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GLADSTONE LNG PTY LTD

# Gladstone LNG Project - Fisherman's Landing

Initial Advice Statement



352/14586/0

10 January 2008



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Environment & Water Resources  
Level 3  
80 Albert Street  
Brisbane QLD 4000 Australia  
Tel: +61 7 3221 7444  
Fax: +61 7 3221 7791  
www.worleyparsons.com  
WorleyParsons Services Pty Ltd  
ABN 61 001 279 812

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### PROJECT 352/14586/0 - GLADSTONE LNG PROJECT - FISHERMAN'S LANDING

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REV	DESCRIPTION	ORIG	REVIEW	WORLEY- PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
A	Final for submission to the EPA	 Project team	 T Graham	 T Graham	10-01-08	N/A	
		_____	_____	_____		_____	
		_____	_____	_____		_____	
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## EXECUTIVE SUMMARY

Gladstone LNG Pty Ltd (GLNG PL), which is a subsidiary of the publicly listed Australian company Liquefied Natural Gas Ltd, is proposing to develop a 2.6 million tonne per annum, mid-scale, liquefied natural gas (LNG) plant at Fisherman's Landing in the Port of Gladstone, which will process coal seam gas (CSG) sourced from the Arrow Energy NL gas fields in the Bowen Basin and load it onto vessels for export. The development will incorporate the construction and operation of a medium scale LNG plant, including treatment and liquefaction facilities, storage tanks and jetty/ship loading facilities.

This initial advice statement (IAS) has been prepared by WorleyParsons and GLNG PL as the first step in an environmental impact assessment process, as GLNG PL intends to voluntarily prepare an environmental impact statement (EIS) for the proposed project under the Queensland *Environmental Protection Act 1994*.

For clarity, the following activities do NOT form part of the IAS and subsequent EIS environmental approval process for the Gladstone LNG project:

- Coal seam gas field development, which will be undertaken by Arrow Energy NL;
- 400 km Central Queensland Gas Pipeline (CQGP) from Moranbah to Gladstone, which will be developed by the AGL-Arrow Joint Venture (AGL Energy Ltd and Arrow Energy NL);
- Lateral gas pipeline (approximately 4 km in length) to connect the CQGP to the proposed Fisherman's Landing site boundary, which will also be developed by the AGL-Arrow Joint Venture;
- Structural modifications/extension to Fisherman's Landing Wharf No.5, which will be completed by Central Queensland Ports Authority (CQPA); and
- Channel dredging, which will also be undertaken by CQPA.

The purpose of this IAS is to provide information that will:

- Assist the Environmental Protection Agency in determining whether to grant or refuse the voluntary EIS application required to support an Environmental Authority Application for a Level 1 Petroleum Activity under section 104(1) of the *Environmental Protection Act 1994*;
- Enable stakeholders (including the general community) to determine the nature and level of their interest in the proposal; and
- Inform the preparation of the Terms of Reference for an EIS for the proposed project should the voluntary EIS application be approved.

This IAS has been developed to provide an overview of the nature and extent of the potential environmental, social and economic impacts that may be associated with the construction and operation of the proposed project as far as they can be foreseen at this time. The IAS also identifies the key statutory approvals that may be required for the project to proceed, and identifies further environmental studies that may be required to support the project.



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## 1. INTRODUCTION

### 1.1 Project Overview

Gladstone LNG Pty Ltd (GLNG PL), which is a subsidiary of the publicly listed Australian company Liquefied Natural Gas Ltd (refer to Section 1.2 for further detail), intends to establish a liquefied natural gas (LNG) export trade to deliver Queensland coal seam gas (CSG) to international markets. CSG will be sourced from the Arrow Energy NL gas fields in the Bowen Basin and delivered to Gladstone by pipeline, where GLNG PL intends to develop a liquefied natural gas (LNG) plant to condense the CSG and load it onto LNG vessels for export.

It is intended that the plant will be constructed at the Fisherman's Landing site in the Port of Gladstone and utilise the existing Fisherman's Landing Wharf No. 5 (refer Figure 1 and Figure 2). GLNG PL has planned the project in two stages, with the first stage consisting of a single processing train (Train 1), which will provide an initial maximum operational capacity of 1.3 million tonnes of LNG per year. The addition of the second train (Train 2) within three years of Train 1, will double this capacity. GLNG PL is seeking approval for both stages of development, with an expected project life of 25 years.

Upon delivery to the site, the CSG will be treated to lower the concentrations of carbon dioxide and water. The processed gas will then be cooled to  $-160\text{ }^{\circ}\text{C}$  and flashed to low pressure for storage in two  $100\ 000\ \text{m}^3$  cryogenic LNG storage tanks. A cryogenic loading line will connect the LNG storage tanks to a set of loading arms mounted on the Wharf No. 5 extension.

All of the equipment to be used will be conventional oil and gas field processing plant equipment, utilising proven technologies. Due to the relatively small size and simplicity of the proposed plant, the majority of the equipment will be imported in pre-assembled modules via the construction jetty at Fisherman's Landing.

The project will be dependent upon the following activities to be provided by others. It should be noted that these items do not form part of the project scope for the proposed environmental impact statement (EIS) for the Gladstone LNG project:

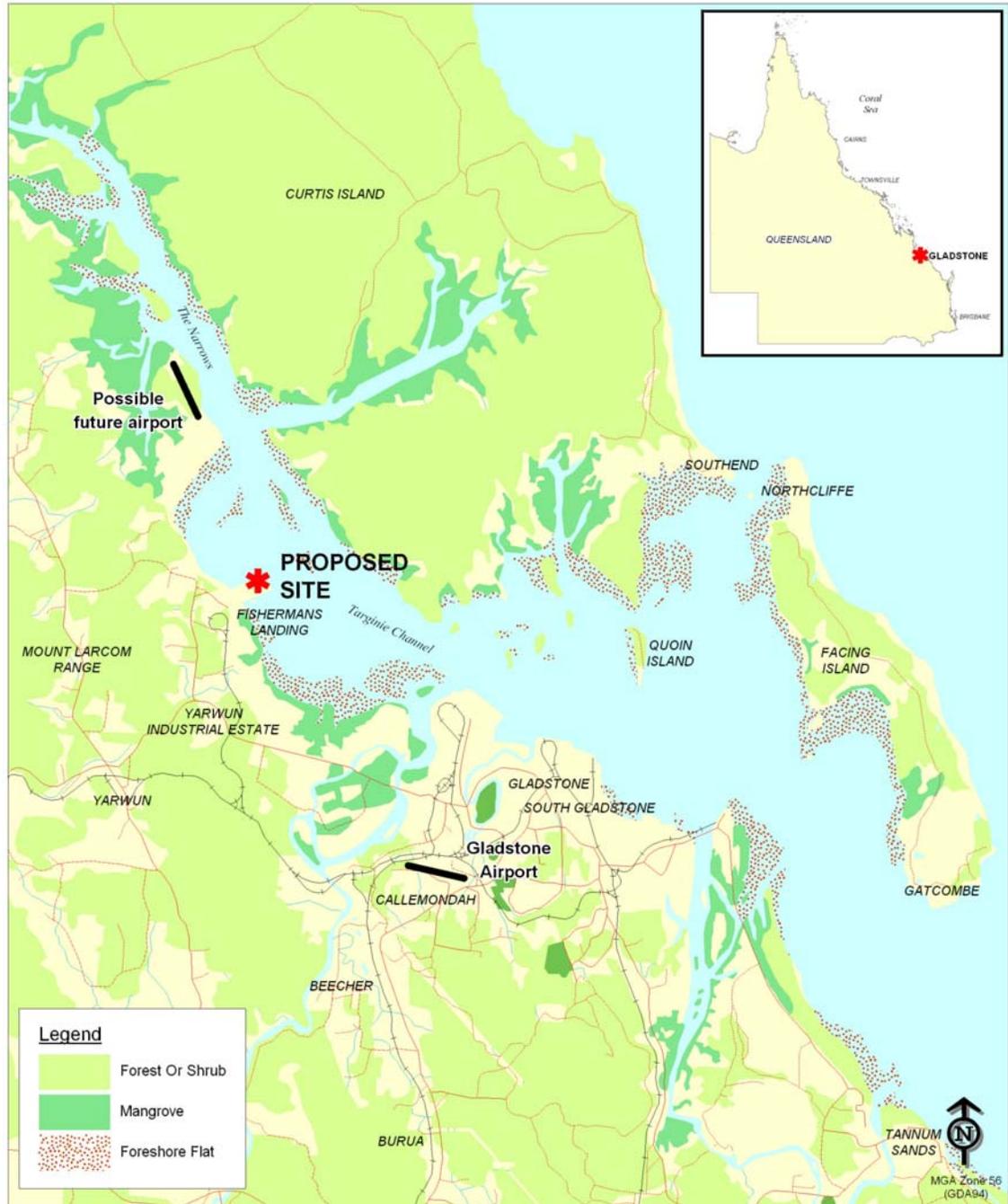
- Structural modifications/extension to the existing Fisherman's Wharf No. 5 in order to accommodate the berthing of LNG vessels (by Central Queensland Ports Authority);
- Dredging of the berth pocket and nearby channel may also be required to accommodate LNG carriers up to  $153\ 000\ \text{m}^3$  capacity (by Central Queensland Ports Authority);
- Coal seam gas field development, which will be undertaken by Arrow Energy NL;
- The delivery of gas to the plant will be undertaken independently by the AGL-Arrow Joint Venture (a 50:50 JV between AGL Energy Ltd and Arrow Energy NL), which will construct and operate a lateral pipeline to the LNG Plant from the Central Queensland Gas Pipeline.



