16 VISUAL AMENITY

16.1 INTRODUCTION

A Landscape and Visual Impact Assessment (LVIA) was undertaken for the Project to assess the visual and lighting impacts of:

- the LNG Facility
- the Curtis Island Bridge/Road on the existing landscape.

As noted previously in this EIS, QGC is not proposing to construct a bridge and associated roads as part of the Project and, as such, will not be the proponent for construction or operation of the bridge and roads. However, the visual impact of these activities, among potential Ancillary Infrastructure which may be constructed by a separate proponent, has been assessed for the sake of completeness. Any management and mitigation measures included in this chapter applicable to the bridge and roads are included as recommendations only and are not commitments made by QGC.

A summary of the key findings of the LVIA is outlined below, with a copy of the full LVIA¹ undertaken provided in *Appendix 5.18* of this volume.

16.2 DESCRIPTION OF PROJECT ENVIRONMENTAL OBJECTIVES

The Project environmental objective for visual amenity is: to preserve the visual amenity of the landscape as far as practicable.

16.3 METHODOLOGY

The following subsections provide a summary of the components of the LNG Facility and Ancillary Infrastructure that were considered in the LVIA and which were used to define the study area, as well as the methodology used to undertake the assessment.

Once this was completed, the EIS impact assessment methodology as outlined in *Volume 1* was then applied to determine the Project environmental impact significance.

¹ Environmental Resources Management Australia, 2009. *Queensland Curtis LNG Project: LNG Facility and Associated Infrastructure: Landscape and Visual Impact Assessment.* Unpublished report for Queensland Gas Company Limited (QGC), Report Reference 0086165, April 2009.

16.3.1 Scope of Assessment – Project Components

16.3.1.1 Main Components of the LNG Facility Considered in the LVIA

The LNG Facility on Curtis Island comprises the development, construction and operation of an LNG processing plant, export terminal and associated infrastructure on Curtis Island. It should be noted that the LNG Facility is subject to ongoing detailed design. While the following assumptions have been used as the basis of the visual impact assessment, the location, configuration and size of various Facility components may be altered as LNG Facility design is refined.

The main components of the LNG Facility that were assessed in the LVIA are outlined below and shown on *Figure 5.16.1.*

- a LNG Facility with a production capacity of up to 12 million tonnes per annum (mtpa) (each processing unit or "train" will have a nominal 4 mtpa production capacity, and contain a number of columns, cold boxes, banks of air coolers, and a refrigeration compression area with associated turbine stacks, exhaust stack 29 m high) designed for continuous 24-hour operation
- three LNG storage tanks with a capacity of between 160,000 and 180,000 m³, assumed as each being 100 m diameter and approximately 46 m in height to the top of the concrete dome, topside structures and relief valve vents may be slightly higher (to service up to two trains) and a third tank to be constructed for the third train
- an LPG storage tank with a capacity of up to 100,000 m³, approximately 68m diameter x 31 m high
- two process flare stacks at approximately 60 m high, and a marine flare at approximately 13 m high
- associated utilities and infrastructure including air, water, nitrogen, refrigerant storage, power generation, fire protection and safety, fuel gas, stormwater management, waste management, flare and telecommunications systems and access roads
- associated common buildings, including administration, maintenance and control rooms, and motor control centres
- a marine jetty containing specialised LNG loading facilities and LNG tanker berths
- materials offloading facilities (MOF).

Note that detailed design is ongoing, and dimensions of the main components of infrastructure may vary subject to ongoing refinement of the design.

Figure 5.16.1 Photomontage Showing the Main Components of the LNG Facility



There will be no continuous flaring from the LNG Facility except for a small pilot flame for ignition purposes. However, the LVIA did consider the visual impact of flaring as this will be required in a number of different scenarios (refer *Volume 2, Chapter 9* for details of potential flaring scenarios).

16.3.2 Environmental Management Measures in LNG Facility Design

The following general environmental management measures have been incorporated (where practicable) into the design of the LNG Facility to reduce impacts on landscape and visual amenity:

- Minimise as much as practicable the removal of mangroves from the shoreline during construction and operation of the Materials Offloading Facility (MOF) and the jetty. The retained areas of mangroves will provide visual screening and assist in minimising the disruption of natural shoreline vegetation.
- Retain where practicable vegetation on ridges and hills adjoining the LNG Facility, to provide screening of the LNG Facility from viewing locations to the south-east.
- Consider where possible revegetation of cut/fill slopes with natural vegetation.

16.3.2.1 Curtis Island Bridge/Road

The proposed Curtis Island Bridge/Road was assessed in the LVIA as this infrastructure is being investigated by the Department of Infrastructure and Planning (DIP) to provide access to the Curtis Island Industrial Precinct.

