

Terms of reference

Terms of reference for an environmental impact statement

Final terms of reference for the Gladstone LNG (Fisherman’s Landing) Project

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Background

Gladstone LNG Pty Ltd (GLNG PL), which is a subsidiary of the publicly listed Australian company Liquefied Natural Gas Ltd, proposes to develop a mid-scale liquefied natural gas (LNG) plant at Fisherman's Landing Wharf (FLW) near Gladstone. The proposal has an expected life of 25 years and the first stage would produce up to 1.6 million tonnes of LNG per year. A proposed second stage would double the capacity within three years of Stage 1.

For Stage 1, a natural gas liquefaction plant and associated infrastructure and facilities would be built at FLW. Wharf loading facilities at FLW No. 5 would be upgraded to accommodate LNG carrier shipping. Coal Seam Gas (CSG) would be sourced from gas fields operated by Arrow Energy NL via the proposed Central Queensland Gas Pipeline. The CSG will be treated to lower the concentrations of carbon dioxide and water. The processed gas would 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 would connect the LNG storage tanks to a set of loading arms mounted on the Wharf No. 5 extension.

These terms of reference cover the Gladstone LNG project on Fisherman's Landing. The sourcing of the coal seam gas, the delivery pipeline, and modification of the wharf loading facilities have or will be addressed by other assessment and approval processes.

CONTENT OF THE EIS

Executive summary

The function of the executive summary is to convey the most important aspects and options relating to the project to the reader in a concise and readable form. It should use plain English and avoid the use of jargon and esoteric terms. The structure of the executive summary should follow that of the EIS, and focus strongly on the key issues and conclusions.

Glossary of terms

A glossary of technical terms, acronyms and abbreviations shall be provided before the main text of the EIS.

1 Introduction

The function of the introduction is to explain why the EIS has been prepared and what it sets out to achieve. In particular, the introduction should address the level of detail of information required to meet the level of approval being sought (for example, whether the proponent is seeking only a preliminary approval through the Integrated Development Assessment System (IDAS) or a full approval with all permits). It should also define the audience to whom it is directed, and contain an overview of the structure of the document. Throughout the EIS, factual information contained in the document should be referenced.

1.1 Project proponent

Provide details of the project proponents, including details of any joint venture partners. This section should describe the relevant experiences of the proponent, including the nature and extent of business activities, qualifications and environmental record associated with similar projects and its general operations.

1.2 Project description

A brief description of the key elements of the project should be provided and illustrated. Any major associated infrastructure requirements should also be summarised. Detailed descriptions of the project should follow in Section 3.

A brief description should be provided of studies or surveys that have been undertaken for the purposes of developing the project and preparing the EIS. This should include reference to relevant baseline studies or investigations undertaken previously.

1.3 Project objectives and scope

A statement of the objectives which have led to the development of the proposal and a brief outline of the events leading up to the proposal's formulation, including alternatives, envisaged time scale for implementation and project life, anticipated establishment costs and actions already undertaken within the project area.

Describe the current status of the project and outline any major associated infrastructure of which the proponent should be aware that is being, or might be taken or that has been approved in the area affected by the Project. In particular, mention should be made of other relevant LNG facilities, upgrades and proposed expansion of facilities at Port of Gladstone, and the nature of the interdependency of these projects. The consequences of not proceeding with the project should also be discussed.

1.4 The environmental impact statement (EIS) process

The purpose of this section is to make clear the methodology and objectives of the environmental impact statement under the relevant legislation. In particular, the discussion should outline the Voluntary EIS process. As the project was deemed not to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) by the Commonwealth Department of the Environment, Water, Heritage and the Arts, the requirements for an EIS under that Act will not be applicable.

1.4.1 Methodology of the EIS

This section should provide a description of the EIS process steps, timing and decisions to be made for relevant stages of the project. This section should also indicate how the consultation process (which will be described in detail in section 1.5) would integrate with the other components of the impact assessment, including the stages, timing and mechanisms for public input and participation.

The information in this section is required to ensure:

- relevant legislation is addressed;
- readers are informed of the process to be followed; and
- stakeholders are aware of any opportunities for input and participation.

1.4.2 Objectives of the EIS

Having described the methodology of the EIS, a succinct statement should be made of the EIS objectives. The structure of the EIS can then be outlined as an explanation of how the EIS will meet its objectives. The reader should be able to distinguish the EIS as the key environmental document providing advice to decision makers considering approvals for the project.

While the terms of reference provide guidance on the scope of the EIS studies, they should not be seen as exhaustive or limiting. It is important for proponents and their consultants to recognise that there cannot be perfect knowledge in advance of undertaking an EIS of what the EIS studies may find.

If it transpires during the preparation of the EIS that previously unforeseen matters not addressed in the terms of reference are found to be relevant to the assessment of impacts of the proposal, those matters should be included in the EIS.

In addition, it is essential that the main text of the EIS should address all relevant matters concerning environmental values, impacts on those values and proposed mitigation measures. No relevant matter should be raised for the first time in an appendix or the draft environmental management plan (EM plan).

When considering whether an impact is or is not significant, the proponent should take account of both the intensity of the impact and the context in which it would occur.

The EIS is a public document. Its purpose is not only to provide information to regulatory agencies, but also to inform the public of the scope, impacts and mitigation measures of the proposal. As such, the main text should be written in plain English avoiding jargon as much as possible. Additional technical detail may be provided in appendices. The main text should not assume that a reader would have a prior knowledge of the project site. It should not be necessary for the reader to have visited the site to understand the issues involved in the proposal.

In brief, the EIS objectives should be to provide public information on the need for and likely effects of the project, to set out acceptable standards and levels of impacts (both beneficial and adverse) on environmental values, and demonstrate how environmental impacts can be managed through the protection and enhancement of the environmental values. Discussion of options and alternatives and their likely relative environmental management outcomes is a key aspect of the EIS.

The role of the EIS in providing the project's draft EM plan should also be discussed, with particular reference to the EM plan's role in providing management measures that can be carried over into conditions that would attach to any approval(s), environmental authorities and permits for the project.

1.4.3 Submissions

The reader should be informed as to how and when public submissions on the draft EIS will be addressed and taken into account in the decision-making process.

1.5 Public consultation process

An appropriate public consultation program is essential to the impact assessment. This section should outline the methodology that will be adopted to identify and mitigate socio-economic impacts of the project. Information about the consultation that has already taken place and the results of such consultation should be provided.

The submission of a list of affected persons and interested persons as well as a statement of how the proponent proposes to consult with those persons is a statutory requirement of the EIS process in the *Environmental Protection Act 1994* (See section 7). Similar requirements, though non-statutory, are usually applied to EIS processes under other State legislation.

The public consultation program should provide opportunities for community involvement and education. It may include interviews with individuals, public meetings, interest group meetings, production of regular summary information and updates, and other consultation mechanisms to encourage and facilitate active public consultation.

The public consultation process should identify broad issues of concern to local community and interest groups and should continue from project planning through commissioning, project operations and final decommissioning. Refer to the EPA guideline *Issue Identification and Community Consultation*.

1.6 Project approvals

1.6.1 Relevant legislation and policy requirements

This section should explain the legislation and policies controlling the approvals process. Reference should be made to the Queensland *Environmental Protection Act 1994*, *Integrated Planning Act 1997* and other relevant Queensland laws.

Local Government planning controls, local laws and policies applying to the development should be described, and a list provided of the approvals required for the project and the expected program for approval of applications.

1.6.2 Planning processes and standards

This section should discuss the project's consistency with existing land uses or long-term policy framework for the area (e.g. as reflected in local and regional plans such as the Central Queensland Strategy for Sustainability – 2004 and beyond, August 2005, Fitzroy Basin Association (FBA)), and with legislation, standards, codes or guidelines available to monitor and control operations on site. This section should refer to all relevant State and regional planning policies. This information is required to demonstrate how the proposal conforms to State, regional and local plans for the area.

1.7 Accredited process for controlled actions under Commonwealth legislation

The Commonwealth Department of the Environment, Water, Heritage and the Arts has determined that the project is not a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and therefore the requirements of that Act will not be applicable.

2 Project need and alternatives

2.1 Project justification

The justification for the project should be described, with particular reference made to the economic and social benefits, including employment and spin-off business development, which the project may provide. The status of the project should be discussed in a regional, State and national context.

2.2 Alternatives to the project

This section should describe feasible alternatives, including conceptual, technological and locality alternatives to the project, and discussion of the consequences of not proceeding with the project. Alternatives should be discussed in sufficient detail to enable an understanding of the reasons for preferring certain options and courses of action and rejecting others. Where relevant comparative environmental impacts of each alternative should be summarised.

The interdependencies of the proposal components should be explained, particularly in regard to how each of any industrial developments, or various combinations of industrial developments, and any infrastructure requirements relate to the viability of the proposal. Should water supply, power, transport and/or storage infrastructure be included as an element of the proposal, this section should include a description of and rationale for such infrastructure.

Reasons for selecting the preferred options should include technical, commercial, social and natural environment aspects where relevant. In particular, the principals of ESD and sustainable development should be included. The relationship of options chosen for waste management and any emissions produced should be detailed.

3 Description of the project

The objective of this section is to describe the project through its lifetime of construction and operation and decommissioning. This information is required to allow assessment of all aspects of a proposal including all phases of the proposal from planning, construction and operation through to decommissioning. It also allows further assessment of which approvals may be required and how they may be managed through the life of the proposal.

Maps or figures showing the position of features or boundaries should use the GDA94 datum. The GDA94 datum should also be used in the text to describe the locations of any features (such as discharge points) or boundaries that may be relevant to subsequent approvals.

3.1 Location

3.1.1 Regional context

The regional context of the proposal should be described and illustrated on maps at suitable scales. This section should indicate the sources of gas (coal seam and/or petroleum), pipelines and associated infrastructure in a regional context.

3.1.2 Local context

The project location should be described in detail in the local context. A map should be included at an appropriate scale that identifies the entire project footprint and adjoining properties including on site LNG facility, gas transmission pipeline and associated infrastructure, as well as access points to, from and within the project.

The location within the port where construction is to take place, area to be dredged, potential spoil disposal sites, and surrounding areas should be illustrated in maps at suitable scales.

Local descriptions of the project components should include real property descriptions. Maps should show the precise location of the project area, and in particular:

- the location and boundaries of the project footprint;
- the location and boundaries of land tenures (in place or proposed) to which the project area is or will be subject;
- any mining and petroleum exploration leases in the region;
- planning scheme zonings;
- features of state and national environmental significance;
- existing and proposed infrastructure; and
- The location of any proposed buffer areas or buffer zones surrounding the project working area.

Other proposed LNG projects should be identified in the local context with the potential for efficient use of infrastructure.

3.2 Construction

The extent and nature of the project's construction phase should be described. The description should include the type and methods of construction, the extent of the surface disturbance, the construction equipment to be used and the items of plant to be transported onto the construction site. Any staging of the proposal should be described and illustrated showing site boundaries, development sequencing and timeframes. The estimated numbers of people to be employed in the project construction phase should also be provided with a brief description of where those people may be accommodated and/or how they will be transported to the site.

Indirect implications for the gas pipeline network should also be discussed.

3.3 Operations

The location and nature of the processes to be used should be described in the text and illustrated with maps, diagrams and artist's impressions as required.

Operational issues to be addressed should include, but may not be limited to:

- a description of plant and equipment to be employed;
- hours of operation;
- transport requirements (road, rail and shipping);
- maintenance dredging and dredge material disposal including frequency, estimated volumes and locations of dredged material disposal area(s);
- the estimated number of people to be employed;
- security requirements;
- the capacity of plant and equipment; and
- chemicals to be used.

Concept and layout plans should be provided highlighting proposed buildings, structures, plant and equipment associated with the processing operation. The nature, sources, location and quantities of all materials to be handled, including the storage and stockpiling of raw materials, should be described.