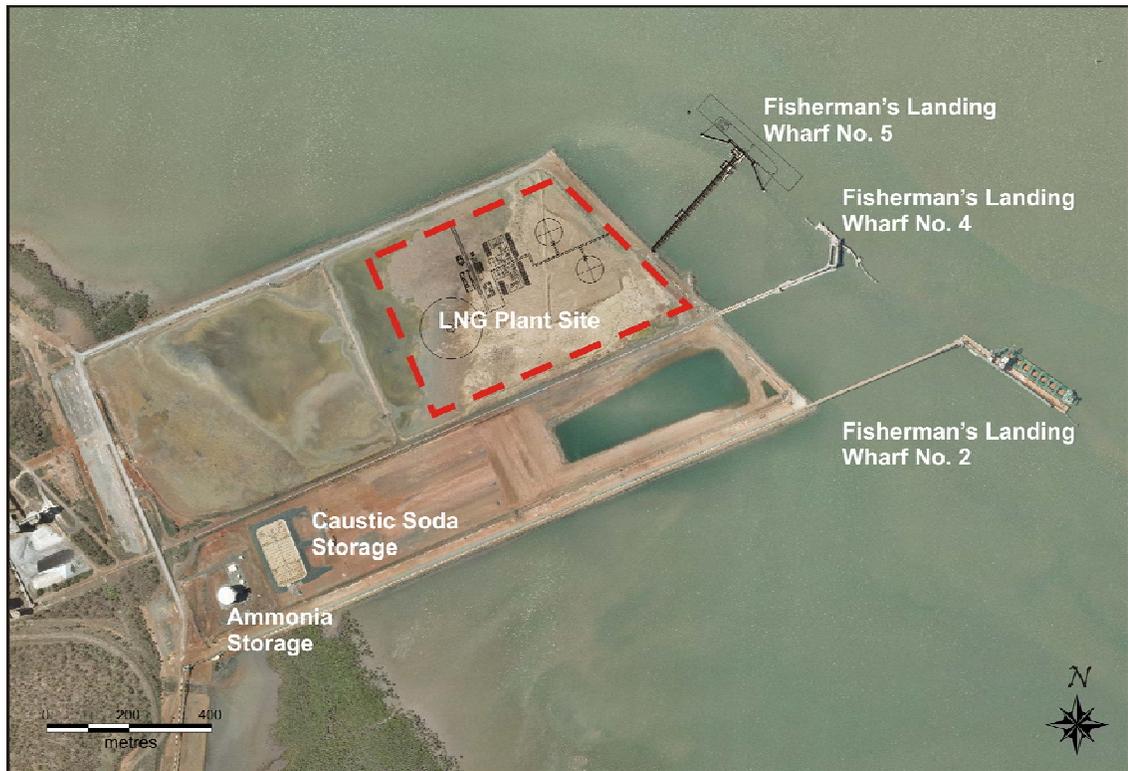
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**Figure 1** Gladstone region, showing the proposed GLNG PL site



**Figure 2** Proposed Fisherman's Landing site

## 1.2 Project Proponent

The project will be developed and operated by GLNG PL, a subsidiary of LNG International Pty Ltd which is under the parent company Liquefied Natural Gas Limited (LNG Limited). LNG Limited is a publicly listed company on the Australian Securities Exchange. Figure 3 illustrates the relationship between these companies.

LNG Limited has been formed to act as 'the energy link' between previously discovered, but non-commercial gas reserves and potential new energy markets. Specifically, LNG Limited's strategy is to deliver this gas to new energy markets as LNG, which provides a viable delivery alternative where gas pipelines are uneconomic due to distance, technical impediments and/or where there is insufficient consumer demand.

The proponent is a mid-scale LNG developer for onshore LNG projects in Australia, and differentiates itself by using innovative, fit for purpose solutions and applying these to small to medium size LNG projects, which presents a viable alternative to conventional large scale projects.



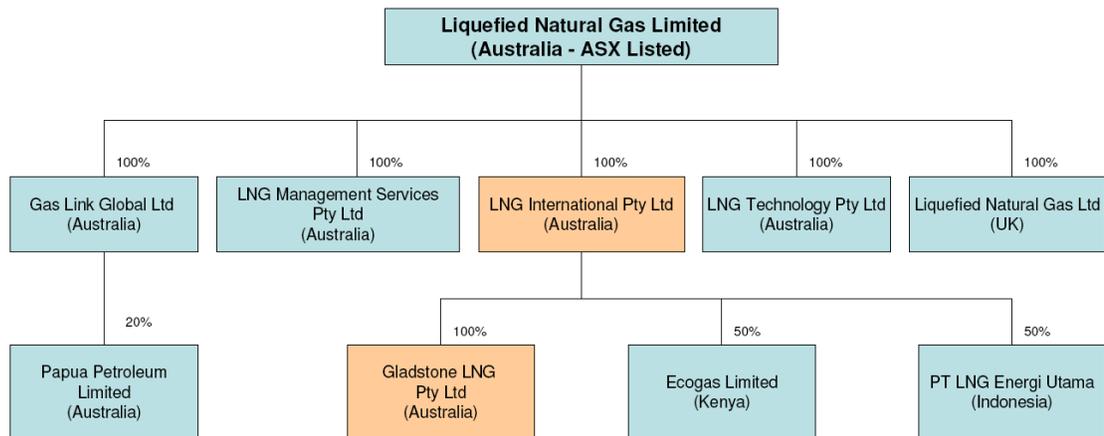
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LNG Limited is also developing similar projects in other parts of the world. Currently, LNG Limited has a strong focus on the development of LNG projects in Iran and Indonesia with a combined capacity of 5.25 Mtpa, as well as additional opportunities in Papua New Guinea and elsewhere.

In May 2006, Golar LNG Limited became LNG Limited's largest shareholder. In June 2006, Golar LNG Limited and LNG Limited signed a collaboration agreement on joint LNG project developments and, to date, have identified five prospective LNG project opportunities.

In December 2007, Arrow Energy NL became a 10 % shareholder of LNG Limited.



**Figure 3** Liquefied Natural Gas Limited corporate structure

LNG Limited had a market capitalisation of AU\$110 million as at 20 December 2007.

The contact details for GLNG PL are as follows:

Gladstone LNG Pty Ltd  
GPO Box 920  
West Perth, WA 6872

### 1.3 Project Financing

It is GLNG PL's intention to equity finance the project through to financial close and then to finance the development of the project via a suitable mix of debt and equity.

GLNG PL expects to fund the construction of plant via a mix of project owners' equity and project debt.

Based on the project's estimated development cost of US\$400 million for the first LNG train and a debt/equity ratio of 70/30, the funding contributions would be US\$280 million debt and US\$120 million equity.



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## 1.4 Need for the Project

The Gladstone LNG project will enter into arrangements with one or more off takers for the entire production of the proposed LNG plant.

LNG has become a major export product for Australia, worth about AU\$3.2 billion in export income in 2004 – 2005. World demand for LNG is expected to double by 2010 to more than 280 million tonnes. Australia has become an important world supplier for nations seeking secure energy supplies produced in a stable economic and political environment.

Demand is growing because LNG is safe, flexible, reliable, economic and environmentally acceptable. In 2003, 125 million tonnes of LNG were traded around the world with the Asia Pacific region accounting for 67 % of this trade. The Asian share of the market is expected to grow to 80 % by 2015.

With growing demand and declining alternative sources of energy, the United States is also likely to be a major growth market for LNG imports, with an eightfold increase forecast by 2015. This will be particularly noticeable in California, where 83% of natural gas is imported and a considerable shortfall is predicted unless new production and importing facilities are built.

## 1.5 Project Economic Benefits

It is estimated that the construction of the LNG Plant will require an investment of up to US\$400 million for the first LNG train and up to US\$250 million for the second. This excludes upgrading of the jetty and wharf and the associated dredging program by Central Queensland Ports Authority (CQPA).

The project will generate significant economic benefits on a regional, state and national scale as a result of:

- The employment of up to 120 people during construction, and 12 permanent employees for the operation of the plant;
- Government revenue collected through taxes and royalties on the CSG collection and LNG export businesses;
- The generation of export income;
- Expenditure in the local economy through the purchase and use of local resources, wherever practical, for the construction and operation of the plant;
- The local expenditure of worker disposable incomes;
- Raising the profile of CSG production in Queensland; and
- Supporting the development of new gas pipeline infrastructure (from Moranbah to Gladstone) in central Queensland.



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It should be noted that the consequences of not proceeding with the project would be the non-realisation of the above benefits to the detriment of the local, regional and Australian economies.

## 1.6 Document Purpose and Scope

The purpose of this initial advice statement (IAS) is to provide information that will:

- Assist the Environmental Protection Agency (EPA) in determining whether to grant or refuse approval for the preparation of a voluntary EIS to support an Environmental Authority Application for a Level 1 Petroleum Activity under section 104(1) of the *Environmental Protection Act 1994*;
- Enable stakeholders (including the general community) to determine the nature and level of their interest in the proposal; and
- Inform the preparation of the Terms of Reference for an EIS for the proposed project should a voluntary EIS application be granted.

The IAS has been developed to provide an overview of the nature and extent of the potential environmental, social and economic impacts that may be associated with the construction and operation of the proposed project as far as they can be foreseen at this time. The IAS also identifies the key statutory approvals that may be required for the project to proceed, and identifies further environmental studies that may be required to support the project.



