the Precinct to operate safely, it is essential that it is constructed in accordance with design intent, and to an appropriate level of quality.

Construction and decommissioning safety studies will relate to:

- The construction and de-commissioning program;
- The safety and emergency procedures; and
- Safeguards required ensuring safety on site and in surrounding areas during the construction phase of the Precinct.

The following are the key elements of construction and decommissioning safety:

- Familiarisation with past, existing and proposed operations and preliminary review of construction program;
- Identification of hazards specific to construction operations and assessment of associated safeguards. Assessment of operational safeguards for the construction period;
- Review of safety assurance system;
- Finalisation of construction/commissioning programs; and
- Review of procedures for management of change during construction/commissioning.

The objectives of the Construction and Decommissioning Safety Study are to:

- Identify all of the hazardous events associated with the construction of the Precinct Project;
- Assess the level of risk posed to the site, the surrounding community and the environment by these hazardous events; and
- Document the existing control measures in place to prevent or mitigate the risks posed by these hazardous events, with the focus being on potential incidents with impacts`.

POTL will ensure that the Developer conducts a separate Construction Safety Study before the actual construction phase after identification of the construction contractor.

6.6 Conclusions

The Hazard and Risk assessment has identified the nature and scale of hazards that may occur during the design and construction, operation and decommissioning of the TMPP. The study identified a total of 35 hazards which resulted in 12 high risks, 15 substantial risks, five medium risks and three low risks before mitigation measures. After mitigation measures, it resulted in 1 high risks, three substantial risks, 13 medium risks and 18 low risks. These risks along with mitigation measures have been listed in Table 6-4, Table 6-5, and Table 6-6.

The Precinct will not significantly impact on the amenity of sensitive receivers, providing appropriate management procedures are implemented as identified in the assessment studies.

Based on the assessments conducted by GHD, it can be concluded that there are no hazards that have offsite impacts. The controls in place adequately safeguard against safety, asset and environmental consequences from hazards associated with stated dangerous substances.

It is important to note that the hazard and risk studies conducted are the start of the process, not the end. A successful outcome depends on methodical close out of the recommendations and additional controls identified in the assessment process.