Indicative process flow-sheets should be provided showing material balances for the processing plant, and the anticipated rates of inputs, along with similar data on products, wastes and recycle streams.

3.3.1 Resource base and project life

Summarise the results of studies and surveys undertaken to identify the natural resources required to implement the proposal. The location, area, volume, tonnage and quality of natural resources required should be described (e.g. land, gas, water, energy, etc.). Maps at suitable scales should be provided showing the locations of the supplying resource. This section should comment on the proposed life of the project.

3.3.2 Processing and products

This section should describe the quantities and characteristics of the products produced on an annual basis. Indicative process flow-sheets should be provided showing material balances for the processing plant, and the anticipated rates of inputs, along with similar data on products, wastes and recycle streams.

3.4 Product handling

Describe and show on plans at an appropriate scale the proposed methods and facilities to be used for product storage and for transferring product from the processing plant to the storage facilities and from the storage facilities to the transport facilities. Include discussion of any environmental design features of these facilities including bunding of storage facilities.

3.5 Infrastructure requirements

This section should provide descriptions, with concept and layout plans, of requirements for constructing, upgrading or relocating all infrastructure associated with the project. The locations of any necessary infrastructure easements should be shown on the plan. The matters to be considered should include, where relevant, such infrastructure as temporary and permanent roads, bridges, jetties, conveyors, power lines and other cables, wireless technology (e.g. microwave telecommunications), and pipelines for any services (whether underground or above).

This section should address the wharf details, including the gross mass of any pre-assembled modules (PAM) proposed to be imported, the point of access to land (wharf) and any contribution proposed to upgrade the wharf facilities.

Also, this section should identify opportunities to share infrastructure with other proposed LNG projects in the locality including gas feed pipelines, product storage tanks, cryogenic product and boil-off gas return pipeline and ship loader facilities. The potential benefits and disadvantages should be discussed.

3.5.1 Transport—road/ship

Describe arrangements for the transport of plant, equipment, products, wastes and personnel during both the construction phase and operational phases of the project. The description should address the use of existing facilities and all requirements for the construction, upgrading or relocation of any transport related infrastructure.

Information should be provided on road transportation requirements on public roads for both construction and operations phases, including:

- the volume, composition (types and quantities), origin and destination of goods to be moved including construction materials, plant, raw materials, wastes, hazardous materials, finished products;
- the volume of traffic generated by workforce personnel, visitors and service vehicles;
- method of movement (including vehicle types and number of vehicles likely to be used);
- anticipated times at which movements may occur;
- the Maritime Transport of LNG within the Pilotage Area of Gladstone including:
 - berthing/unberthing requirements including weather constraints,
 - security zones around the vessels both in berth and in transit through the port need to be identified together with the impact on other maritime operations,
 - priority of vessel movements,
 - interaction with other vessels,
 - scheduling of vessel movement,
 - channel configuration including swing basins,
 - towage requirements including the provision of escort tugs (if deemed necessary),
 - confirmation of the vessel size to be used,
 - arrival and departure conditions of the vessel, and
 - number of ships using Gladstone Port Authority's facilities, anchorage arrangements, access to and from the port, navigational arrangements, and additional servicing of vessels;
- details of vehicle traffic and transport of heavy and oversize indivisible loads (including types and composition);
- the proposed transport routes; and
- need for increased road maintenance and upgrading.

3.5.2 Energy

The EIS should describe all energy requirements, including electricity, natural gas, and/or solid and liquid fuel requirements for the construction and operation of the proposal. Energy conservation should be briefly described in the context of any Commonwealth, State and Local Government policies. Timeframes should also be provided for the anticipated dates of commencement of construction of supply facilities, testing and commissioning. This section of the EIS should include details on energy demand and annual consumption.

3.5.3 Water supply and storage

The EIS should provide information on water usage by the project, including the quality and quantity of all water supplied to the site. In particular, the proposed water uses and the proposed and optional sources of water supply should be described (e.g. bores, rainwater harvesting, any surface storages such as dams and weirs, municipal water supply pipelines).

Details on daily, seasonal and/or peak operational requirements should include:

- quality of water required, including strategies to prevent contamination;
- quantity of water required including:
 - maximum hourly and daily demand,
 - mean daily demand, and
 - total annual consumption;
- any additional water supply infrastructure; and
- requirements for fire-fighting or other emergency services.

Determination of potable water demand should be made for the project, including the temporary demands during the construction period. Details should be provided of any existing town water supply to meet such requirements. If water storage and treatment is proposed on site, for use by the site workforce, then this should be described.

The proposed sources and volumes of water required for pressure testing of the LNG tanks, any pre-treatment required and any pre-release treatment proposed for such test water.

3.5.4 Stormwater drainage

A description should be provided of the proposed stormwater drainage system and the proposed disposal arrangements, including any off-site services.

If stormwater drainage systems will discharge or allow discharge across state coastal land within the Curtis Coast Coastal Management District, or propose to discharge to tidal waters, a development permit to undertake operational work within the coastal management district and/or tidal work will be required.

3.5.5 Sewerage

This section should describe, in general terms, the sewerage infrastructure required by the project. If it is intended that industrial effluent or relatively large amounts of domestic effluent are to be discharged into an existing sewerage system, an assessment of the capacity of the existing system to accept the effluent should be provided in section 4.3 'Waste'. For industrial effluent, this should include detail of the physical and chemical characteristics of the effluent(s).

3.5.6 Telecommunications

The EIS should describe any existing telecommunications infrastructure (such as optical cables, microwave towers, etc.) that may be impacted by the proposal, and identify the owners of that infrastructure.

3.5.7 Accommodation and other infrastructure

A description should be provided of any other developments directly related to the project not described in other sections, such as:

- temporary camps;
- townships or residential developments;
- fuel storage areas;
- equipment hardstand and maintenance areas; and
- technical workshops and laboratories.

3.6 Waste management

3.6.1 Character and quantities of waste materials

Provide a description of all wastes to be generated by the proposal during the construction, operational and decommissioning phases of the project. In addition to the expected total volumes of each waste produced, include an estimate of the following per unit volume of product produced:

- the volume of coal seam gas to be processed;
- the amount of resulting process wastes; and
- the volume of any re-usable by-products.

Schematic diagrams, which for the operational phase may be simplified versions of those provided in section 3.3, should be provided for each distinct stage of the project (e.g. construction/site preparation, commissioning, operation and decommissioning) indicating the processes to be used and highlighting their associated waste streams (i.e. all waste outputs: solid, liquid and gaseous), including recycling efforts, such as stockpiling and reusing top soils and those outputs associated with shipping operations including exhaust and fugitive emissions. The schematic diagrams, or an associated table, should cross-reference the relevant sections of the EIS where the potential impacts and mitigation measures associated with each waste stream are described. The physical and chemical characteristics of waste material from the process plant should be provided.

Having regard for best practice waste management strategies and the Environmental Protection (Waste) Policy, the proposals for waste avoidance, reuse, recycling, treatment and disposal should be described in the appropriate sub-section below. Information should also be provided on the variability, composition and generation rates of all waste produced at the site and processing plant.

Cleaner production waste management planning should be detailed especially as to how these concepts have been applied to preventing or minimising environmental impacts at each stage of the proposal. Details on natural resource use efficiency (e.g. energy and water), integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis should be presented.

3.6.1.1 Air emissions

Describe in detail the quantity and quality of all air emissions (including particulates, fumes and odours) from the project during construction and operation. Particulate emissions include those that would be produced by any industrial process, or by transportation equipment (e.g. trucks, either by entrainment from the load or by passage on unsealed roads).

The methods to be employed in the mitigation of impacts from air emissions should be described in section 4.6.

This section of the EIS should provide an overview of projected annual emissions for each relevant greenhouse gas (GHG), with total emissions expressed in 'CO₂ equivalent' terms. A detailed inventory of GHG emissions should be provided in section 4.6. The Australian Greenhouse Office Factors and Methods Workbook (available via the internet) can be used as a reference source for emission estimates and supplemented by other sources where practicable and appropriate.

3.6.1.2 Solid waste disposal

Describe the quantity and quality of solid wastes, and the proposed methods of their treatment and disposal. The proposed location, site suitability, dimensions, source and volume of any landfill proposed to be constructed as part of this project, including its method of construction, should be shown.

3.6.1.3 Liquid waste

A description should be presented of the origin, quality and quantity of wastewater and any immiscible liquid waste originating from the project. Particular attention should be given to the capacity of wastes to generate acid, and saline or sodic wastewater. A water balance for the proposal and processing plant is required to account for the estimated usage of water.

The EIS will need to consider the following effects:

- groundwater from excavations;
- rainfall directly onto disturbed surface areas;
- run-off from roads, plant and industrial areas, chemical storage areas;
- drainage (i.e. run-off plus any seepage or leakage);
- seepage from onsite waste storages;
- water usage for:
 - process use,
 - dust suppression, and
 - domestic purposes;
- evaporation;
- domestic sewage treatment - disposal of liquid effluent and sludge; and
- water supply treatment plant - disposal of wastes.

3.7 Rehabilitation and decommissioning

This section should describe the options, strategies and methods for the rehabilitation of the environment disturbed by the proposal.

The means of decommissioning the proposal, in terms of the removal of plant, equipment, structures and buildings should be described, and the methods proposed for the stabilisation of the affected areas should be given. Information should be provided regarding decommissioning and rehabilitation of the plant site, removal of processing plant, rehabilitation of concrete footings and foundations, hardstand areas, storage tanks and wharfage

(including any potential for reuse of these facilities). Options and methods for the disposal of wastes from the demolition of plant and buildings should be discussed.

Where detention ponds are to be constructed, proposals should be given for the management of these structures after the completion of their use. Also, the final drainage and seepage control systems and long-term monitoring plans should be described.

A description of topsoil management should consider transport, storage and replacement of topsoil to disturbed areas. The minimisation of topsoil storage times (to reduce fertility degradation) should also be addressed.

Detail of the impacts of the preferred rehabilitation strategy should be discussed in the appropriate subsections of Section 4 (Environmental values and management of impacts). Implications for the long-term use and fate of the site should also be addressed, particularly with regard to the site's possible inclusion on the Environmental Management Register or Contaminated Land Register.

4 Environmental values and management of impacts

The functions of this section are:

- To describe the existing environmental values of the area which may be affected by the proposal. Environmental values are defined in section 9 of the Environmental Protection Act 1994, environmental protection policies and other documents such as the ANZECC 2000 guidelines and South East Queensland Regional Water Quality Management Strategy. Environmental values may also be derived following recognised procedures, such as described in the ANZECC 2000 guidelines. Environmental values should be described by reference to background information and studies, which should be included as appendices to the EIS.
- To describe the potential adverse and beneficial impacts of the proposal on the identified environmental values. Any likely environmental harm on the environmental values should be described.
- To describe any cumulative impacts on environmental values caused by the proposal, either in isolation or by combination with other known existing or planned sources of contamination.
- To present environmental protection objectives and the standards and measurable indicators to be achieved.
- To examine viable alternative strategies for managing impacts. These alternatives should be presented and compared in view of the stated objectives and standards to be achieved. Available techniques, including best practice, to control and manage impacts to the nominated objectives should be discussed. This section should detail the environmental protection measures incorporated in the planning, construction, operations, decommissioning, rehabilitation and associated works for the proposal. Measures should prevent, or where prevention is not possible, minimise environmental harm and maximise socio-economic and environmental benefits of the proposal. Preferred measures should be identified and described in more detail than other alternatives.
- Describe any computational model used to make predictions of impacts and/or outcomes of mitigation measures. The description should address the inputs, assumptions, limitations, sensitivities, accuracy, and precision of the model.

Environmental protection objectives may be derived from legislative and planning requirements which apply to the proposal including Commonwealth strategies, State planning policies, local authority strategic plans, environmental protection policies under the *Environmental Protection Act 1994*, fish habitat management policies under the *Fisheries Act 1994*, and any catchment management plans prepared by local water boards or land care groups. Special attention should be given to those mitigation strategies designed to protect the values of any sensitive areas and any identified ecosystems of high conservation value within the area of possible proposal impact.