## 2. PROJECT PROPOSAL

### 2.1 Project Site Selection

When the opportunity to export LNG was identified by GLNG PL, an assessment was made of the benefits and costs relating to LNG export through the ports of Townsville and Gladstone. The Port of Gladstone was selected as it offered the following attributes:

- A natural deepwater harbour, protected by a series of islands;
- Sufficient land available for industrial development, which was located a reasonable distance from areas of urban development and close to existing infrastructure;
- The proposed development of the Moranbah – Gladstone pipeline and its timing;
- The proposed Moranbah – Gladstone pipeline traverses through other CSG regions and provides access to additional CSG supplies for the LNG Plant.

Three potential sites were considered within the Port of Gladstone. These sites were located at Fisherman's Landing, and at Boatshed Point and China Bay on Curtis Island. The Fisherman's Landing locality was selected as the most suitable, as development on Curtis Island was considered impractical due to:

- Higher development costs, given the greenfield site situation and the lack of access to services, transport networks and other infrastructure.
- A more lengthy development approvals process.
- The potential for greater environmental effects given that the sites support features of greater environmental significance, including remnant vegetation, intertidal wetlands and mangroves, which could all be directly impacted by the development.
- Greater potential for noise and visual amenity impacts on the community, as there are a number of dwellings located within 0.8 km to 2.0 km of the site.

The Fisherman's Landing site also possesses the following positive attributes:

- It is in close proximity to existing infrastructure, including wharf facilities and power, water, telecommunication and transport (including vessel access) networks.
- Fisherman's Landing offers a number of construction options, including the use of modular assembly techniques.
- The site is located on reclaimed land, which has been highly modified and does not possess any features of environmental significance that have the potential to be impacted by the development. Similarly, the site is located a sufficient distance from any coastal areas of high significance and therefore presents a relatively low environmental risk.



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- Fisherman's Landing and the adjacent inland areas already support substantial industrial activities and the development of the LNG Plant at this location is least likely to present significant impacts with regard to visual amenity, noise and vibration, traffic management and air quality.
- The location of the LNG Plant on the proposed site was unlikely to pose a significant safety risk to the surrounding community or adjacent existing land uses. A preliminary assessment of a worst case hazard scenario found that the impacts of a potential fire, explosion or toxic gas release would be largely contained within the proposed site boundary and would not impose any significant restrictions on existing or future adjacent land uses.

## 2.2 Project Site

The project is proposed to be located on Fisherman's Landing, which is a reclaimed area located within the Port of Gladstone (managed by CQPA) that is serviced by three associated wharves (refer to Figure 2 and Figure 4). It is proposed that GLNG PL would occupy the northeast section of the reclaimed area and utilise the Fisherman's Landing No. 5 Wharf, which has been established by CQPA as a multi-user multi-product, bulk liquids facility. This site was identified by CQPA as the most suitable site for the project.

Other users of the Fisherman's Landing area include:

- Orica Ltd, which has an ammonia storage tank and caustic soda storage in the southwest corner of this area. Orica uses the tanks to store product imported through the Fisherman's Landing Wharf No. 5; and
- Rio Tinto Aluminium (RTA) and Cement Australia, which each use conveyers running longitudinally through the area. These conveyors connect the nearby RTA Yarwun refinery with Fisherman's Landing Wharf No. 2 and the Cement Australia plant with Fisherman's Landing Wharf No. 4.

As the site has only been reclaimed relatively recently, it has no vegetative cover or other terrestrial features of significant environmental value. The Fisherman's Landing reclamation area is, however, located in proximity to sensitive marine environments, including seagrass meadows, salt marsh areas and mangrove stands (refer to Section 3 for details).

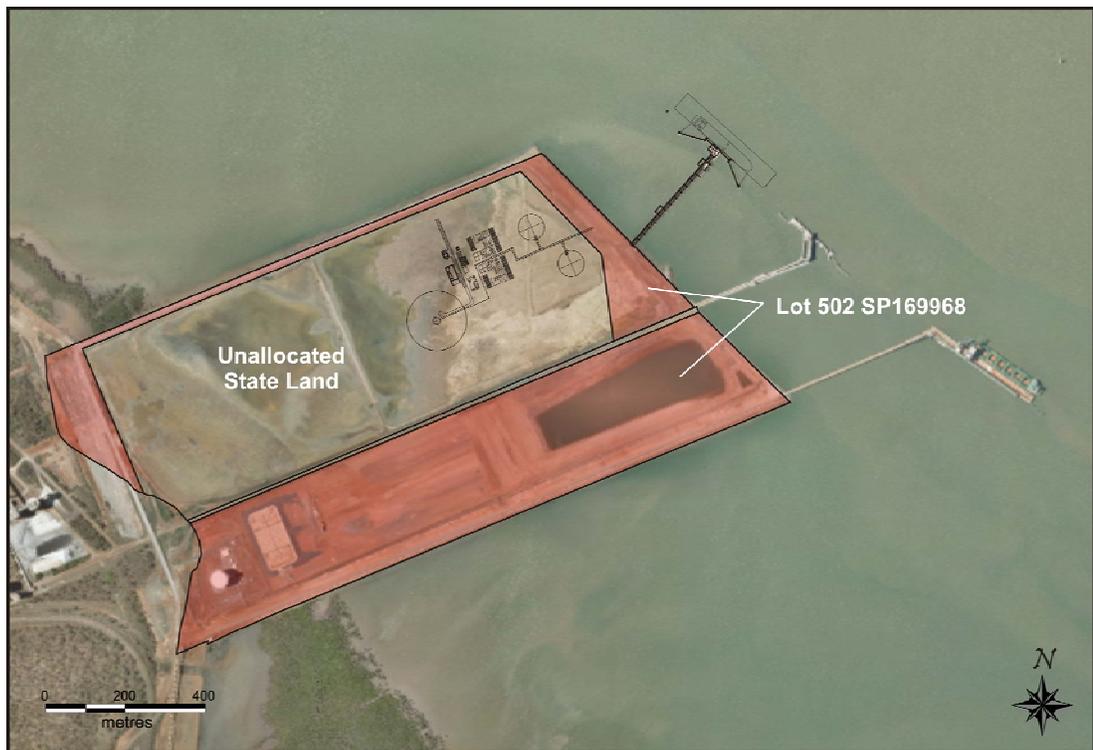


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**Figure 4** Fisherman's Landing site

The current tenure of the site is illustrated in Figure 5. The site is partially located on lot 502 on SP169968 (freehold land) and partly on unallocated state land. Lot 502 incorporates the bund wall area that was initially developed to contain the subsequent reclamation works. The unallocated state land is in the process of being converted to freehold/leasehold land by the CQPA.



**Figure 5** Land tenure, Fisherman's Landing site



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## 2.3 Project Components

Whilst the sole focus of this IAS is the development of the Gladstone LNG Project, the project will be undertaken in parallel with the development of both upstream and downstream infrastructure by other parties. This supporting infrastructure involves the development of a gas pipeline lateral to deliver gas to the site, and the further development of the Port (channel and berthing areas) to accommodate the proposed LNG carriers. Brief details of these other projects are presented in Section 2.7.

It should be noted that separate development approvals will be required for this supporting infrastructure, and that these approvals will be the responsibility of:

- Arrow Energy in the case of the lateral gas pipeline; and
- CQPA in the case of the land reclamation, wharf expansion and channel dredging.

Due to the relatively small size and simplicity of the proposed plant, it is proposed that the majority of the process equipment will be imported in pre-assembled shop tested modules via the construction jetty at the northern corner of the Fisherman's Landing area.

The principal components will include:

- Gas metering skid – This measures the quantity of gas being delivered to the LNG Plant from the Arrow Energy gas fields via the gas pipeline.
- Gas conditioning skid – This equipment lowers the residual moisture and carbon dioxide content in the feed gas (down to the required specification) prior to liquefaction.
- Liquefaction module (cold box) – This is essentially a multistream heat exchanger that cools and condenses the conditioned gas stream to approximately -160 °C, via a heat exchange with several cold refrigerant (mixed refrigerant) streams.
- Compressor package – The above mentioned mixed refrigerant (MR) is circulated via a compressor, which increases the MR pressure from approximately 4 bar to 30 bar. This compressor is driven by an aeroderivative 50 MW gas turbine.
- MR coolers – These large units simply reject the heat associated with the MR compression mentioned above.
- LNG storage – This will comprise of two 100 000 m<sup>3</sup> full containment LNG storage tanks.
- Power station – A small (≈ 15 MW) gas engine power station will be installed to supply the auxiliary power demands of the LNG Plant, such as pump motors, fan motors, building requirements, site lighting, loading arms, fire-fighting systems etc. This power station will utilise boil off gas (BOG) for fuel consumption.



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- LNG transfer – It is proposed to install three LNG loading arms (two liquid supply + one vapour return) plus other required control/monitoring equipment on the existing Wharf No. 5 (which is to be extended by CQPA). This will allow LNG to be safely loaded onto berthed LNG carriers at a rate of approximately 10 000 m<sup>3</sup>/hr.
- Ammonia absorption system – This system will utilise waste heat generated from the plant to drive an ammonia absorption chiller, which will provide cooling at various process locations within the LNG Plant. Consequently, the efficiency of the liquefaction process is significantly improved.

## 2.4 Construction and Operational Processes

### 2.4.1 Construction

#### 2.4.1.1 Construction Management

GLNG PL will engage an engineering procurement and construction management (EPCM) contractor for the project. The EPCM contractor will coordinate and manage the LNG Plant construction comprising:

- Assembly/connection of the imported process plant modules, plus associated onsite construction; and
- Construction of the two 100 000 m<sup>3</sup> LNG storage tanks.