This section should address all elements of the environment, (such as land, water, coast, air, waste, noise, nature conservation, cultural heritage, social and community, health and safety, economy, hazards and risk) in a way that is comprehensive and clear. To achieve this, the following issues should be considered for each environmental value relevant to the project:

- Environmental values affected: describe the existing environmental values of the area to be affected including values and areas that may be affected by any cumulative impacts (refer to any background studies in appendices - note such studies may be required over several seasons). It should be explained how the environmental values were derived (e.g. by citing published documents or by following a recognised procedure to derive the values).
- Impact on environmental values: describe quantitatively the likely impact of the proposal on the identified environmental values of the area. The cumulative impacts of the proposal must be considered over time or in combination with other (all) impacts in the dimensions of scale, intensity, duration or frequency of the impacts. In particular, any requirements and recommendations of the Great Barrier Reef Marine Park Authority, relevant State planning policies, environmental protection policies, and national environmental protection measures, if applicable, should be addressed.
- Cumulative impacts on the environmental values of land, air and water and cumulative impacts on public health and the health of terrestrial, aquatic and marine ecosystems must be discussed in the relevant sections. This assessment may include air and water sheds affected by the proposal and other proposals competing for use of the local air and water sheds.

- Where impacts from the proposal will not be felt in isolation to other sources of impact, it is recommended that the proponent develop consultative arrangements with other industries in the proposal's area to undertake cooperative monitoring and/or management of environmental parameters. Such arrangements should be described in the EIS.
- Environmental protection objectives: describe qualitatively and quantitatively the proposed objectives for enhancing or protecting each environmental value. Include proposed indicators to be monitored to demonstrate the extent of achievement of the objective as well as the numerical standard that defines the achievement of the objective (this standard must be auditable). The measurable indicators and standards can be determined from legislation, support policies and government policies as well as the expected performance of control strategies. Objectives for the management and future use of any contaminated land should be included.
- Control strategies to achieve the objectives: describe the control principals, proposed actions and technologies to be implemented that are likely to achieve the environmental protection objectives; include designs, relevant performance specifications of plant. Details are required to show that the expected performance is achievable and realistic.
- Monitoring programs: describe the monitoring parameters, monitoring points, frequency, data interpretation and reporting proposals.
- Auditing programs: describe how progress towards achievement of the objectives will be measured, reported and whether external auditors will be employed. Include scope, methods and frequency of auditing proposed.
- Management strategies: describe the strategies to be used to ensure the environmental protection objectives are achieved and control strategies implemented e.g. continuous improvement framework including details of corrective action options, reporting (including any public reporting), monitoring, staff training, management responsibility pathway, and any environmental management systems and how they are relevant to each element of the environment.
- Information quality: information given under each element should also state the sources of the information, how recent the information is, how any background studies were undertaken (e.g. intensity of field work sampling), how the reliability of the information was tested, and what uncertainties (if any) are in the information.

It is recommended that the final TOR and the EIS follow the heading structure shown below. The mitigation measures, monitoring programs, etc., identified in this section of the EIS should be used to develop the environmental monitoring program for the project (see section 5).

4.1 Climate

This section should describe the rainfall patterns (including magnitude and seasonal variability of rainfall), air temperatures, humidity, wind (direction and speed) and any other special factors (e.g. temperature inversions) that may affect management of the proposal including air quality within the region of the proposal. Extremes of climate (droughts, floods, cyclones including storm surges, etc) should also be discussed with particular reference to water management at the proposal site. The vulnerability of the area to natural or induced hazards should also be addressed. The relative frequency and magnitude of these events should be considered together with the risk they pose to management of the project.

The potential impacts due to climatic factors should be addressed in the relevant sections of the EIS. The impacts of rainfall on soil erosion should be addressed in Section 4.2. The impacts of storm events on the capacity of waste containment systems (e.g. site bunding/stormwater management dams) should be addressed in Section 4.4 with regard to contamination of waterways and in Section 4.3 with regard to the design of the waste containment systems. The impacts of winds, rain, humidity and temperature inversions on air quality should be addressed in Section 4.6.

4.2 Land

4.2.1 Description of environmental values

This section describes the existing environment values of the land area that may be affected by the proposal. It should also define and describe the objectives and practical measures for protecting or enhancing land-based environmental values, describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

4.2.1.1 Topography/geomorphology

Maps should be provided locating the project in both regional and local contexts. The topography of the proposal site should be detailed with contours at suitable increments, shown with respect to Australian Height Datum (AHD). Significant features of the locality should be included on the maps including the Highest Astronomical Tide (HAT). Such features would include any locations subsequently referred to in the EIS (e.g. the nearest noise sensitive locations) that are not included on other maps in Section 4.2. Commentary on the maps should be provided highlighting the significant topographical features. Any environmentally sensitive areas, or areas of a high conservation value, should be included on the maps and discussed.

4.2.1.2 Geology

The EIS should provide a description of the geology of the proposal area, with particular reference to the physical and chemical properties of surface and sub-surface materials and geological structures within the proposed areas of disturbance. Geological properties that may influence ground stability (including seismic activity, if relevant), geological structures within the proposed areas of disturbance/subsistence, or the quality of wastewater leaving any area disturbed by the proposal should be described.

4.2.1.3 Soils

A soil survey of the site affected by the proposal should be conducted at a suitable scale, with particular reference to the physical and chemical properties of the materials that will influence erosion potential, storm water run-off quality, and stabilisation of the land. Information should also be provided on soil stability and suitability for construction of proposal facilities.

An acid sulphate soil investigation, carried out according to QASSIT guidelines, will be undertaken. State Planning Policy 2/02 Planning and Managing development Involving Acid Sulphate Soils and the associated guidelines will be addressed (e.g. identification and management and format of environmental management plans).

Where appropriate, soil profiles should be mapped at a suitable scale and described according to the *Australian soil and land survey field handbook* (McDonald et al, 1990) and *Australian soil classification* (Isbell, 2002). An appraisal of the depth and quality of useable soil should be undertaken. Information should be presented according to the standards required in the *Planning guidelines: the identification of Good Quality Agricultural Land* (DPI, DHLGP, 1993), and the *State Planning Policy 1/92: Development and the conservation of agricultural land*.

4.2.1.4 Land use

The EIS should provide a description of current land tenures and land uses, including native title issues, in the proposal area, with particular mention of land with special purposes. The location and owner/custodians of native title in the area and details of native title claims should be shown.

Maps at suitable scales showing existing land uses and tenures, and the proposal location, should be provided for the entire proposal area and surrounding land that could be affected by the development. The maps should identify areas of conservation value and marine areas in any locality that may be impacted by the proposal. The location of existing dwellings and the zoning of all affected lands according to any existing town or strategic plan, or port land use plan should be included.

4.2.1.5 Infrastructure

The location and owner/custodians of all tenures, reserves, roads and road reserves, railways and rail reserves, and the like, covering the affected land should be shown on maps of a suitable scale. Indicate locations of gas and water pipelines, power lines and any other easements. Describe the environmental values affected by this infrastructure.

4.2.1.6 Sensitive environmental areas

The proximity of the proposal to any environmentally sensitive areas should be shown on a map of suitable scale. Attachment 2 provides a listing of some sensitive areas that may be encountered. This section of the EIS should

then identify whether any of those environmentally sensitive areas could be affected, directly and indirectly, by the proposal.

In particular, the EIS should indicate if the land affected by the proposal is, or is likely, to become part of the protected area estate, or is subject to any treaty. Consideration should be given to national parks, conservation parks, declared fish habitat areas, aquatic reserves, heritage/historic areas or items, national estates, world heritage listings and sites covered by international treaties or agreements (e.g. Ramsar, JAMBA, CAMBA), areas of cultural significance and scientific reserves (see section 4.8 for further guidance on sensitive areas).

4.2.1.7 Landscape character

This section should describe in general terms the existing character of the landscape that will be affected by the proposal. It should comment on any changes that have already been made to the natural landscape since European settlement. It should 'set the scene' for the description of particular scenic values in the following section on visual amenity. The difference being that this section describes the general impression of the landscape that would be obtained while travelling through and around it, while the visual amenity section addresses particular panoramas and views (e.g. from constructed lookouts, designated scenic routes, etc.) that have amenity value.

4.2.1.8 Visual amenity

This section should describe existing landscape features, panoramas and views that have, or could be expected to have, value to the community whether of local, regional, State-wide, national or international significance. Information in the form of maps, sections, elevations and photographs is to be used, particularly where addressing the following issues:

- identification of elements within the proposal and surrounding area that contribute to their image of the town/city as discussed in the any local government strategic plan - city image and townscape objectives and associated maps;
- major views, view sheds, existing viewing outlooks, ridgelines and other features contributing to the amenity of the area, including assessment from private residences in the affected area along the route;
- focal points, landmarks (built form or topography), gateways associated with project site and immediate surrounding areas, waterways, and other features contributing to the visual quality of the area and the project site;
- character of the local and surrounding areas including character of built form (scale, form, materials and colours) and vegetation (natural and cultural vegetation) directional signage and land use;
- identification of the areas of the proposal that have the capacity to absorb land use changes without detriment to the existing visual quality and landscape character; and
- the value of existing vegetation as a visual screen.

4.2.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing the land-based environmental values identified through the studies outlined in the previous section. It should describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

4.2.2.1 Land use suitability

The potential for the construction and operation of the proposal to change existing and potential land uses of the proposal site and adjacent areas should be detailed. Post operations land use options should be detailed including suitability of the area to be used for industry. The factors favouring or limiting the establishment of those options should be given in the context of land use suitability prior to the proposal and minimising potential liabilities for long-term management.

If the development adjoins or potentially impacts on good quality agricultural land, then as assessment of the potential for land use conflict is required including methods proposed for the resolution of the conflict.

Outline incompatible land uses, whether existing or potential, adjacent to all aspects of the project, including essential and proposed ancillary developments or activities and areas directly or indirectly affected by the construction and operation of these activities should be identified and measures to avoid unacceptable impacts defined.

4.2.2.2 Land disturbance

Information should be provided regarding decommissioning of any plant site, removal of processing plant, rehabilitation of concrete footings and foundations, hard stand areas, storage tanks and wharfage (including any potential for reuse of these facilities).

4.2.2.3 Land contamination

The EIS should describe the possible contamination of land from aspects of the proposals including waste and spills at chemical and fuel storage areas.

The means of preventing land contamination (within the meaning of the *Queensland Environmental Protection Act 1994*) should be addressed. Methods proposed for preventing, recording, containing and remediating any contaminated land should be outlined. Intentions should be stated concerning the classification (in terms of the Queensland Contaminated Land Register) of land contamination on the land, processing plant site and product storage areas after proposal completion.

A preliminary site investigation (PSI) of the site consistent with the EPA's *Draft guidelines for the assessment and management of contaminated land in Queensland* should be undertaken to determine background contamination levels. The results of the PSI should be summarised in the EIS and provided in detail in an appendix.

If the results of the preliminary site investigation indicate potential or actual contamination, a detailed site investigation progressively managed in accordance with the stages outlined in Appendix 5 of the *Draft guidelines for the assessment and management of contaminated land in Queensland* should be undertaken.

In short, the following information may be required in the EIS:

- mapping of any areas listed on the Environmental Management Register or Contaminated Land Register under the Environmental Protection Act 1994;
- identification of any potentially contaminated sites not on the registers which may need remediation; and
- a description of the nature and extent of contamination at each site and a remediation plan and validation sampling.

The EIS should address management of any existing or potentially contaminated land in addition to preventing and managing land contamination resulting from project activities.