#### 2.4.1.2 Site Preparation

The Fisherman's Landing site comprises an area of reclaimed land within Port Curtis. Reclamation was undertaken by constructing perimeter bunds through end tipping to enclose the reclamation area. The impounded area was subsequently filled by pumping dredged materials ashore from the estuary.

Where any excavation is to be undertaken into natural soils (including the boring of piles), the potential for acid sulfate soils to be disturbed will be considered and appropriate management measures put implemented. An acid sulfate soils investigation is proposed to be undertaken to identify the location of such soils.

#### 2.4.1.3 LNG Plant Construction

The construction of the plant (including process equipment and LNG tanks) will involve earthworks, piling, installation and interconnection of imported pre-assembled modules, installation of various equipment, and buildings. Environmental risk will be minimised and managed during the construction phase of the project through the implementation of a project specific environmental management plan (EMP). The materials and practices utilised during the construction will be in accordance with the relevant Australian and/or international standards.



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## 2.4.2 Operation

### 2.4.2.1 Operations and Management

GLNG PL's operating and maintenance (O&M) methodology is that the project's O&M responsibilities would be assigned to a suitably qualified contractor under a long term O&M contract, where GLNG PL would be the owner's representative. The O&M contractor will be responsible for the operation and maintenance of the LNG Plant, including the liquefaction plant, storage tanks and jetty, and ship loading facilities, in compliance with the terms of the O&M contract, and in doing so operate and maintain the Gladstone LNG project in accordance with the annual budget, operating plan, good industry practice and all relevant laws and development approval conditions.

It is GLNG PL's intention to provide operational input throughout the project phases, including design, construction and commissioning.

### 2.4.2.2 LNG Process

The LNG process comprises gas pre-treatment and gas liquefaction, as below:

- Pre-treatment
  - Inlet separation
  - CO<sub>2</sub> removal (amine system)
  - Water removal (molecular sieves)
- Production
  - Liquefaction
  - LNG storage
- Export
  - LNG ship loading

The CSG feed gas delivered to the plant will contain approximately 97 % methane, 2 % N<sub>2</sub>, 1 % CO<sub>2</sub> and will exhibit pipeline quality dryness. This feed gas will require further reduction of CO<sub>2</sub> and moisture prior to liquefaction.

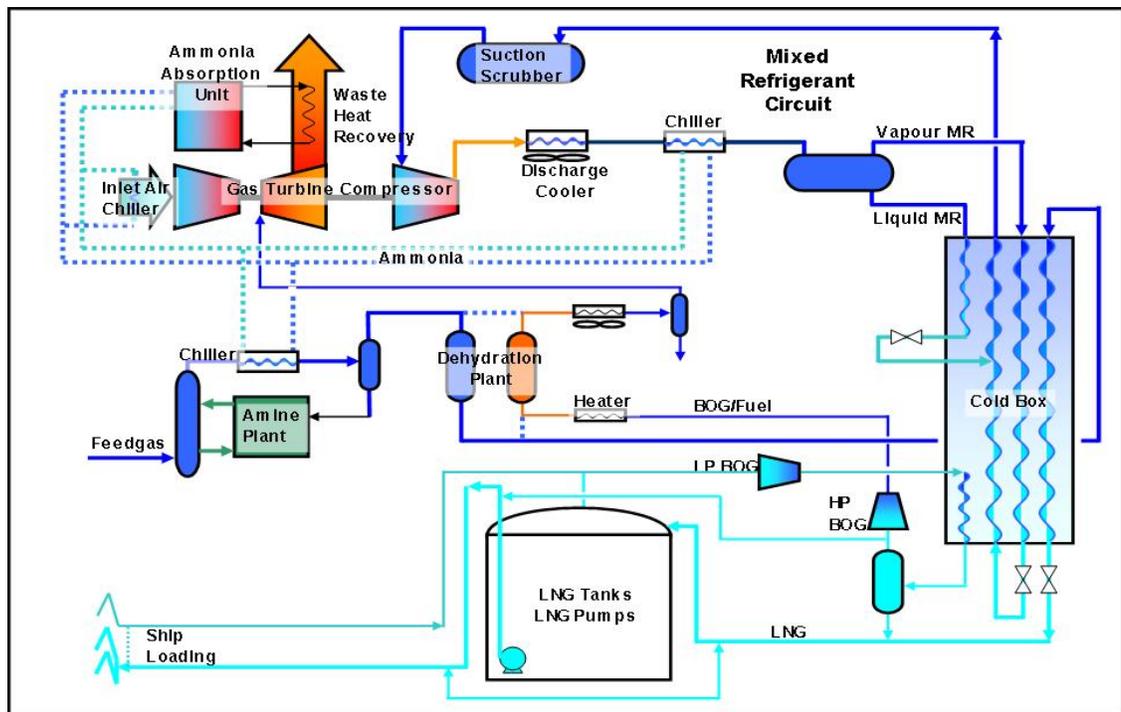
Pipeline gas will enter the gas gate station at the project site. The gas gate station will include a pig receiver, filter/separator, custody transfer meter, pressure controller, emergency shutdown valve and gas analyser. The gas gate station's operation will be the responsibility of AGL-Arrow JV.

Feed gas will first be directed to the amine contactor where CO<sub>2</sub> will be removed down to 50 ppm. A conventional packaged CO<sub>2</sub> removal plant will be used to achieve this specification. The gas exiting the amine contactor is saturated with water ( $\approx 70$  lb/MMscf). In order to remove the bulk of the water, this gas will be cooled to near its hydrate point ( $\approx 15$  °C) using chilled water provided by the ammonia absorption system.



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LNG Limited has an international patent application pending over the use of ammonia absorption chiller technology to replace the traditional pre-cooling technology in the liquefaction process. Ammonia absorption technology is a proven technology and is very well suited for the proposed Gladstone LNG project. Its proposed use has the capacity to convert at least half of the current waste heat to usable cold energy and therefore improve the plant's energy efficiency rating by up to 30 %. The process will also reduce plant greenhouse gas emissions by up to 30 %.



**Figure 6** LNG plant process schematic

Condensed water will be removed from the cooled gas stream and returned to the amine system for use as make-up water.

The gas will then enter the dehydration plant to reduce its water content further to 1 ppm. The dehydration plant utilises molecular sieve vessels. A side stream of dry gas exiting the duty vessel will be used for regeneration gas. Wet regeneration gas will be cooled using air and condensed water. The saturated gas stream will be heated and used as fuel gas. BOG will be preferentially used as regeneration/fuel gas with any shortfall being supplied from the dry gas stream.

Dry gas will then be directed to the cold box where it will be liquefied at  $-160^{\circ}\text{C}$ , flashed to low pressure and stored. The cold box comprises brazed aluminium plate fin exchanges enclosed in a purged steel box. No fractionation of LNG will be undertaken since the feed gas will not contain any heavy hydrocarbons.



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Refrigeration will be provided by a mixed refrigerant stream. The mixed refrigerant will be compressed in a centrifugal compressor driven by a gas turbine. The heat of compression will be removed by air coolers causing the refrigerant to partially condense. Additional cooling of the mixed refrigerant will be provided by the ammonia absorption system. The high pressure pre-cooled refrigerant will be further cooled in the cold box and expanded, using the Joule-Thomson effect thus providing the refrigeration for the dry gas stream. Refrigerant gas will then be returned to the compressor suction scrubber before entering the compressor. Refrigerant make-up will be sourced from the process gas (methane) and nitrogen generator (nitrogen), with the remaining hydrocarbon refrigerants being sourced externally (e.g. ethane, butane, pentane).

Heat for the ammonia absorption system will be obtained from the waste heat contained in the gas turbine exhaust. Cooling produced by the packaged ammonia absorption system will be used to cool the gas turbine inlet air, mixed refrigerant and wet gas stream.

BOG from the LNG tanks will be compressed in a compressor and partially reliquefied in the cold box. The liquid methane produced will be separated, recombined with the main LNG stream and returned to the LNG tanks. The cold gas stream off of the separator will be used as fuel gas.

The LNG tanks will be a full containment configuration. LNG loading pumps will transfer LNG to ships via two loading arms mounted on the jetty. A vapour return arm and line will recover vapour generated on the ship and return this to the LNG tanks and BOG system.

Other process and utilities systems for the plant will include process and cold flare system, power generation using gas engine generators (backup from grid), compressed air package and nitrogen generation package, firewater and safety systems.

## 2.5 Waste Management

The development and operation of the LNG Plant will generate a number of waste streams. These wastes and available management methods are outlined below.

### 2.5.1 General Wastes

During construction, the following general wastes will be produced:

- General domestic garbage from onsite construction workers;
- Paper, cardboard and timber from packaging;
- Scrap steel;
- Greywater and sewage from onsite amenities; and
- Waste hydrocarbons and oily rags from equipment maintenance and refuelling.

It is expected that a less diverse and smaller volume of general wastes will be generated during operation, including:

- Minor waste hydrocarbons and oily rags;



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- General garbage, including putrescibles from the onsite staff facilities (kitchen, offices);
- Greywater and sewage from onsite amenities; and
- Paper, cardboard and timber from occasional packaging for spare parts etc.

The management of these wastes will be addressed in the project EMP, which will be developed during the EIS process. The EMP will identify controls, which target the reduction of generated wastes and ensure that onsite wastes do not enter the environment and minimise subsequent impacts.

Identified controls and initiatives are likely to include, but not be limited to:

- The provision of onsite waste collection bins, including those for recyclables;
- Wherever possible, recyclable materials are to be used;
- The onsite workforce will receive training in waste minimisation and management;
- All waste building materials will be removed from site at the completion of the construction project; and
- Specific provisions for the storage and handling of hazardous materials, including any regulated wastes.

## 2.5.2 Process Wastes

The process wastes generated by the operation of the LNG Plant will include:

- Carbon dioxide vented from the gas pre-treatment process;
- Hot exhaust gases from the gas turbine stacks and the power station stacks (these gases will comprise oxides of nitrogen, oxygen, carbon dioxide, water, argon, neon, THC and NMHC);
- Fugitive emissions generated during emergency and maintenance shutdowns, involving small quantities of coal seam gas and/or mixed refrigerant; and
- Fugitive emissions resulting from emergency flaring.

A discussion on the potential effect of key process wastes is provided in Section 3 of this report.

In addition to process wastes, sewage effluent may require treatment and appropriate disposal.

## 2.5.3 Stormwater and Effluent Drainage

The surface water discharges associated with the LNG Plant will not be from waste process streams, but will involve surface runoff caused by rainfall, firewater testing or the wash down of equipment during maintenance. These surface water sources have the potential to export oil or suspended solids from within the plant area.

It is expected that the plant will generate the following discharge streams:



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- Drainage from paved areas where there is potential for operational or accidental contamination (routed for treatment);
- Clean stormwater drainage from unpaved areas such as roads, administrative areas and building surfaces;
- Drainage from specific process drains, sumps and curbed areas such as those in the acid gas treating unit area, tank bunds etc.; and
- Spent or used operational and maintenance fluids such as oils and test liquids.

Much of the site will be drained by grading and/or open drains, however, some areas of the site will require special drainage construction. Oily water drains and closed drain systems will be required in hydrocarbon handling areas (e.g. for the small quantities of mixed refrigerants to be used/stored onsite). A surface water management plan will be developed as part of the project EMP to address these issues.

## 2.6 Public Safety

Risks to public safety will be assessed in detail, using quantitative risk assessment methodologies, during the EIS and in support of the application for a Petroleum Facility Licence. The proponent has completed a preliminary risk assessment, which considered the hazards associated with the LNG storage and handling and the relevant regulations for a hazardous facility. This preliminary risk assessment concluded that:

- The risk contour of  $50 \times 10^{-6}$  fatalities per annum, as specified by Emergency Management Queensland, would be contained within the boundaries of the site and therefore not present any significant risk to the community.
- The worst case scenario impacts of a potential fire, explosion or toxic gas release would be largely contained within the proposed site boundaries and would not impose any significant restrictions on existing or future adjacent industrial land uses.

GLNG PL will develop an integrated risk management plan for the life of the project.

## 2.7 External Infrastructure Requirements

The successful development of the proposed LNG project will be contingent upon the development of the following infrastructure:

- Coal seam gas field development, which will be undertaken by Arrow Energy NL.
- 400 km Central Queensland Gas Pipeline (CQGP) from Moranbah to Gladstone, which will be developed by the AGL-Arrow Joint Venture (AGL Energy Ltd and Arrow Energy NL).
- Lateral gas pipeline (approximately 4 km in length) to connect the CQGP to the proposed Fisherman's Landing site boundary, which will also be developed by the AGL-Arrow Joint Venture.



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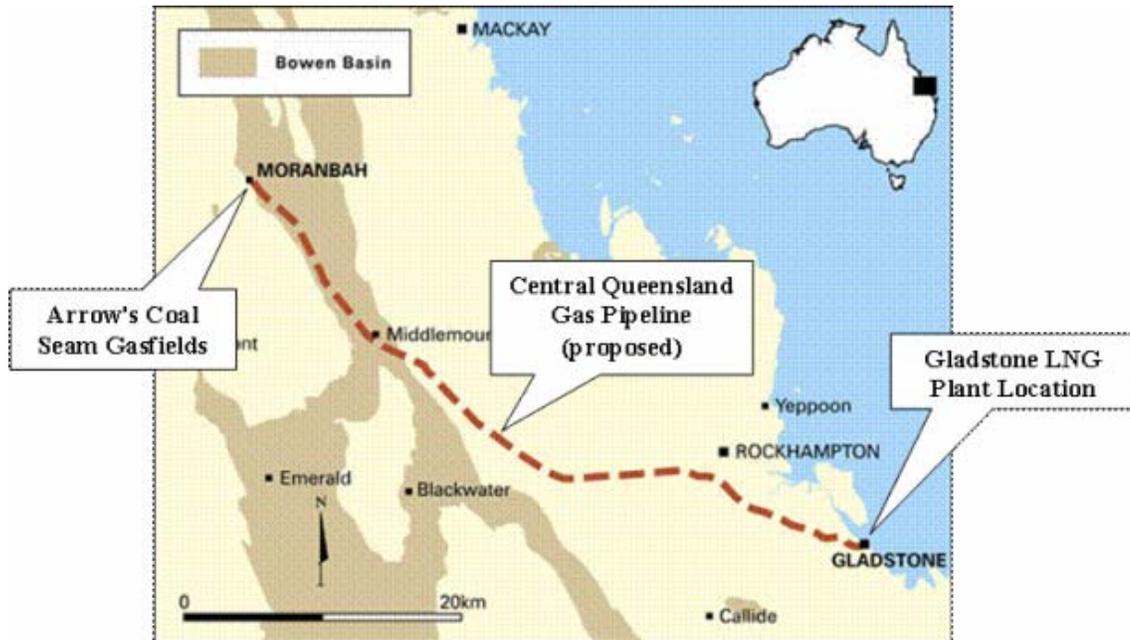
- Structural modifications/extension to Fisherman's Landing Wharf No.5, which will be completed by Central Queensland Ports Authority (CQPA).
- The further development of the Targinie dredged channel to provide vessel access to the Fisherman's Landing wharves. CQPA is planning a capital dredging program to widen and deepen this channel, the associated swing basin, and Fisherman's Landing berth pockets for current and future utilisation of the area.

## 2.7.1 Central Queensland Gas Pipeline

Arrow Energy NL and AGL Energy Limited are currently progressing the development of the CQGP, which will provide a high pressure gas transmission between Moranbah and Gladstone (refer to Figure 7). This pipeline will provide an alternate energy source to Gladstone, and promote the further development of CSG resources within the Bowen Basin. An EIS has been prepared for the CQGP and the Coordinator-General assessed that the CQGP can proceed subject to certain conditions in October 2007.

It is proposed that gas will be sourced from the Moranbah Gas Project and delivered to Gladstone using the CQGP and a yet to be constructed lateral of approximately 4 km in length, which will connect the main pipeline with the Fisherman's Landing site. This lateral will be developed independently by the AGL-Arrow JV.

Under agreement, the AGL-Arrow JV will be responsible for the development of the lateral between the CQGP and the LNG Plant boundary. AGL-Arrow JV will therefore undertake the necessary environmental, planning and development work, including all relevant approvals and studies, associated with the development of the new pipeline lateral. It is anticipated that the gas lateral can be accommodated with amendments to the approvals under the (soon to be granted) Pipeline Licence for the CQGP. In view of this, the gas lateral is not addressed within the scope of this document.



**Figure 7** Proposed Central Queensland Gas Pipeline route

### 2.7.2 Port Works

It is expected that the berth pocket at Fisherman's Landing Wharf No. 5 will need to be deepened, as will the adjacent shipping channel, before the proposed LNG carriers will be able to access the wharf. The required depths are, however, within the limits of planned further development of the coastal infrastructure, which CQPA intends to undertake. Works will also be required to extend Wharf No.5 in order to accommodate the LNG loading arms and associated infrastructure.

These planned works are part of a CQPA strategy to improve access to the Fisherman's Landing wharves. As such, these works, whilst necessary for the operation of the LNG Plant, are not incidental to the project. CQPA will therefore undertake the necessary environmental, planning and development work, including all relevant approvals and studies, associated with the development of the berth pocket, channels and Wharf No.5 upgrade. As such, these matters are not covered within the scope of this document.

### 2.7.3 Site Access

The site is located at the end of the road network, which services industry in the Fisherman's Landing precinct. This access road to the site is currently gravelled for about 1.6 km from the intersection near the Rundle Shale Oil site to the northwest of the Fisherman's Landing site.

During plant construction it is proposed to regularly water the gravel section of the road to reduce any dust nuisance and improve safety.



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There is an existing marine offloading facility ramp at the northeast corner of Fisherman's Landing (refer to Figure 4), which will be used to bring large items to site. This will substantially reduce the need for heavy load traffic on Gladstone roads during construction of the LNG Plant.

## 2.7.4 Power Supply

As previously mentioned, the Gladstone LNG Plant will provide its own power during normal operations. However, it is anticipated that the LNG Plant may require an auxiliary back-up supply of up to 10 MW of power at 11 kV voltage. GLNG PL has commenced discussions with Ergon Energy with regard to various options and timing of back-up supply power for the proposed Gladstone LNG Plant.

## 2.7.5 Telecommunications

The existing telecoms in the area of the plant are capable of supporting the project without any upgrades. There is currently a telephone line to the Fisherman's Landing Wharf No. 5 control room. If a high speed cable Internet network is not available, then GLNG PL will install an adequate link in consultation with the relevant authorities.

## 2.7.6 Water Supply

Potable water will be required for the operation of the LNG Plant. This water will primarily be used for human consumption and wash down. An existing 300 mm potable water main is located at the southwest corner of the Fisherman's Landing reclamation area and it is proposed to extend this line to supply the potable water needs of the plant.