4.2.2.4 Erosion and stability

For all permanent and temporary landforms, possible erosion rates and management techniques should be described. For each soil type identified, erosion potential (wind and water) and erosion management techniques should be outlined. An erosion-monitoring program, including rehabilitation measures for erosion problems identified during monitoring, should also be outlined. Mitigation strategies should be developed to achieve acceptable soil loss rates, levels of sediment in rainfall runoff and wind-generated dust concentrations.

The report should include an assessment of likely erosion effects for all disturbed areas such as:

- the plant site, including buildings; and
- access roads or other transport corridors.

Methods proposed to prevent or control erosion should be specified and should be developed with regard to preventing significant degradation of local waterways by suspended solids.

Management of acid sulfate soils should be based on assessment in accordance with the *Guidelines for Sampling and Analysis of Lowland Acid Sulfate Soils (ASS) in Queensland 1998 (Revision 4.0)* and management and monitoring plans prepared in consultation with officers of the Department of Natural Resources and Mining.

4.2.2.5 Landscape character

Describe the potential impacts of the project landscape character of the site and the surrounding area. Particular mention should be made of any changes to the broad-scale topography and vegetation character of the area. Details should be provided of measures to be undertaken to mitigate or avoid the identified impacts.

4.2.2.6 Visual amenity

This section should analyse and discuss the visual impact of the proposal on particular panoramas and outlooks. It should be written in terms of the extent and significance of the changed skyline as viewed from

places of residence, work, and recreation, from road, cycle and walkways, from the air and other known vantage points day and night, during all stages of the project as it relates to the surrounding landscape. The assessment is to address the visual impacts of the project structures and associated infrastructure, using appropriate simulation. Sketches, diagrams, computer imaging and photos are to be used where possible to portray the near views and far views of the completed structures and their surroundings from visually sensitive locations. Special consideration is to be given to public roads, public thoroughfares, and places of residence or work, which are within the line-of-sight of the project.

Detail should be provided of all management options to be implemented and how these will mitigate or avoid the identified impacts.

4.2.2.7 Lighting

Management of the lighting of the project, during all stages, is to be provided, with particular reference to objectives to be achieved and management methods to be implemented to mitigate or avoid:

- the visual impact at night;
- cumulative visual and lighting impacts
- night operations/maintenance and effects of lighting on fauna and residents;
- the potential impact of increased vehicular traffic; and
- changed habitat conditions for nocturnal fauna and associated impacts.

4.2.2.8 Transport

The EIS should provide sufficient information to make an independent assessment of how the State-controlled and local government road networks will be affected.

Details should be provided of the impacts on environmental values of any new roads or road realignments. The EIS should include detailed analysis of probable impact of identified construction and operational traffic generated by the project with particular concern to impacts on road infrastructure, road users and road safety.

The EIS needs to identify impacts on the State-controlled and local government road networks and to indicate clearly the corrective measures necessary to address adverse road impacts and the costs involved. This will require the proponent to compare the traffic situation and road conditions with, and without, the project.

Information about the impacts and proposed measures for dealing with those impacts should be prepared by the proponent in close consultation with the local District Office of the Department of Main Roads.

The EIS should also address the potential impacts on privately owned or port authority operated ports and State-controlled, Commonwealth-controlled or privately owned airports.

This section should address how transport elements and impacts of the Project, taking into account future demand growth (including the potential impact of other major infrastructure and industrial projects in the nearby area), relate to Queensland Transport's and the Department of Main Roads' existing transport strategies for the Central Queensland area and the future infrastructure needs of this area as presented in State Government documents, including: Statements of Intent for Road Link Development; Gladstone Integrated Regional Transport Plan 2001 – 2030; and Capricornia Integrated Regional Transport Plan 2004 – 2030.

4.3 Waste

This section should complement other sections of part 4 of the EIS by providing technical details of waste treatment and minimisation, with proposed emission, discharge and disposal criteria, while other sections describe how those emissions, discharges and disposals would impact on the relevant environmental values. The purpose of this format is to concentrate the technical information on waste management into one section in order to facilitate its transfer into the EM plan.

4.3.1 Description of environmental values

This section should introduce and briefly describe the existing environment values that may be affected by the project's wastes. Refer to each of the waste streams described in section 3.6 and provide references to more detailed descriptions of the relevant environmental values in other sections of part 4 of the EIS.

4.3.2 Potential impacts and mitigation measures

The purpose of this section is to bring together a description of the preferred methods (and discuss any alternatives) to be used to deal with waste streams and outline their impacts. The full description of the magnitude and nature of impacts on particular environmental values due to the management of waste should be provided in the relevant sections of part 4 of the EIS.

This section defines and describes the objectives and practical measures for protecting or enhancing environmental values from impacts by wastes, describes how nominated quantitative standards and indicators may be achieved for waste management, and how the achievement of the objectives will be monitored, audited and managed.

As part of the description, this section should provide details of each waste in terms of:

- operational handling and fate of all wastes including storage;
- on-site treatment methods proposed for the wastes;
- methods of disposal (including the need to transport wastes off-site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes;
- the potential level of impact on environmental values;
- proposed discharge/disposal criteria for liquid and solid wastes;
- market demand for recyclable waste (where appropriate) should be addressed;
- waste minimisation techniques processes proposed; and
- decommissioning of the site.

Having regard for the Environmental Protection (Waste) Policy, the EIS should indicate the results of investigation into the feasibility of using waste minimisation and cleaner technology options during all phases of the proposal. The EPA has also released draft guidelines covering aspects of waste management under this EPP, which should be addressed.

Waste minimisation and treatment, and the application of cleaner production techniques, should also be applied to gaseous wastes, particularly nitrogen oxides, sulfur oxides, particulates and carbon dioxide. Particular attention should be paid to measures, which will maximise energy efficiency and minimise internal energy consumption in the proposal.

Cleaner production waste management planning should be detailed especially as to how these concepts have been applied to preventing or minimising environmental impacts at each stage of the proposal. Details on natural resource use efficiency (e.g. energy and water), integrated processing design, co-generation of power and by-product reuse as shown in a material/energy flow analysis are required.

4.4 Water resources

4.4.1 Description of environmental values

This section describes the existing environment for water resources that may be affected by the proposal in the context of environmental values as defined in such documents as the *Environmental Protection Act 1994*, *Environmental Protection (Water) Policy 1997* EPP(Water), ANZECC 2000 and the South East Queensland Water Quality Management Strategy. The definition of waters in the EPP(Water) includes the bed and banks of waters, so this section should address impacts on benthic sediments as well as the water column.

Where a licence or permit will be required under the *Water Act 2000* to take or interfere with the flow of water, this section of the EIS should provide sufficient information for a decision to be made on the application. Similarly, waterway barrier works may need approval under the *Fisheries Act 1994*, and if so should be addressed in the EIS.

4.4.1.1 Surface waterways

A description should be given of the surface watercourses and their quality and quantity in the area affected by the proposal with an outline of the significance of these waters to the river catchment system in which they occur (NB impacts on coastal water quality should be discussed in Section 4.5 (Coastal environment)). Details provided should include a description of existing surface drainage patterns, and flows in major streams and wetlands. Also provide details of the likelihood of flooding, history of flooding including extent, levels and frequency, and a

description of present and potential water uses downstream of the areas affected by the proposal. Flood studies should include a range of annual exceedance probabilities for affected waterways, where data permits.

The EIS should provide a description, with photographic evidence, of the geomorphic condition of any watercourses likely to be affected by disturbance or stream diversion. The results of this description should form the basis for the planning and subsequent monitoring of rehabilitation of the watercourses during or after the operation of the proposal.

An assessment is required of existing water quality in surface waters and wetlands likely to be affected by the proposal. The basis for this assessment should be a monitoring program, with sampling stations located upstream and downstream of the proposal. Complementary stream-flow data should also be obtained from historical records (if available) to aid in interpretation.

The water quality should be described, including seasonal variations or variations with flow where applicable. A relevant range of physical, chemical and biological parameters should be measured to gauge the environmental harm on any affected creek or wetland system.

Describe the environmental values of the surface waterways of the affected area in terms of:

- values identified in the *Environmental Protection (Water) Policy 1997*;
- sustainability, including both quality and quantity;
- physical integrity, fluvial processes and morphology of watercourses, including riparian zone vegetation and form; and
- any water resource plans, land and water management plans relevant to the affected catchment.

4.4.1.2 Groundwater

To the extent commensurate with the likely impacts of the proposal, the EIS should review the quality, quantity and significance of groundwater in the proposal area, together with groundwater use in neighbouring areas.

The review should include a survey of existing groundwater supply facilities (bores, wells, or excavations) to the extent of any environmental harm. The information to be gathered for analysis is to include:

- location;
- pumping parameters;
- draw down and recharge at normal pumping rates; and
- seasonal variations (if records exist) of groundwater levels.

If appropriate, a network of observation points which would satisfactorily monitor groundwater resources both before and after commencement of operations should be developed.

This section should include reference to:

Nature of the aquifer/s

- geology/stratigraphy - such as alluvium, volcanic, metamorphic;
- aquifer type - such as confined, unconfined; and
- depth to and thickness of the aquifers.

Hydrology of the aquifer/s

- depth to water level and seasonal changes in levels;
- groundwater flow directions (defined from water level contours);
- interaction with surface water;
- interaction with sea/salt water;
- possible sources of recharge; and
- vulnerability to pollution.

Any data obtained from a groundwater survey should be sufficient to enable specification of the major ionic species present in the groundwater, pH, electrical conductivity and total dissolved solids.

Describe the environmental values of the underground waters of the affected area in terms of:

- values identified in the Environmental Protection (Water) Policy;
- sustainability, including both quality and quantity; and
- physical integrity, fluvial processes and morphology of groundwater resources.

4.4.2 Potential impacts and mitigation measures

This section is to assess potential impacts on water resource environmental values identified in the previous section. It will also define and describe the objectives and practical measures for protecting or enhancing water resource environmental values, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should describe the possible environmental harm caused by the proposed proposal to environmental values for water as expressed in the *Environmental Protection (Water) Policy 1997*.

Water management controls should be described, addressing surface and groundwater quality, quantity, drainage patterns and sediment movements. The beneficial (environmental, production and recreational) use of nearby marine, surface and groundwater should be discussed, along with the proposal for the diversion of affected creeks during mining, and the stabilisation of those works. Monitoring programs should be described which will assess the effectiveness of management strategies for protecting water quality during the construction, operation and decommissioning of the proposal.

Key water management strategy objectives include:

- protection of the integrity of the marine environment, and ultimately the Great Barrier Reef Marine Park and World Heritage property;
- protection of important local aquifers and protection of their waters;
- maintenance of sufficient quantity and quality of surface waters to protect existing beneficial downstream uses of those waters (including maintenance of in-stream biota and the littoral zone); and
- minimisation of impacts on flooding levels and frequencies both upstream and downstream of the project.

Conduct a risk assessment for uncontrolled emissions to water due to system or catastrophic failure, implications of such emissions for human health and natural ecosystems, and list strategies to prevent, minimise and contain impacts.

4.4.2.1 Surface water and water courses

The potential environmental harm to the flow and the quality of surface waters from all phases of the proposal should be discussed, with particular reference to their suitability for the current and potential downstream uses, including the requirements of any affected riparian area, wetland, estuary, littoral zone, and any marine and in-stream biological uses. The impacts of surface water flow on existing infrastructure should be considered. Refer to the *Environmental Protection (Water) Policy 1997* and *Water Act 2000*.

The hydrological impacts of the proposal should be assessed, particularly with regard to stream diversions, scouring and erosion, and changes to flooding levels and frequencies both upstream and downstream of the project. When flooding levels will be affected, modelling of afflux should be provided and illustrated with maps. Assessment of impacts on the flow and the quality of surface waters and effects on ecosystems should include an assessment of the likely effects on mangrove and other estuarine habitats as a result of any temporary diversion of existing water courses.

Consideration should be given to monitoring of seawater quality at points of outflow.

Quality characteristics discussed should be those appropriate to the downstream and upstream water uses that may be affected. Chemical and physical properties of any waste water (including concentrations of constituents) at the point of entering natural surface waters should be discussed along with toxicity of effluent constituents to flora and fauna.

Reference should be made to the properties of the land disturbed and processing plant wastes, the technology for settling suspended clays from contaminated water, and the techniques to be employed to ensure that contaminated water is contained and successfully treated on the site.

In relation to water supply and usage, and wastewater disposal, the EIS should discuss anticipated flows of water to and from the proposal area. Where dams, weirs or ponds are proposed, the EIS should investigate the effects of predictable climatic extremes (storm events, floods and droughts) on: the capacity of the dams to

retain contaminants; the structural integrity of the containing walls; and the quality of water contained, and flows and quality of water discharged. The design of all water storage facilities should follow the technical guidelines on site water management.

The need or otherwise for licensing of any dams (including referable dams) or creek diversions, under the *Water Act 2000* should be discussed and permanent or temporary waterway barriers under the *Fisheries Act 1994* should be discussed. Water allocation and water sources should be established in consultation with Department of Natural Resources and Mining.

Having regard for the requirements of the *Environmental Protection (Water) Policy 1997*, the EIS should present the methods to avoid stormwater contamination by raw materials, wastes or products and present the means of containing, recycling, reusing, treating and disposing of stormwater. Where no-release water systems are to be used, the fate of salts and particulates derived from intake water should be discussed.

The Australian and New Zealand Environment and Conservation Council (ANZECC, 2000) *National Water Quality Management Strategy*, *Australian Water Quality Guidelines for Fresh and Marine Waters* and the *Environmental Protection (Water) Policy 1997* should be used as a reference for evaluating the effects of various levels of contamination.

Options for mitigation and the effectiveness of mitigation measures should be discussed with particular reference to sediment, acidity, salinity and other emissions of a hazardous or toxic nature to human health, flora or fauna.

Where it is proposed that creeks will be diverted, the EIS should detail how rehabilitation will affect both the physical and ecological condition of the creek's bed and banks and the quality of water in it. Furthermore, the EIS should describe the monitoring that will be undertaken after decommissioning, and who will have responsibility for management measures and corrective action, to ensure that rehabilitated creeks do not degrade.

4.4.2.2 Groundwater

The EIS should include an assessment of the potential environmental harm caused by the proposal to local groundwater resources.

The impact assessment should define the extent of the area within which groundwater resources are likely to be affected by the proposed operations and the significance of the proposal to groundwater depletion or recharge, and propose management options available to monitor and mitigate these effects. The response of the groundwater resource to the progression and finally cessation of the proposal should be described.

An assessment should be undertaken of the impact of the proposal on the local ground water regime caused by the altered porosity and permeability of any land disturbance.

An assessment of the potential to contaminate groundwater resources and measures to prevent, mitigate and remediate such contamination should be discussed.

4.5 Coastal environment

4.5.1 Description of environmental values

This section describes the existing coastal environment, which may be affected by the proposal in the context of coastal values identified in State of the Coastal Zone Reports and environmental values as defined by the *Environmental Protection Act 1994* and environmental protection policies. The *Environmental Protection (Water) Policy 1997* has a set of default environmental values for waterways that include aquatic ecosystem protection.

This section should also identify actions associated with the project that are assessable development within the coastal zone and will require assessment under the provisions of the *Coastal Protection and Management Act 1995*.

4.5.1.1 Water quality

Provide baseline information on water quality in the sea and in estuaries below the limit of tidal influence, including heavy metals, acidity, turbidity and oil in water. Discuss the interaction of freshwater flows with marine waters its significance in relation to marine flora and fauna adjacent to the proposal area.

Describe the environmental values of the coastal seas of the affected area in terms of:

- values identified in the *Environmental Protection (Water) Policy*; and
- the *State Coastal Management Plan* and any regional coastal plan.

4.5.1.2 Coastal processes

Provide an assessment of physical and chemical characteristics of sediments within the littoral and marine zone adjacent to the proposal area.

Describe the physical processes of the adjacent marine environment, including currents, tides, storm surges, freshwater flows and their interaction in relation to the assimilation and transport of pollutants entering marine waters from, or adjacent to, the proposal area.

Describe the environmental values of the coastal resources of the affected area in terms of the physical integrity and morphology of landforms created or modified by coastal processes.

4.5.2 Potential impacts and mitigation measures

This section defines and describes the water quality objectives and practical measures for protecting or enhancing coastal environmental values, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the water quality objectives will be monitored, audited and managed.

Describe the water quality objectives used (including how they were developed), and how predicted activities will meet these objectives (refer to the EPA's *Queensland water quality guidelines* and the *Australian and New Zealand guidelines for fresh and marine water quality*, ANZECC, 2000).

The potential environmental harm caused by the proposal on coastal resources and processes should be described in the context of controlling such effects. The State Planning Policy – Planning and Managing Development involving Acid Sulfate Soils 2002 should be addressed as should the State Coastal Management Plan 2001 and QDPI Guidelines for Marine Areas.

The section should provide plans detailing the type, location and extent of the operational or tidal works proposed (e.g. any structures, formations, culverts, abutments or services, and any works proposed to be attached to these structures). The plans submitted should include as a minimum, the following:

- the location of the Coastal Management District in relation to the proposed works;
- a plan view of the proposed works, showing the location of Lowest Astronomical Tide (LAT), Highest Astronomical Tide (HAT) and Mean High Water Springs (MHWS), and including existing works which would abut the proposed works, but are not included in the works;
- location of proposed works in relation to current and proposed tenure and lot on plan descriptions;
- indicate the constructional details of the proposed works and any temporary works required for construction of the works; and
- the datum for any levels shown (relative to LAT or Australian Height Datum).

The EIS should assess the impact on the coastal environment due to these works and propose measures to avoid or mitigate the impacts.

The role of buffer zones in sustaining fisheries resources through maintaining connectivity between coastal and riparian vegetation and estuarine and freshwater reaches of catchments should be discussed.

4.5.2.1 Coastal transport

In regard to increased shipping volumes, the following should be specifically addressed:

- particular safety standards, restricted zones, buffer zones, and/or operational safety procedures associated with LNG ship operations (for entry to the harbour, transit to and from the port and loading and unloading);
- potential impacts on existing shipping activity; and impact of extra tug voyages; and
- potential to impact on recreational crafts in the Gladstone Harbour.

The Regional Harbour Master Gladstone and Gladstone Port Authority should be adequately consulted regarding maritime issues relating to the movement and loading of LNG tankers and any barge operations. The EIS should discuss the results of the consultation.

4.6 Air

4.6.1 Description of environmental values

This section describes the existing air environment that may be affected by the proposal. The following topics may be addressed (note - the topics are not an exhaustive treatment of all possible air or impacts).

A description of the existing air shed environment should be provided having regard for particulates and gaseous compounds. The background levels and sources of suspended particulates, SO_x, NO_x, Volatile Organic Components (VOCs), and any other relevant constituents of the air environment that may be affected by the proposal should be discussed.

Sufficient data on local meteorology and ambient levels of pollutants should be gathered to provide a baseline for later studies or for the modelling of air quality environmental harms within the air shed. Parameters should include air temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models.

4.6.1.1 Greenhouse gas emissions

This section of the EIS should:

- provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO₂ equivalent' terms; and
- briefly describe method(s) by which estimates were made.

The Australian Greenhouse Office Factors and Methods Workbook (available via the internet) can be used as a reference source for emission estimates and supplemented by other sources where practicable and appropriate.

4.6.2 Potential impacts and mitigation measures

This section describes and quantifies the emissions to air and potential impact of the project and its associated activities together with the objective and practical measures for protecting or enhancing environmental values for air. It will describe how nominated quantitative standards and indicators may be achieved, and how the achievement of the objectives will be monitored, audited and managed. Information should be submitted on the use of new technologies to reduce air emissions from the stack(s) or other emission sources.

The objectives for air emissions should be stated in respect of relevant standards (ambient and ground level concentrations), relevant emission guidelines, and any relevant legislation, and the emissions modelled using a recognised atmospheric dispersion model. The potential for interaction between the emissions from the LNG plant, and emissions in the air shed, and the likely environmental harm from any such interaction, should also be detailed.

The proposed levels of emissions should be compared with the national environmental protection measures (NEPM) for ambient air quality (1998), the National Health Medical Research Council (NHMRC) national guidelines (1985) for control of emissions from stationary sources, and the Environmental Protection (Air) Policy (1998).

Emissions in Gladstone from existing and proposed industries, including exhaust from shipping, should be considered for worst case scenario conditions. The impact the project will have on the total air shed of Gladstone should be discussed. The cumulative impacts on air quality should be considered in the context of the current community views on air quality from existing and approved operations.

Where appropriate, the predicted average ground level concentrations in nearby areas should be provided. These predictions should be made for both normal and expected maximum emission conditions and the worst case meteorological conditions should be identified and modelled where necessary. Ground level predictions should be made at any residential, industrial and agricultural developments believed to be sensitive to the effects of predicted emissions. The techniques used to obtain the predictions should be referenced, and key assumptions and data sets explained. The assessment of the proposal's impact on air quality should include at least the following matters:

- Evaluate the contribution of nitrogen oxides, sulfur oxides and volatile hydrocarbon emissions from the proposal to impacts within the local airshed. Address both acute and cumulative impacts by considering the project in conjunction with existing and approved emission sources within the region;
- Evaluating the extent to which SO_x and NO_x emissions from the proposal and the existing emission sources within the region will contribute to the generation of acid rain or acidification or other atmospheric condensation, such as dew or to the generation of photochemical smog;
- The human health risk associated with emissions from the facility of all hazardous or toxic pollutants should be assessed whether they are or are not covered by the National Environmental Protection Council (Ambient Air Quality) Measure or the Environmental Protection (Air) Policy 1998;
- The National Health and Medical Research Council 'National guidelines for control of emissions of air pollutants from new stationary sources' covers a fairly limited list of generic industry sources. Therefore in

order to assess the extent to which the proposal complies with best practice environmental management, the emissions from the facility should be compared to best practice emissions from a conventional petroleum refining operation (or other equivalent process);

- Detail the type and quantity of hydrocarbons to be released into the air to enable the assessment of health impacts;
- Detail the features of the proposal designed to suppress or minimise emissions, including dusts and odours;
- The assessment of proposed levels of all emissions, including dust and fumes, should include emissions during both normal and upset conditions. Consideration should be given to the range of potential upset condition scenarios and the air emissions that may be generated as a result;
- Where there is no single atmospheric dispersion model that is able to handle the different atmospheric dispersion characteristics exhibited in the proposal area (e.g. sea breezes, strong convection, terrain features, temperature inversions and pollutant re-circulation), a combination of acceptable models will need to be applied;
- The limitations and accuracy of the applied atmospheric dispersion models should be discussed. The air quality modelling results should be discussed in light of the limitations and accuracy of the applied models;
- Air quality predictions should be compared to the relevant goals in the National Environmental Protection Council (Ambient Air Quality) Measure and the Environmental Protection (Air) Policy 1998 goals;
- Air shed management and the contribution of the proposal to air shed capacity in view of existing and future users of the air shed for assimilation and dispersion of emissions; and
- The views of affected persons on the cumulative impact on air quality from existing and approved operations should be described and the potential impact from this project considered in that context.

4.6.2.1 Greenhouse gas abatement

This section of the EIS should propose and assess greenhouse gas abatement measures. It should include:

- a description of the proposed measures (alternatives and preferred) to avoid and/or minimise greenhouse gas emissions directly resulting from activities of the project, including such activities as transportation of consumables, and energy use by the project;
- an assessment of how the preferred measures minimise emissions and achieve energy efficiency;
- a comparison of the preferred measures for emission controls and energy consumption with best practice environmental management; and
- a description of any opportunities for further offsetting greenhouse gas emissions through indirect means.