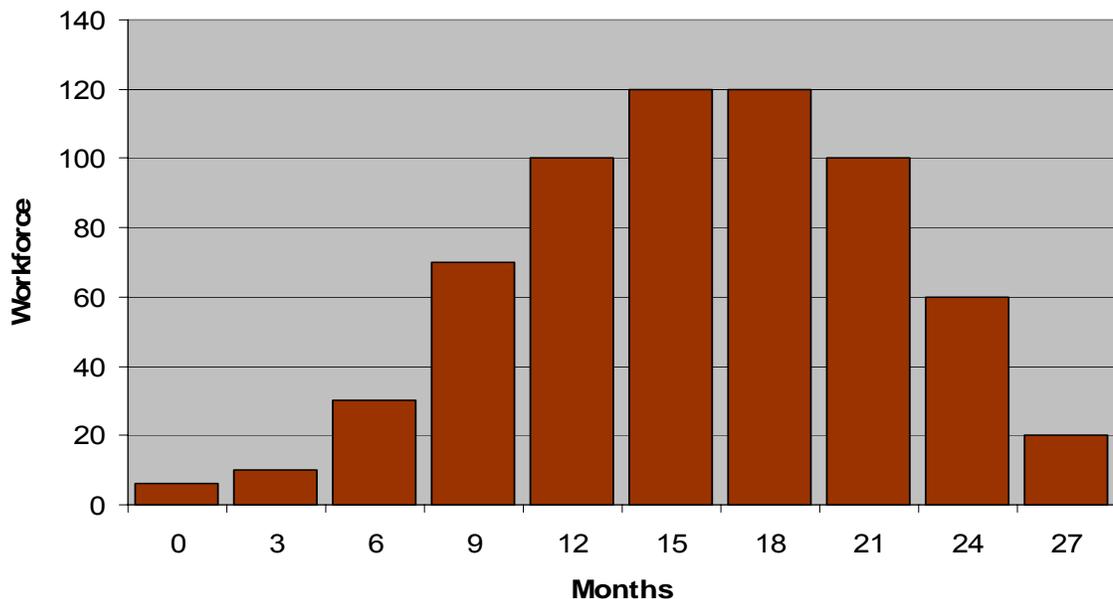
Fire water can be supplied using a pump taking seawater from directly in front of the plant.



## 2.8 Employment

### 2.8.1 Construction Workforce

It is expected that the construction of this simple mid-scale LNG plant will require between 50 and 120 workers onsite, depending on the stage of works. The peak demand of 120 persons will coincide with the heavy construction period prior to commissioning in late 2010.



**Figure 8** Expected workforce during construction

It is GLNG PL's preference to house the construction workforce in temporary camp accommodation adjacent to the Fisherman's Landing site. CQPA will be involved in the final location of the camp. If required, an overflow option will be local accommodation in Gladstone and the surrounding area.

### 2.8.2 Operational Workforce

The plant will employ approximately 12 permanent operational staff and will operate 24 hours a day. Additional personnel will be required onsite during maintenance periods and there will be numerous contractors (either frequenting the plant, and/or undertaking tasks offsite) to assist and maintain the ongoing demands of the plant. The operational workforce will be accommodated in existing dwellings in the local Gladstone area.

Wherever possible, resources for both the construction and operation will be sourced locally and from within the State.



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## 2.9 Proposed Project Timetable

It is proposed that the project development work will be completed and the first LNG train commissioned prior to the first scheduled LNG delivery in early 2011. The proposed schedule is highlighted in the table below.

**Table 1** Key milestones from the proposed project schedule

Key milestone	Target date
Completion of pre-feasibility study	Jul 2007
Secure preferred site	Jan 2008
Commencement of voluntary EIS process	Jan 2008
Completion of EIS and development approval processes	Oct 2008
Commence onsite construction works (LNG tank foundation preparation only)	Nov 2008
Financial close	Dec 2008
LNG plant commissioning (Train 1)	Oct 2010
First LNG delivery	Q1 2011
Commence onsite construction works (Train 2)	Nov 2011
LNG plant commissioning (Train 2)	Oct 2013
LNG delivery from Train 2	Q1 2014

## 2.10 Environmental and Planning Approval Requirements

The proposed development will be subject to the application of a range of State and Commonwealth legislation. The project is seeking an Environmental Authority for a number of environmentally relevant activities (under the *Environmental Protection Act 1994*) and a Petroleum Facility Licence under the *Petroleum and Gas (Production and Safety) Act 2004* to enable it to operate.

The following sections provide an overview of the necessary approvals.

### 2.10.1 Local Government

It is expected that no local authority approval for a material change of use under the *Integrated Planning Act 1997* will be required, given that the proposed site and works will be located on strategic port land within the Port of Gladstone, and, as the LNG Plant is a Petroleum Facility, it is exempt development.



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## 2.10.2 State Government

It is expected that the project will require the following approvals:

- A Petroleum Facility Licence under the *Petroleum and Gas (Production and Safety) Act 2004*.
- An Environmental Authority under the *Environmental Protection Act 1994* for the following environmentally relevant activities (ERAs):
  - ERA 7(a) – Chemical storage - storing chemicals (other than crude oil, natural gas and petroleum products), including ozone depleting substances, gases or dangerous goods under the dangerous goods code in containers having a design storage volume of < 1 000 m<sup>3</sup>.
  - ERA 11(b) – Crude oil or petroleum product storage - storing crude oil or a petroleum product in tanks or containers having a combined total storage capacity of 500 000 L or more.
  - ERA 13(b) – Fuel gas refining or processing - refining or processing of fuel gas in works having a design production capacity at standard temperature and pressure of 200 000 000 m<sup>3</sup> or more a year.
  - ERA 17 – Fuel burning using any process capable of burning more than 500 kg of fuel per hour.
  - ERA 18(a) – Operating a power station with a rated capacity of 10 MW or more.
  - ERA 74 – Stockpiling, loading or unloading of goods in bulk - commercially loading, unloading or stockpiling materials or goods, in association with an activity mentioned in item 71, using a crane, conveyor, pump or other similar way at a rate of more than 100 t/day.

As part of the environmental authority application, the proponent proposes to submit a voluntary EIS (prepared in accordance with the process outlined in Part 2, Chapter 3 of the *Environmental Protection Act 1994*).

- A development approval under the *Integrated Planning 1997*, which incorporates the approval requirements of various pieces of legislation, including:
  - Tidal works under the *Coastal Protection and Management Act 1995*; and
  - A major hazard facility under the *Dangerous Goods Safety Management Act 2001*.

The project will also be subject to the requirements of other Acts, policies and regulations including:

- *Aboriginal Cultural Heritage Act 2003*;
- *Transport Infrastructure Act 1994*;



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- State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils; and
- *Fisheries Act 1994.*

## 2.10.3 Commonwealth Government

### 2.10.3.1 Environmental Protection and Biodiversity Conservation Act 1999

At the Commonwealth level, the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is applicable to those developments/actions that are likely to impact on a matter of national environmental significance.

The most relevant matter of national significance in the region is the Great Barrier Reef. Whilst the Great Barrier Reef Marine Park excludes most of the operational areas of the Port of Gladstone, the Great Barrier Reef World Heritage Area extends all the way to the coast line (to the mean low water mark) and therefore includes the tidal areas surrounding Fisherman's Landing. In view of the project's proximity to the Marine Park and World Heritage Area, it is proposed to make a referral to Commonwealth Department of the Environment, Water, Heritage and the Arts to determine if the proposed project is considered to constitute a controlled action under the EPBC Act.

### 2.10.3.2 Civil Aviation Regulations 1988 and Civil Aviation Safety Regulations 1988

The Commonwealth *Civil Aviation Regulations 1988* and *Civil Aviation Safety Regulations 1988* provide Civil Aviation Safety Authority (CASA) with the power to control the height of objects, structures, buildings and plumes, which might be a hazard to aircraft. These regulations would therefore typically apply to tall structures (i.e. the LNG plant stack) and generated plumes (i.e. exhaust from the LNG Plant) in the vicinity of certified or registered aerodromes.

Aviation authorities have established that an exhaust plume with a vertical gust in excess of 4.3 m/s may cause damage to an aircraft airframe, or interfere with aircraft when flying at low levels. As a result of this, CASA requires the proponent of a facility with an exhaust plume, which has an average vertical velocity exceeding the limiting value (4.3 m/s at the aerodrome obstacle limitation surface or at 110 m above ground level anywhere else), to be assessed for the potential hazard to aircraft operations.

In view of this it is proposed to conduct an aviation safety assessment in accordance with CASA requirements for the proposed plant, which will define the size of the potential hazard zone around the site.



## 2.11 Proposed Environmental Studies

It is proposed that a range of environmental studies will be required to support the application process, including the following:

- Acid sulfate soils investigation;
- Air quality modelling and assessment;
- Exhaust plume modelling;
- Environmental noise assessment;
- Soil and groundwater contamination assessment; and
- Cultural heritage assessment.



## 3. EXISTING ENVIRONMENT AND POTENTIAL IMPACTS

### 3.1 Air Quality

#### 3.1.1 Description

The site is located within the Gladstone airshed, which is affected by emissions from several major industries including the Gladstone power station, RTA Yarwun refinery, Orica chemical plant and Cement Australia manufacturing plant.

#### 3.1.2 Potential Impacts

In July 2007, Katestone was commissioned by the Coordinator-General, on behalf of GLNG PL, to undertake an initial assessment of the impact on air quality of emissions from the proposed plant.

Due to the preliminary nature of the assessment, Katestone (2007) used nitrogen dioxide as the air pollutant indicator to determine whether there would be any airshed capacity constraints associated with the proposed plant at the Fisherman's Landing site. Nitrogen dioxide can affect both human health and vegetation, and impacts on both of these were considered in the assessment (Katestone 2007).