Direct means of reducing greenhouse gas emissions could include such measures as:

- integrating transport for the project with other local industries such that greenhouse gas emissions from the construction and running of transport infrastructure are minimised;
- maximising the use of renewable energy sources; and
- carbon trading through recognised markets.

Indirect means of reducing greenhouse gas emissions could include such measures as:

- carbon sequestration at nearby or remote locations, either: above ground by such means as planting trees and other vegetation to achieve greater biomass than that cleared for the project; or below ground by geosequestration; and
- carbon trading through recognised markets.

The environmental management plan in the EIS should include a specific module to address greenhouse abatement. That module could include:

- commitments to the abatement of greenhouse gas emissions from the project with details of the intended objectives, measures and performance standards to avoid, minimise and control emissions;
- commitments to energy management, including undertaking periodic energy audits with a view to progressively improving energy efficiency;

- a process for regular review of new technologies to identify opportunities to reduce emissions and use energy efficiently, consistent with best practice environmental management;
- any voluntary initiatives such as projects undertaken as a component of the national Greenhouse Challenge Plus program, or research into reducing the lifecycle and embodied energy carbon intensity of the project's processes;
- opportunities for offsetting greenhouse emissions, including, if appropriate, carbon sequestration and renewable energy uses; and
- commitments to monitor, audit and report on greenhouse emissions from all relevant activities and the success of offset measures.

4.6.2.2 Climate change adaptation

Climate change, through alterations to weather patterns and rising sea level, has the potential to impact in the future on developments designed now. Most developments involve the transfer to, or use by, a proponent of a community resource in one form or another, such as the granting of a non-renewable resource or the approval to discharge pollutants to air, water or land. Therefore, it is important that the project design be adaptive to climate change so that community resources are not depreciated by projects that would be abandoned or require costly modification before their potential to provide a full return to the community is realised. Consequently, the EIS should provide an assessment of the project's vulnerabilities to climate change and describe possible adaptation strategies for the activity including:

- a risk assessment of how changing patterns of rainfall and hydrology, temperature, extreme weather and sea level (where appropriate) may affect the viability and environmental management of the project;
- the preferred and alternative adaptation strategies to be implemented; and
- commitments to undertaking, where practicable, a cooperative approach with government, other industry and other sectors to address adaptation to climate change.

The EPA recognises that predictions of climate change and its effects have inherent uncertainties, and that a balance must be found between the costs of preparing for climate change and the uncertainty of outcomes. However, proponents should use their best efforts to incorporate adaptation to climate change in their EIS and project design.

4.7 Noise and vibration

4.7.1 Description of environmental values

This section describes the existing environment values that may be affected by noise and vibration from the proposal.

If the proposed activity could adversely impact on the noise environment, baseline monitoring should be undertaken at a selection of sensitive sites affected by the proposal. Noise sensitive places are defined in the *Environmental Protection (Noise) Policy 1997*. Long-term measured background noise levels that take into account seasonal variations are required. The locations of sensitive sites should be identified on a map at a suitable scale. The results of any baseline monitoring of noise and vibration in the proposed vicinity of the proposal should be described.

Sufficient data should be gathered to provide a baseline for later studies. The daily variation of background noise levels at nearby sensitive sites should be monitored and reported in the EIS, with particular regard given to detailing variations at different periods of the night. Monitoring methods should adhere to accepted best practice methodologies, relevant Environmental Protection Agency guidelines and Australian Standards, and any relevant requirements of the *Environmental Protection (Noise) Policy 1997*.

Comment should be provided on any current activities near the proposal area that may cause a background level of ground vibration (for example: major roads, quarrying activities, etc.).

4.7.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing environmental values from impacts by noise, describes how nominated quantitative standards and indicators may be achieved for noise management, and how the achievement of the objectives will be monitored, audited and managed. The assessment of noise impacts should include matters raised in the document *The health effects of*

environmental noise – other than hearing loss published by the enHealth Council, 2004 (or later editions), ISBN 0 642 82304 9.

The potential for noise to be carried to sensitive receptors across the harbour should be examined. The citing of potential linear noise emitters such as banks of air coolers should consider the potential for re-enforcement with similar existing or potential emissions.

Information, including mapped noise contours from a suitable acoustic model, should be submitted based on the proposed generation of noise. The potential environmental harm of noise at all potentially sensitive places, in particular, any place of work or residence should be quantified in terms of objectives, standards and indicators to be achieved. Particular consideration should be given to emissions of low-frequency noise; that is, noise with components below 200Hz. The assessment should also include a discussion of noise impacts on terrestrial and marine animals and avifauna, particularly migratory species. Proposed measures for the minimisation or elimination of impacts should be provided, including details and illustrations of any screening, lining, enclosing or bunding. A discussion should be provided of timing schedules for construction and operations with respect to minimising environmental nuisance and harm from noise.

The magnitude, duration and frequency of any vibration resulting from project construction or operational activities should be discussed. A discussion should be provided of measures to prevent or minimise environmental nuisance and harm.

An estimate should be made of the cumulative noise level at the boundaries of the sites of the Project and at the boundaries of existing and future land uses likely to be affected by noise from the Project. This estimate should include noise from construction and operation.

The assessment should also address off-site noise and vibration impacts that could arise due to increased road and shipping transportation directly resulting from the project. The mitigation of off-site noise and vibration impacts due to transport to and from the site should also be described and include a discussion on existing speed zones, scheduled transport movements and industry.

4.8 Nature conservation

4.8.1 Description of environmental values

This section will describe the existing environment values for nature conservation that may be affected by the proposed activities in the context of environmental values by the *Environmental Protection Act 1994*, Environmental Protection Policies and regulations, and the *Nature Conservation Act 1992* (NCA).

Describe the environmental values of nature conservation for the affected area in terms of:

- integrity of ecological processes, including habitats of rare and threatened species;
- conservation of resources;
- biological diversity, including habitats of rare and threatened species;
- sites containing marine plants protected under the *Fisheries Act 1994*;
- integrity of landscapes and places including similar natural places; and
- aquatic and terrestrial ecosystems.

A discussion will be presented on the nature conservation values of the areas likely to be affected by the proposal. The flora and fauna communities which are rare or threatened, environmentally sensitive localities including the marine environment, waterways, riparian zone, and littoral zone, rainforest remnants, and habitat corridors should be described. The description should include a plant species list, a vegetation map at appropriate scale and an assessment of the significance of native vegetation, from a local, regional, state and national perspective. The description should indicate any areas of state or regional significance identified in an approved biodiversity planning assessment (BPA) produced by the EPA (e.g. see the draft Regional Nature Conservation Strategy for SE Qld 2001-2006). Also, reference will be made to the Queensland *Vegetation Management Act 2000* (VMA), including the findings of any Regional Vegetation Management Plan and the NCA.

The EIS should identify issues relevant to sensitive areas, or areas, which may have, low resilience to environmental change. Areas of special sensitivity include the marine environment and wetlands, wildlife breeding or roosting areas, any significant habitat or relevant bird flight paths for migratory species, and habitat of threatened plants, animals and communities. The capacity of the environment to assimilate discharges/emissions should be assessed. Proposal proximity to any biologically sensitive areas should be described.

Areas regarded as sensitive with respect to flora and fauna are those that have one or more of the following features, and will be identified, mapped, avoided or have the impacts on them minimised:

- important habitats of species listed under the *Nature Conservation Act 1992* and/or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* as presumed extinct, endangered, vulnerable or rare;
- regional ecosystems listed as 'endangered' or 'of concern' under State legislation, and/or ecosystems listed as presumed extinct, endangered or vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*;
- good representative examples of remnant regional ecosystems or regional ecosystems which are poorly represented in protected areas;
- sites containing marine plants protected under the *Fisheries Act 1994*;
- sites listed under international treaties such as Ramsar wetlands and World Heritage areas;
- sites containing near threatened or bio-regionally significant species or essential, viable habitat for near threatened or bio-regionally significant species;
- sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and Japan (JAMBA) and between Australia and China (CAMBA);
- sites adjacent to nesting beaches, feeding, resting or calving areas of species of special interest; for example, marine turtles and cetaceans;
- sites containing common species which represent a distributional limit and are of scientific value or which contains feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance; and
- sites containing high biodiversity that are of a suitable size or with connectivity to corridors/protected areas to ensure survival in the longer term; such land may contain:
 - natural vegetation in good condition or other habitat in good condition (e.g. wetlands); and/or
 - degraded vegetation or other habitats that still supports high levels of biodiversity or acts as an important corridor for maintaining high levels of biodiversity in the area;
 - a site containing other special ecological values, for example, high habitat diversity and areas of high endemism;
 - ecosystems which provide important ecological functions such as: wetlands of national, state and regional significance; coral reefs; riparian vegetation; important buffer to a protected area or important habitat corridor between areas;
 - sites of geomorphological significance, such as lava tubes or karst;
 - protected areas which have been proclaimed under the *Nature Conservation Act 1992* and *Marine Parks Act 1982* or are under consideration for proclamation; and/ or
 - areas of major interest, or critical habitat declared under the *Nature Conservation Act 1992* or high nature conservation value areas or areas vulnerable to land degradation under the *Vegetation Management Act 1999*.

Reference should be made to both State and Commonwealth endangered species legislation and the proximity of the area to any World Heritage property.

The Queensland *Vegetation Management Act 1999* and the findings of any regional vegetation management plan should also be referenced.

The occurrence of pest plants and animals in the project area should be described.

4.8.1.1 Terrestrial fauna

The fauna occurring in the area affected by the proposal should be described, noting the broad distribution patterns in relation to vegetation, topography and substrate. The description of the fauna present or likely to be present in the area should include use of the area by migratory birds, nomadic birds, fish and terrestrial fauna.

The EIS should indicate how well any affected communities are represented and protected elsewhere in the province where the site of the proposal occurs.

Areas regarded as sensitive with respect to flora and fauna and having one or more of the following features will be identified, mapped and, if relevant, avoided or the effects minimised:

- Important habitats of species listed under the *Nature Conservation Act 1992*;
- Regional ecosystems recognised by the EPA as 'endangered' or 'of concern'; and
- Sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements, and CAMBA.

4.8.1.2 Aquatic biology

If no biota surveys/studies have previously been conducted in and downstream of the project area, the aquatic flora and fauna occurring in the areas affected by the proposal should be described, noting the patterns and distribution in the waterways and any associated wetlands and marine environment. The description of the fauna present or likely to be present in the areas should include:

- fish species, mammals, birds, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the waterways within the affected area, and/or those in any associated wetlands and marine environment;
- species diversity and abundance;
- any rare or threatened marine species, particularly the dugong and its habitat;
- existence of any other listed rare, threatened or otherwise noteworthy species/communities in the study areas, and current level of protection;
- habitat requirements and sensitivity to changes; including movement corridors and barriers to movement;
- aquatic plants;
- aquatic and benthic substrate;
- the existence of feral or exotic animals;
- use of wetland and marine habitat by migratory birds, and nomadic birds, fish and terrestrial fauna; and
- habitat potentially impacted due to changes in currents in associated wetland and marine environments.

Discuss the potential for seasonal changes in flora and fauna distribution patterns. The EIS should indicate how well any affected communities are represented and protected elsewhere in the sub-region where project sites occur.

4.8.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing nature conservation values, describes how nominated quantitative standards and indicators may be achieved for nature conservation management, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should address any actions of the project or likely impacts that require an authority under the *Nature Conservation Act 1992* and the *Fisheries Act 1994*. A discussion of any clearing activities in relation to requirements of the *Vegetation Management Act 1999* and associated policies should be included.

The discussion should cover all likely direct and indirect environmental harm due to the project on flora and fauna particularly sensitive areas as listed below (also see Attachment 2). Terrestrial and aquatic (marine and freshwater) environments should also be covered. Also include human impacts and the control of any domestic animals introduced to the area.

Strategies for protecting the Great Barrier Reef Marine Park and World Heritage Property, and any rare or threatened species should be described, and any obligations imposed by State or Commonwealth legislation or policy or international treaty obligations (i.e. JAMBA, CAMBA) should be discussed. Emphasis should be given to potential environmental harm to benthic and intertidal communities, seagrass beds and mangroves.

The potential environmental harm to the ecological values of the area arising from the construction, operation and decommissioning of the project should be described, and the indirect effects on vegetation should be discussed. Short-term and long-term effects should be considered with comment on whether the impacts are reversible or irreversible. Mitigation measures and/or offsets should be proposed for adverse impacts. Any departure from no net loss of ecological values should be described.

The provision of buffer zones and movement corridors, and strategies to minimise environmental harm on migratory, nomadic and aquatic animals should be discussed.

Weed management strategies are required for containing existing weed species and ensuring no new declared plants are introduced to the area. Reference should be made to the local government authorities' pest management plan when determining control strategies. The strategies for both flora and fauna should be discussed in the main body of the EIS and provided in a working form in a Pest Management Plan as part of the overall EM plan for the project.

4.9 Cultural heritage

4.9.1 Description of environmental values

This section describes the existing cultural heritage values that may be affected by the proposal. Describe the environmental values of the cultural landscapes of the affected area in terms of the physical and cultural integrity of the landforms.

An indigenous cultural heritage study must be undertaken in accordance with the requirements of Part 7 of the *Aboriginal Cultural Heritage Act 2003*.

An historical cultural heritage study should also be undertaken of the known and potential historical cultural heritage values of the affected area. The study will, as a minimum, include a desktop analysis and an archaeological investigation (i.e. a physical investigation) of the area potentially affected by the project.

This desktop component of the study should, as a minimum, review the following sources for information on historical cultural heritage values within the region of the project site:

- the Queensland Heritage Register, for places already protected under the *Queensland Heritage Act 1992*;
- local government heritage registers, lists or inventories; and
- the results of previous cultural heritage studies conducted within the region of the project.

The scope of the archaeological investigation should be based upon the results of the desktop analysis. The archaeological investigation is to be conducted by an appropriately qualified person, as required by the *Queensland Heritage Act 1992*, and should address all types of historical cultural heritage places located within the project area (i.e. built, archaeological and cultural landscape values).

The discovery and protection of any previously unidentified archaeological artefacts or archaeological places during the course of the historical cultural heritage study must comply with Part 9 of the *Queensland Heritage Act 1992*.

4.9.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for managing, protecting or enhancing cultural heritage values that may be affected by the proposal. It describes how practices may be implemented for the appropriate management of those values, and how the achievement of the objectives will be monitored, audited and managed.

4.9.2.1 Indigenous cultural heritage

The potential impacts on indigenous cultural heritage values in the vicinity of the project must be managed under a cultural heritage management plan (CHMP) developed and approved under Part 7 of the *Aboriginal Cultural Heritage Act 2003*. Development of the CHMP should follow the guidelines gazetted under section 85 of the *Aboriginal Cultural Heritage Act 2003*. The development of the CHMP should be negotiated with the lead agency for indigenous cultural heritage, the Department of Natural Resources and Water. The EPA's EIS Coordinator must be made aware of the progress of the CHMP approval process and of any related issues that should be addressed in the EIS assessment report.

4.9.2.2 Non-indigenous historical cultural heritage

The potential impacts on non-indigenous historical cultural heritage values and their avoidance or mitigation should also be addressed in a management plan. The historical heritage management plan will specifically address identified values and provide a process for managing yet undiscovered values should they become apparent during development of the project.

The development of a historical heritage management plan should be negotiated with the lead agency (the Cultural Heritage Branch, Environmental Protection Agency) and any other relevant stakeholders.

The historical heritage management plan should as a minimum address the following issues:

- Processes for the mitigation, management and protection of identified historical cultural heritage values during excavations of the construction, operational, rehabilitation and decommissioning phases of the project;
- Processes for reporting, as required by section 89 of the *Queensland Heritage Act 1992*, the discovery of any archaeological artefact not previously identified in the historical cultural heritage study;
- Procedures for the collection of any artefact material, including appropriate storage and conservation; and
- Historical cultural heritage awareness training or programs for project staff.

The historical heritage management plan should be incorporated into the project's draft EM plan.

4.10 Social

4.10.1 Description of environmental values

This section describes the existing social values that may be affected by the proposal.

The social amenity and use of the proposal area and adjacent areas for rural, agricultural, forestry, fishing, recreational, industrial, educational or residential purposes should be described. Consideration should be given to:

- community infrastructure and services, access and mobility;
- population and demographics of the affected community;
- housing availability;
- local community values, vitality and lifestyles;
- recreational, cultural, leisure and sporting facilities and activities in relation to the affected area;
- health, emergency services and education facilities;
- rural and commercial activities near the proposed activities;
- current property values;
- number of properties directly affected by the project; and
- number of families directly affected by the project, this should include not only property owners but also families of workers either living on the property or workers where the property is their primary employment.

Describe the social values for the affected area in terms of the integrity of social conditions, including amenity and liveability, harmony and well being, sense of community, access to recreation, and access to social and community services and infrastructure.

Social, economic and cultural values are not as easily separated as physical and ecological values. Therefore it may be necessary for some material in this section to be cross-referenced with in section 4.9 Cultural Heritage and Section 4.12 Economy.

4.10.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing social values, describes how nominated quantitative standards and indicators may be achieved for social impacts management, and how the achievement of the objectives will be monitored, audited and managed.

The social impact assessment should be the basis of proposed mitigation strategies to be described in this section with particular attention being paid to:

- the sourcing of the construction and operational workforce and the social and cultural implications this may have for the host community particularly if any part of the workforce is sources from overseas;
- the availability of accommodation for the project's workforce and the possible cumulative impact on the housing and rental market;
- documenting the demographic changes in the profile of the region and the associated sufficiency of current infrastructure and services; and

- developing a community consultation management plan that promotes an active role for impacted communities.

The social impact assessment of the project should consider the information gathered in the community consultation program and the analysis of the existing socio-economic environment, and describe the project's impact, both beneficial and adverse, on the local community. The impacts of the project on local and regional residents, community services and recreational activities are to be analysed and discussed for all stages of the development. The nature and extent of the community consultation program are to be described and a summary of the results incorporated in the EIS.

The social impact assessment should include sufficient data to enable State authorities, such as the Department of Communities, Department of Housing, Department of Local Government Sport and Recreation, Queensland Health and Education Queensland, to plan for the continuing provision of public services in the region of the project. Proponents of projects that are likely to result in a significant increase in population of an area should consult the relevant management units of the State authorities, and summarise the results of the consultations in the EIS. The summary should discuss how the impacts of population increase on public services, particularly health and education, would be mitigated.

The social impact assessment of the project is to be carried out in consultation with the Department of Communities and with reference to CQSS2 3.9 Social – target and indicators for viable towns and communities. The assessment of impacts should describe the likely response of affected communities and identify possible beneficial and adverse impacts (both immediate and cumulative). These impacts should be considered both at the regional and local level.

The EIS should address the following matters:

- The number of personnel to be employed, the skills base of the required workforce and the likely sources (i.e. local, regional or other) for the workforce during the construction and operational phases for each aspect of the Project. Include an assessment of impacts on local and state labour markets, with regard to the source of the workforce. This information is to be presented according to occupational groupings of the workforce. In relation to the source of the workforce, information is required as to whether the proponent, and/or contractors, are likely to employ locally or through other means and whether there are initiatives for local employment opportunities;
- The number of workers who are likely to be accompanied by dependents;
- A description of the planned accommodation facilities, and the type of accommodation (i.e. single or accompanied);
- Include an assessment of impacts on local residents, current land uses and existing lifestyles and enterprises;
- The EIS should address impacts of both construction and operational workforces and associated contractors on housing demand, community services and community cohesion. The capability of the existing housing stock, including rental accommodation, to meet any additional demands created by the project is to be discussed;
- An analysis of the cumulative impacts of the Project and other major projects planned or occurring simultaneously in the region in influencing the capacity of the existing housing and temporary accommodation markets to meet the need of projected numbers of both the construction and operational workforce;
- Any identified constraints and opportunities for new housing construction in the catchment area, including the capacity of the local land development and housing construction industries to provide new housing;
- An analysis of the consequential impact and mitigation measures of increased demand for, and uptake of affordable accommodation, particularly rental accommodation, in the region including the reduction in available affordable housing in the local government areas, and the potential displacement of existing residents who may no longer be able to afford accommodation;
- An accommodation strategy, where necessary, in consultation with relevant State government agencies, which will detail proposals that avoid, mitigate or offset any short and medium term adverse effects on the local housing market;
- The assessment of impacts should take account of relevant demographic, social, cultural and economic profiles;

- Identify any new skills and training to be introduced in relation to the project. Adequate provision should be made for apprenticeship and worker training schemes. If possible, the occupational skill groups required and potential skill shortages anticipated should be indicated;
- Provide comment on how much service revenue and work from the project (e.g. provisioning, catering and site maintenance) would be likely to flow to existing communities in the area of the project, particularly if a fly-in, fly-out workforce is proposed;
- Include an assessment of impacts on existing local residents' values and aspirations; and
- In regard to affected indigenous and non-indigenous communities respectively, particular attention should be paid to the effects on:
 - the ability of both indigenous and non-indigenous people, to live in accordance with their own values and priorities,
 - the use of and access to culturally important areas and landscapes,
 - the access to existing human and commercial services and housing,
 - the ability to participate in regional and local employment and training opportunities, and
 - the new project workforce and their families.

For the construction and operational phases of the development, describe the effects of the proposal on local and regional residents, including land acquisition and relocation issues and property valuation and marketability, community services and recreational activities .

Discuss the potential environmental harm on the amenity of adjacent areas used for cropping, grazing, forestry, recreation, industry, education, aesthetics, or scientific or residential purposes. Describe the implications of the proposal for future developments in the local area including constraints on surrounding land uses.

The educational impacts of the proposed development are to be analysed and described, particularly in regard to:

- primary, secondary and tertiary educational sectors;
- improved appreciation of conservation areas; and
- environmental education for the general public.

For identified impacts to social values, suggest mitigation and enhancement strategies and facilitate initial negotiations towards acceptance of these strategies. Practical monitoring regimes should also be recommended.

4.11 Aviation Issues

4.11.1 Description of Environmental Values

This section should describe the existing aviation environment which may be affected by the Project. Reference should be made to the *Civil Aviation Safety Regulations 1998*, the *Civil Aviation Regulations 1998*, CASA Guidelines and the State Planning policy 1/02 – Development in the Vicinity of Certain Airports and Aviation Facilities. This section should include accurate plans that detail the location and height of any proposed structures and the location of the facility with respect to protected airspace Obstacle Limitation Surface (OLS).

4.11.2 Potential Impacts and Mitigation Measures

This section should define and assess the potential impacts of the project on the Gladstone Airport and alternative proposed airport site at Kangaroo Island. Details should be provided of the measures to be undertaken to mitigate or avoid the identified impacts. Issues to be addressed include:

- permanent structures, such as buildings, intruding into the protected airspace;
- temporary structures such as cranes intruding into the protected airspace; and
- results of an exhaust plume assessment where an exhaust plume has an average vertical velocity exceeding 4.3m/s at the protection airspace OSL.

4.12 Health and safety

4.12.1 Description of environmental values

This section describes the existing community values for public health and safety that may be affected by the proposal. The effect of air emissions, on nearby and other potentially affected populations should be identified and described. Particular attention should be paid to those sections of the population, such as children and the elderly, which are especially sensitive to environmental health factors.

4.12.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting or enhancing health and safety community values, describes how nominated quantitative standards and indicators may be achieved for social impacts management, and how the achievement of the objectives will be monitored, audited and managed.