The potential impacts of emissions of oxides of nitrogen from the proposed LNG plant were estimated by Katestone (2007) using the CALPUFF dispersion model and wind fields developed for the Gladstone Airshed Modelling System. The assessment took into account estimates of emissions from the LNG Plant in isolation, as well as in combination with those from existing and approved industrial sources in the region. It should be noted that the database of existing and approved industrial sources used by Katestone is not completely up to date, but should be updated in time for a more rigorous evaluation to support the development approval process.

Emissions sources of the proposed LNG plant and building characteristics were provided to Katestone by GLNG PL.

The modelling predictions provide a strong indication that human health and vegetation protection criteria can be adequately met at the Fisherman's Landing site. Air quality was predicted to remain below the relevant air quality standards/goals for human health at all locations. In relation to potential impacts on sensitive vegetation, the dispersion modelling results suggest there will be two small additional areas where the *Environmental Protection Policy (Air) 1997* Schedule 1 Part 2 goal of 95 µg/m<sup>3</sup> for the 4-hour average of nitrogen dioxide is exceeded as a result of the operation of the proposed LNG plant. However, the areas are minimal and contained within industrial land or within the boundaries of the reclaimed land within which the LNG plant site is situated. There is unlikely to be an adverse impact on sensitive vegetation as a result of the predicted exceedance.

A more detailed study assessing all potential air pollutants and areas of air quality impact based on the detailed design of the LNG Plant is proposed to be undertaken to inform the EIS process.



## 3.2 Noise and Vibration

### 3.2.1 Description

A desktop review of aerial photography over the area surrounding the Fisherman's Landing site indicates that the nearest visible sensitive receptor is located approximately 3 km to the southwest on the corner of Landing and Guerassimoff roads where there is a small acreage property with a house. This property is, however, located much closer to both the Cement Australia rail handling facility, which is approximately 1.4 km to the northeast of the dwelling, and the RTA Yarwun refinery, which is approximately 2.2 km to the south-southeast. Each of these sites is likely to represent a much greater noise source than the proposed LNG terminal.

Previous noise monitoring undertaken by URS (2007) at a site nearby to the sensitive receptor (approximately 800 m southeast of the dwelling and 3 km south-southwest of the proposed site), indicated that the current background noise level in the area is around 39 to 40 dB(A) depending on the time of day. Therefore, given the distance to the nearest dwelling and the more immediate location of other noise generating industries, it is unlikely that noise will be a significant issue at the project site.

### 3.2.2 Potential Impacts

The *Environmental Protection (Noise) Policy 1997* (EPP Noise) and associated guidelines provides the framework for managing and assessing the impact of noise emissions in Queensland. The EPP Noise specifies an acoustic quality objective as an ambient  $L_{Aeq}$  (24 hour) level of 55 dB(A) or less for most of Queensland's population living in residential areas, and other planning noise levels for transportation noise sources. The EPP Noise does not specify noise criteria for industries. The 'Planning for noise control' guideline (EPA 2004) provides a process for determining noise criteria for new projects that ensures protection of the acoustic environment for background noise creep. Operational noise criteria for the project will ultimately be developed with the EPA and will be informed by an environmental noise assessment and an evaluation of noise criteria derived in accordance with the 2004 Guideline, as part of the proposed EIS.

Construction noise will be managed to be in accordance with the *Environmental Protection Regulation 1998*, which covers environmental nuisance from intrusive noise sources.

It is expected that given the distance to the nearest dwelling and the more immediate location of other noise generating industries, it is probable that noise will not be a significant issue at the project site.



**Figure 9** Identified potential sensitive noise receptors

## 3.3 Terrestrial Environment

### 3.3.1 Description

It is proposed that the LNG Plant be developed on recently reclaimed land at Fisherman's Landing. As such, there are no identified terrain features (geology, soils, topography) of environmental significance. There may, however, be some potential for the presence of acid sulfate soils given the elevation of the site at around 3 m AHD.

### 3.3.2 Potential Impacts

Given the nature of the proposed works and the current terrestrial environment, it is not expected that the proposed project will cause any significant impacts to the terrestrial environment. A field investigation will be undertaken as part of the EIS process, however, to determine the distribution, if any, of acid sulfate soils at the site. If required, an acid sulfate soils management plan will be developed.



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## 3.4 Coastal Environment

### 3.4.1 Description

A number of marine areas of environmental significance exist within close proximity to Fisherman's Landing, including the following areas that are defined under legislation and other directories:

- the Great Barrier Reef Marine Park;
- Great Barrier Reef World Heritage Area;
- State Great Barrier Reef Marine Park;
- Rodds Bay Dugong Protection Area; and
- Port Curtis Wetland, as identified in the Directory of Important Wetlands in Australia.

The primary environmental features of interest in the vicinity of the project site in the inner harbour are seagrass meadows, mangrove stands, benthic communities and the local system of wetlands that extend along either side of the Narrows and the Targinie Channel waterways. The area is also known to be frequented by dugong and cetaceans, and there is an established medium density nesting population of flatback turtles (*Natator depressus*) that inhabit the area surrounding South End on Curtis Island (Limpus *et al.* 2006).

In the immediate vicinity of the proposed site, there are extensive areas of seagrass meadows and mangrove stands. Rasheed *et al.* (2002) and Taylor *et al.* (2007) identify large meadows of the seagrass species *Zostera capricorni*, *Halophila ovalis* and *H. decipiens*, which dominate the tidal flats to the north and south of Fisherman's Landing, as well as the sand banks located within the channel to the east. Surveys of the area completed by Danaher *et al.* (2005) and Walker & Houston (1996) also identified the presence of mangroves, which extend along the coastline from the Gladstone city precinct to the north beyond Fisherman's Landing. There is, however, no indication of the presence of either seagrasses or mangroves in the immediate area of Fisherman's Landing.

In a baseline survey of benthic habitats of the port area, Rasheed *et al.* (2002) identified that the Fisherman's Landing wharves were predominantly surrounded by a scallop/rubble reef community dominated by bivalves with a mix of reef species. There was also an area immediately to the north of the wharves, which was a medium density rubble reef dominated by bivalves, ascidians, bryozoans and hard corals (Rasheed *et al.* 2002).

The Port Curtis wetland system, which is listed in the Directory of Important Wetlands in Australia, covers an area of approximately 30 000 ha and includes the marine, tidal and coastal areas surrounding Gladstone, the southern section of the Narrows and southern Curtis Island. The wetland provides important habitat for birds and other marine animals of national significance and, in the vicinity of Fisherman's Landing, the intertidal areas are dominated by mangroves and seagrass meadows, as discussed above, and incorporate large areas of saltpan to the south, which have been identified as a major shorebird feed site by the EPA, and exposed rocky/sandy banks to the north (Danaher *et al.* 2005). There is also a small creek/tidal inlet located approximately two kilometres to



the south of the proposed site, which comprises a complex of saline grasslands, various mangrove species, exposed banks and saltpan (Danaher *et al.* 2005).

Although a search of the EPBC Act protected matters database indicates that around 13 threatened marine species of national environmental significance inhabit the region, URS (2007) and WBM (1990) report that dugong, cetaceans (bottlenose dolphins) and turtles (green, flatback and loggerhead) are the most likely marine fauna to be encountered in the Port.

### 3.4.2 Potential Impacts

Given the scope and nature of the proposed development (i.e. excluding dredging works), the primary potential for impact on the coastal environment will be associated with any tidal works required for the upgrade of the existing wharf. The disturbance of the seabed for the installation of new marine structures and the potential for pollution associated with work on the wharf, berthing dolphins and mooring hooks will be minor, however, and will be managed through suitable environmental controls included in the EMP, which will be developed for the construction and operation of the project. In particular, the absence of seagrass and mangroves in the immediate vicinity of the wharf and the mobility of the resident marine fauna simplifies the matter, as there will be no expected impact on marine plants or animals.

## 3.5 Cultural Heritage

### 3.5.1 Description

GLNG PL is not aware of any cultural heritage surveys that have been undertaken at the site, however, an assessment of cultural heritage values and sites of significance would be undertaken as part of the EIS process.

### 3.5.2 Potential Impacts

Given the nature of the works and the proposed site, it is considered unlikely that the construction and operation of the site will impact on the cultural heritage values of the area. This will, however, be further assessed during the EIS process, and a cultural heritage management plan or similar will be developed, as required, in accordance with the State *Aboriginal Cultural Heritage Act 2003* for the project.

## 3.6 Visual Amenity

### 3.6.1 Description

The proposed LNG plant site is located in a landscape that is punctuated by heavy industry, including the nearby Stuart shale oil pilot plant, RTA Yarwun refinery, Orica Ltd ammonia storage, Orica Ltd chemical plant and the Cement Australia production facility. Figure 10 and Figure 11 highlight this



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arrangement, as well as the aesthetic nature of the Fisherman's Landing area, which is devoid of vegetation.

The site is located approximately 10 km northwest of Gladstone, however, its visibility is obscured from most sections of the city by existing industry, including the RG Tanna Coal Terminal and the Gladstone Power Station.



**Figure 10** View of Fisherman's Landing from the east



**Figure 11** View of Fisherman's Landing from the north



### 3.6.2 Potential Impacts

Given its proximity to other visually significant industries and the obscured line of sight to Gladstone, it is not expected that the proposed plant will have significant impacts on the visual amenity of the area.

## 3.7 Traffic and Transport

### 3.7.1 Description

The Fisherman's Landing site will be accessible by both road and sea (there is a barge landing immediately adjacent to the site). The site is located at the end of the road network, which services industry in the Fisherman's Landing precinct. There will be increased traffic utilising the main feeder roads linking to the area, however, these roads run predominately through industrial areas and would appear to be well below capacity.

There are two designated airfields (one existing airport at Gladstone and one reserved for future development to the north of the site) in the vicinity of the proposed site. The airspace above the site is used by aircraft approaching and departing the sites (or could be in future) and obstacle limitation surfaces have been defined for the area.

### 3.7.2 Potential Impacts

The proposed project will predominantly impact on the local traffic and transport infrastructure during the construction phase when up to 120 workers will be onsite and a range of materials and equipment will be delivered to site by truck. It is expected that the majority of plant components will be shipped in by barge and it is therefore unlikely that this will impact on the integrity or capacity of the local road system.

During the operation of the plant, it will support 12 permanent staff and require the occasional delivery of equipment, consumables (including gases) and services, which should have limited impact on the local transport networks.

The operation of the plant may generate high temperature exhaust gases, which could generate upward rising air plumes. Such plumes could impact on the navigation/safety of aircraft accessing either of the two designated airport areas. This matter will be further investigated during the EIS process through air modelling and liaison with the relevant agencies (such as CASA).



## 3.8 Socio-economic Aspects

### 3.8.1 Description

In the September 2006 Gladstone Regional Overview recently compiled by GAPD Ltd (2006), it notes the following key statistics for Gladstone and the surrounding region:

- There is a population of approximately 64 000.
- The median age in Gladstone city is 32 and is forecast to rise marginally to 33 over the next 20 years.
- Average annual population growth is currently around 0.9 % within Gladstone City, however, this is to forecast to rise to 2.4 % and then 3.1 % for the next ten years and the ten years after that respectively.
- Employment by population can be categorised as follows for Gladstone region, in accordance with the Gladstone Regional Overview (GAPD Ltd 2006):
  - Managers and administration 9.8 %
  - Professionals 11.6 %
  - Associate professionals 10.7 %
  - Tradespersons 17.0 %
  - Clerks/sales/service workers 15.2 %
  - Labourers and related workers 33.8 %
  - Other 1.9 %
- To the end of the June 2006 quarter, the median house price in Gladstone City was \$252 500 and the median weekly rent was \$225.
- House price growth at June 2006 was high, with a quarterly increase of 7.4 %.

### 3.8.2 Potential Impacts

Whilst the expected socioeconomic impacts of the project are expected to be minimal due to the relatively small permanent workforce, the impacts during construction could be more significant, particularly if local resources are scarce and labour needs to be brought to Gladstone from other regions. These impacts, including any effects on housing, employment and public services, will be assessed during the EIS process.



## 4. ENVIRONMENTAL AND RISK MANAGEMENT SYSTEMS

An EMP will be developed for the project during the EIS process, which addresses the relevant environmental risks associated with the construction, operation and decommissioning phases of the project. The EMP will also specify any required ongoing environmental monitoring to be undertaken at the site.

The approach to be implemented by GLNG PL is espoused in its environmental and occupational health safety and welfare policy statements, which are included in Appendix A.

The construction contractor will be engaged on the basis that compliance with the project EMP, development approvals and environmental permits will be a contractual requirement. GLNG PL will maintain compliance with the EMP and relevant approval conditions through a program of risk-based tools, including onsite audits, documentation reviews and key performance metrics.

### 4.1 Operation and Maintenance Contract

Whilst GLNG PL does not yet have an environmental management system, at the appropriate time, there will be an operation and maintenance contract established with a reputable entity having the following objectives:

- Safety performance
  - Ensure that the highest standards of occupational health, safety and risk management are employed at the site, which will be give cause to all stakeholders to recognise GLNG PL's superior safety performance.
- Environmental performance
  - Ensure that the highest standards of environmental responsibility are employed at the site. Compliance with legislation will be considered the minimum standard and full acceptance by the community in which GLNG PL operates will be actively pursued.
- Aligned business objectives
  - Ensure that both GLNG PL and the contractor's business objectives are aligned to achieve GLNG PL's clients' business objectives and not at the expense of our clients' objectives.
- Meet reliability and availability goals
  - Through the utilisation of competent personnel and best practice maintenance, GLNG PL will achieve the target reliability and availability for the Gladstone LNG plant.



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At an early stage, GLNG PL will ensure that the contractor will become intimately involved in:

- Hazard identification and HAZOP processes;
- Risk assessment and identification of risk reduction measures;
- The development of an integrated management system;
- Developing facility operating procedures;
- Developing health, safety and environmental management systems and procedures; and
- Establishing community liaison processes.

By commencing the above tasks in partnership with the contractor and in advance of the commencement of operations at the plant site, GLNG PL will proactively seek to identify, manage and mitigate environmental, health and safety, technical and other pertinent risks.



## 5. STAKEHOLDER ENGAGEMENT

GLNG PL is committed to a public consultation program as part of the project approvals process and intends to formulate a consultation program, which provides opportunities for active community involvement and education through an inclusive program.

The public consultation process would identify broad issues of concern to local community and interest groups at all stages including project planning, construction, commissioning, operations and final decommissioning.

The key objectives of the developed consultation program will be to:

- Inform the different interest groups about the project proposal;
- Seek an understanding of interest group concerns about the proposal;
- Explain the environmental impact assessment process and indicate how public input might influence the final recommendations for the project;
- Provide an understanding of the regulatory approval process;
- Seek local information and input into the project; and
- Provide the community with a sense of ownership in the project.

The public consultation program would include public meetings, interest group meetings, production of regular summary information and updates and other consultation mechanisms for encouraging and facilitating active public consultation. A list of affected persons and interested stakeholders would be developed.

Ultimately, the consultation would establish:

- The project's ongoing program for communicating and consulting with the public and stakeholder groups during the course of the project.
- Appropriate project responses to the issues and suggestions of stakeholders and members of the public, including potential project design modifications aimed at mitigating or managing environmental impact issues.

To date, GLNG PL has undertaken preliminary consultation with select government agencies, including Emergency Management Queensland, Department of Infrastructure and Planning, EPA and CQPA. GLNG PL also proposes to conduct focused community liaison with the Port of Gladstone Community Focus Group, which was recently established by the CQPA.



## 6. GLOSSARY

<b>BOG</b>	Boil off gas
<b>CASA</b>	Civil Aviation Safety Authority
<b>CQGP</b>	Central Queensland Gas Pipeline, which is to be developed by the AGL-Arrow Joint Venture
<b>CQPA</b>	Central Queensland Ports Authority
<b>CSG</b>	Coal seam gas
<b>EIS</b>	Environmental impact statement
<b>EMP</b>	Environmental management plan
<b>EPA</b>	Queensland Environmental Protection Agency
<b>EPBC Act</b>	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)
<b>EPCM</b>	Engineering procurement and construction management
<b>EPP Noise</b>	<i>Environmental Protection (Noise) Policy 1997</i> (QLD)
<b>ERA</b>	Environmentally relevant activity, as defined under the <i>Environmental Protection Act 1994</i> (QLD)
<b>GLNG PL</b>	Gladstone LNG Pty Ltd, a subsidiary of the ASX-listed Liquefied Natural Gas Ltd company.
<b>IAS</b>	Initial advice statement
<b>L<sub>Aeq</sub></b>	Adjusted equivalent continuous A-weighted sound pressure level (or average) measured over a time period
<b>LNG</b>	Liquefied natural gas
<b>LNG Ltd</b>	Liquefied Natural Gas Limited, which is the parent company of GLNG PL
<b>MR</b>	Mixed refrigerants
<b>O&amp;M</b>	Operation and maintenance
<b>RTA</b>	Rio Tinto Aluminium
<b>ToR</b>	Terms of reference for an EIS



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## **Appendix A            LNG Limited Policy Statements**

# LNG LIMITED

## ENVIRONMENTAL POLICY STATEMENT

LNG Limited will seek as its core environmental objectives to:

- Meet all legal obligations and industry agreements to the fullest extent possible
- Establish, monitor and review environmental targets and report environmental performance
- Seek cost effective measures to abate greenhouse emissions as part of its business operations
- Participate and communicate with relevant parties on environmental issues in an open and timely manner
- Protect the natural and cultural environment of the Kimberley region to the maximum practical extent
- Investigate and, where practical, implement alternative and renewable methods of generating energy within its regional operations
- Manage environmental issues such as soil erosion, land degradation, contamination, bushfire and deforestation consequences, pollution of water ways, toxic substances, hazardous substances and disposal of waste to minimize their effects on the immediate community and the environment in general
- Train and encourage all employees and Directors to embrace their environmental responsibility and ensure that all contractors accept and adhere to the highest possible environmental standards.

LNG Limited

Phil Harvey

Chairman

# **LNG LIMITED**

## **OCCUPATIONAL HEALTH SAFETY & WELFARE POLICY**

Safety is a top priority value for all at LNG Limited. In line with our total commitment to safety, a safety officer will be appointed to each project team with sufficient power to enforce adherence to safe working practices and with the commission to actively encourage safety awareness at all levels of the company's operations.

At each operational site the senior company person will also be appointed as the safety officer. Safety will be an integral part of their supervisory functions. Accordingly the supervisory personnel are to be instructed to constantly monitor for unsafe conditions or practices and either correct them or instigate appropriate action through the safety officer.

Before commencing work on any project, all employees are instructed in safe working practices and in the appropriate company guidelines at the time to ensure a high level of safety whilst on the site.

The company guidelines should ensure there is effective involvement and open communication on safety and health matters at all levels of the company including all Directors.

The company's safe and healthy work practices, standards and behaviour at work should be transferred to the home and community by all company employees.

LNG Limited

Phil Harvey

Chairman