The EIS should assess the effects on the project workforce of occupational health and safety risks and the impacts on the community in terms of health, safety, and quality of life from project operations and emissions. Any impacts on the health and safety of the community, workforce, suppliers and other stakeholders should be detailed in terms of health, safety, quality of life from factors such as air emissions, and noise.

Map(s) should be provided showing the locations of sensitive receptors, such as, but not necessarily limited to, kindergartens, schools, hospitals, aged care facilities, residential areas, and centres of work (e.g. office buildings, factories and workshops). The EIS, illustrated by the maps, should discuss how planned discharges from the project could impact on public health in the short and long term, and should include an assessment of the cumulative impacts on public health values caused by the proposal, either in isolation or by combination with other known existing or planned sources of contamination, where practical.

The EIS should address the project's potential for providing disease vectors. Measures to control mosquito and biting midge breeding should be described. Any use of recycled water should be assessed for its potential to cause infection by the transmission of bacteria and/or viruses by contact, dispersion of aerosols, and ingestion (e.g. via use on food crops). Similarly, the use of recycled water should be assessed for its potential to cause harm to health via the food chain due to contaminants such as heavy metals and persistent organic chemicals. Practical monitoring regimes should also be recommended in this section.

4.13 Economy

4.13.1 Description of environmental values

This section describes the existing economic environment that may be affected by the proposal. The character and basis of the local and regional economies should be described including:

- economic viability (including economic base and economic activity, future economic opportunities, current local and regional economic trends); and
- historical descriptions of large-scale resource developments and their effects in the region.

4.13.2 Potential impacts and mitigation measures

The function of this section is to define and describe the objectives and practical measures for protecting or enhancing economic values, to describe how nominated quantitative standards and indicators may be achieved for economic management, and how the achievement of the objectives will be monitored, audited and managed.

An economic analysis, including a cost-benefit analysis (CBA), should be presented from national, state, regional and local perspectives as appropriate to the scale of the project. The general economic benefits from the project should be described.

At a level of detail appropriate to the scale of the project, the analysis is to consider:

- the significance of this proposal on the local and regional economic context;
- the long and short-term beneficial (e.g. job creation) and adverse (e.g. competition with local small business) impacts that are likely to result from the development;
- the potential, if any, for direct equity investment in the project by local businesses or communities;
- the cost to all levels of government of any additional infrastructure provision;

- implications for future development in the locality (including constraints on surrounding land uses and existing industry);
- the potential economic impact of any major hazard identified in section 4.13;
- the distributional effects of the proposal including proposals to mitigate any negative impact on disadvantaged groups;
- impacts on local property values; and
- the cost-benefit analysis should address any decision to have pre-assembled modules (PAM) constructed off-shore and should consider the ability of local manufacturers to contribute to the supply of each components.

Consideration of the impacts of the project in relation to energy self-sufficiency, security of supply and balance of payments benefits may be discussed. Attention should be directed to the long and short-term effects of the project on the land-use of the surrounding area and existing industries, regional income and employment and the state economy.

For identified impacts to economic values, suggest mitigatory and enhancement strategies and facilitate initial negotiations towards acceptance of these strategies. Practical monitoring regimes should also be recommended.

Economic impacts of the project could be discussed in the context of CQSS2 3.8 economy - Aspirational target and on-ground actions explaining predicted cumulative and intergenerational impacts and proposing measures to be used for monitoring and impacts.

4.14 Hazard and risk

4.14.1 Description of environmental values

This section describes the potential hazards and risk to people and property that may be associated with the proposal as distinct from hazards and risk to the natural environment, which should be addressed in other sections of the TOR.

Detail the values related to people and property that could be affected by any hazardous materials and actions incorporated in the proposal. The degree and sensitivity of risk should be detailed.

4.14.2 Potential impacts and mitigation measures

This section defines and describes the objectives and practical measures for protecting people and places from hazards and risk, describes how nominated quantitative standards and indicators may be achieved for hazard and risk management, and how the achievement of the objectives will be monitored, audited and managed.

4.14.2.1 Identification of relevant standards, guidelines and codes of practices

The EIS should identify the relevant standards that define the principles for the design and operation of the LNG facility, including wharf operations and shipping, in the Australian context. If there are no relevant Australian Standards, the consultant should define and justify the use of relevant international standards.

4.14.2.2 Hazard identification

The proponent should conduct a hazard identification exercise in order to identify the nature and scale of all hazards which might occur during the Project.

- This should include all pollutants or any other hazardous material used, produced or stored in association with the project.
- The hazard identification exercise should include the impact on the Project of any natural events such as cyclones, earthquakes, bushfires or local flooding.
- Any identified impact on the Project should also be extended to determine the resultant impact on the surrounding areas and community.

The EIS should provide an inventory for each class of substances listed in the Australian Dangerous Goods Codes to be held on-site. This information should be presented by classes and should contain:

- chemical name;
- concentration in raw material chemicals;

- concentration in operation storage tank/s;
- U.N. number;
- packaging group;
- correct shipping name; and
- maximum inventory of each substance.

Details should be provided of:

- safeguards proposed for the transport, storage, use, handling and on-site movement of the materials to be stored on-site;
- the capacity and standard of bunds to be provided around the storage tanks for classified dangerous goods and other goods likely to adversely impact upon the environment in the event of an accident; and
- the procedures to prevent spillages, and the emergency plans to manage hazardous situations.

4.14.2.3 Preliminary hazard analysis

Conduct a preliminary analysis of the consequences of these incidents (identified in the hazard identification process) on people, property and the biophysical environment to identify potential impacts. Consideration should also be given to adverse incidents associated with neighbouring land uses (e.g. Orica ammonia storage tank) and the effect on the construction and operation of the LNG Facility.

If the preliminary analysis predicts significant off-site impacts, then a more detailed risk assessment analysis is to be performed.

4.14.2.4 Risk analysis

Complete an evaluation of the likelihood of each scenario occurring in order to calculate the level of risk in surrounding areas due to the presence of the facility.

- The risk analysis should include a representative set of incident scenarios, including credible worst case events.
- The risk analysis is to include a Quantitative Risk Assessment (QRA) including the calculation of overpressure contours at 7, 14, 21 and 35kPA; heat radiation contours at 4.7, 12.6 and 23kW/m²; toxic exposure contours at ERPG 3 and ERPG 2 levels and calculation of risk contours at 50, 10, 5, 1 and 0.5x10⁻⁶ per year individual fatality risk levels as per the New South Wales Department of Urban Affairs and Planning's Hazardous Industry Planning Advisory Paper No. 4 "Risk Criteria for Land Use Safety Planning" (HIPAP4). The overpressure and heat radiation levels should also be determined at any anticipated sensitive place so as to determine the effect at that location.
- The risk analysis is required to address the potential for a major accident at the proponent's facility to impact on adjoining land uses (existing and proposed), including hazardous land uses.
- Risk contours should be presented on a suitably scaled location map.
- Significant safety controls and passive protective barriers that prevent or mitigate a potential major accident should be discussed in sufficient detail to determine the adequacy and relevancy of the safeguards in the potential accident scenarios.

4.14.2.5 Acceptability of risk

The EIS should document the outcomes of the assessment, including demonstration that the design, operation, and maintenance of the facility (including wharf) complies with the relevant legislation, standards and guidelines.

The assessment should outline the implications for and the impact on the surrounding land uses, and should involve consultation with Department of Emergency Services, Queensland Fire and Rescue Authority, and Queensland Ambulance Service. The capacity and standards of the bunds around the storage tanks for classified dangerous goods should be detailed. The acceptability of the risk to surrounding land uses should be assessed by referring to nationally-adopted risk criteria presented in the HIPAP4 Guideline.

The proponent should develop an integrated risk management plan, or similar, for the whole of the life of the project including construction, operation and decommissioning phases.

The integrated risk management plan should include the following components:

- operational hazard analysis;

- regular hazard audits;
- fire safety;
- emergency response plans;
- qualitative risk assessment; and
- construction safety.

Where relevant, each of these components should be prepared in accordance with the relevant NSW DUAP Hazardous Industry Planning Advisory Paper (HIPAP).

Evacuation planning should reflect two-way planning with proposed neighbouring LNG plants including scenarios where either plant suffers upset requiring evacuation under a range of wind conditions.

4.15 Cross-reference with the terms of reference

This section provides a cross reference of the findings of the relevant sections of the EIS, where the potential impacts and mitigation measures associated with the project are described, with the corresponding sections of the terms of reference. A list of all commitments made by the Proponent in the EIS should be provided, together with a reference to the relevant section in the EIS.

5 Environmental management plan

The environmental management plan (EM plan) should be developed from the mitigation measures detailed in part 4 of the EIS. Its purpose is to set out the proponents' commitments to environmental management. That is, how environmental values will be protected and enhanced.

The EM plan is an integral part of the EIS, but should be capable of being read as a stand-alone document without reference to other parts of the EIS. The general contents of the EM plan should comprise:

- the proponents' commitments to acceptable levels of environmental performance, including environmental objectives, i.e. levels of expected environmental harm, performance standards and associated measurable indicators, performance monitoring and reporting;
- impact prevention or mitigation actions to implement the commitments; and
- corrective actions to rectify any deviation from performance standards.

Through the EM plan, the EIS's commitments to environmental performance can be used as regulatory controls through conditions to comply with those commitments. Therefore, the EM plan is a relevant document for project approvals, environmental authorities and permits, and may be referenced by them.

6 References

All references consulted should be presented in the EIS in a recognised format.

7 Recommended appendices

A1. Final terms of reference for this EIS

A copy of the final TOR should be included in the EIS. Where it is intended to bind appendices in a separate volume from the main body of the EIS, the TOR at least should be bound with the main body of the EIS for ease of cross-referencing. A summary, cross-referencing specific items of the TOR to the relevant section of the EIS, should also be provided in Section 4.14 of the EIS. For this purpose the TOR should be line numbered.

A2. Development approvals

A list of the development approvals required by the project should be presented.

A3. Study team

The qualifications and experience of the study team and specialist sub-consultants and expert reviewers should be provided.

A4. The standard criteria

A brief summary should be presented of the proposal's compatibility with the standard criteria as defined by the *Environmental Protection Act 1994*, which include the principles of ESD and other relevant policy instruments. With regard to the principles of ESD, as listed in The National Strategy for Ecologically Sustainable Development, published by the Commonwealth Government in December 1992 (available from the Australian Government Publishing Service), each principle should be discussed and conclusions drawn as to how the proposal conforms. A life-of-project perspective should be shown.

A5. Consultation report

The summary Consultation Report appendix for an EIS under the EP Act should commence by including the details of affected and interested persons, and the statement of planned consultation with those persons, originally provided with the draft terms of reference. It should describe how 'interested' and 'affected persons,' and any 'affected parties' as defined in the EPBC Act, were identified.

A further list should be provided that includes the Commonwealth, state and local government agencies consulted, and the individuals and groups of stakeholders consulted.

The Consultation Report appendix should summarise the results of the community consultation program, providing a summary of the groups and individuals consulted, the issues raised, and the means by which the issues were addressed. The discussion should include the methodology used in the community consultation program including criteria for identifying stakeholders and the communication methods used.

A6. Specialist studies

All reports generated on specialist studies undertaken as part of the EIS are to be included as appendices. These may include:

- geology;
- soil survey and land suitability studies;
- waterway hydrology;
- groundwater;
- flora and fauna studies;
- economic studies, CBA; and
- hazard and risk studies.

A7. Research

Any proposals for researching alternative environmental management strategies or for obtaining any further necessary information should be outlined in an appendix

Disclaimer

While this document has been prepared with care, it contains general information and does not profess to offer legal, professional or commercial advice. The Queensland Government accepts no liability for any external decisions or actions taken on the basis of this document. Persons external to the Environmental Protection Agency should satisfy themselves independently and by consulting their own professional advisors before embarking on any proposed course of action.

Approved By

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