The following design criteria were taken into account in the LVIA, based on the Concept Design reports prepared by Connell Wagner on behalf of the DIP (Connell Wagner, 2008²). The location and alignment of the Curtis Island Bridge/Road is shown in *Volume 2, Chapter 4*.

² Connell Wagner (2008a) *Executive Summary. Curtis Island Road / Bridge Concept Design.* Reference 36914-001, Revision 0. Prepared for the Department of the Coordinator-General. December 12, 2008.

Bridge:

- length 1500 m, two traffic lanes (3.5 m) and overall width 13.745 m
- vertical height clearance of 20.5 m from HAT, top of structure 27.5 m
- span length 50 m
- main structure to be grey concrete
- abutments rock riprap and planted with screen vegetation.

Road:

- two traffic lanes 3.5 m each
- shoulder width 1.5 m with 1:3 batters on outer slopes
- minimum RL 5.5 AHD
- embankments and areas of disturbance to be planted with endemic vegetation.

16.3.3 Extent of Study Area

The study area for the LVIA will be the extent of the viewshed. For the purpose of establishing the extent of the viewshed, the design parameters for the LNG Facility and proposed Curtis Island Bridge across The Narrows have been considered separately.

16.3.3.1 LNG Facility

The tallest elements of the LNG Facility are the flare stacks at 60 m high (RL 65.4 AHD); the three LNG tanks at 46 m high (RL 52 AHD) and the LNG trains stacks at 29 m high (RL 40 AHD). For the purpose of calculating the extent of visibility, the parameters used for the LNG Facility are a maximum height of 60 m positioned at each corner of the LNG plant (refer *Figure* 5.16.2).

Figure 5.16.2 Parameters for Calculating the Viewshed of the LNG Facility



The potential visibility of the LNG jetty has been assessed as a separate entity due to the visually more exposed location of the marine section of the LNG Facility extending into the Port of Gladstone. The main structural elements used to undertake the assessment are indicated in *Figure 5.16.3*.



Figure 5.16.3 Parameters for the Proposed LNG Jetty Visibility Assessment

The viewshed for the LNG Facility (including the loading berth) has been classified into Zones of Visual Influence (ZVI) as detailed in *Table 5.16.1* and shown on *Figure 5.16.5*.

 Table 5.16.1
 Viewshed and ZVI for the LNG Facility

| Distance from an observer to the project site (based on 60 m vertical field of view) | Zones of Visual Influence |
|--|---|
| >7 km. | Visually insignificant |
| | A very small element in the Viewshed, which is difficult to discern and will be invisible in some lighting or weather circumstances. |
| 7 – 4.2 km | Potentially noticeable, but not dominant in the landscape (long-distance views) |
| | The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer. |
| 4.2 – 1.4 km | Visually evident and can dominate the landscape (middle- distance view) |
| | The degree of visual intrusion will depend on the Project and its setting within the landscape, and factors such as foreground screening, the sensitivity of the landscape, and the sensitivity of the viewer. |
| < 1.4km | Will be visually dominant in the landscape from most viewing locations ("close-up" view of the Project) |
| | The Project dominates the landscape in which it is sited. |

16.3.3.2 Curtis Island Bridge

The maximum height of the proposed bridge is 27.5 m, and overall length 1,500 m. For the purpose of calculating the viewshed the maximum vertical

height of 28 m has been positioned at each end of the bridge representing a worst-case scenario (refer *Figure 5.16.4*).

Figure 5.16.4 Parameter for Calculating the Viewshed of the Proposed Bridge



The viewshed for the Curtis Island Bridge has been classified into ZVI as detailed in *Figure 5.16.2* and shown on *Figure 5.16.6*.

Table 5.16.2 Viewshed and ZVI for the Proposed Bridge

| Distance from an observer to the project site (based on 28 m vertical field of view) | Zones of Visual Influence | | | | |
|--|--|--|--|--|--|
| >3.2 km | Visually insignificant | | | | |
| | A very small element in the viewshed, which is difficult to discern and will be invisible in some lighting or weather circumstances. | | | | |
| 3.2 - 2 km | Potentially noticeable, but not dominant in the landscape (long-distance views) | | | | |
| | The degree of visual intrusion will depend on the landscape sensitivity and the sensitivity of the viewer. | | | | |
| 2 km – 650 m | Visually evident and can dominate the landscape (middle- distance view) | | | | |
| | The degree of visual intrusion will depend on the Project and its setting within the landscape, and factors such as foreground screening, the sensitivity of the landscape and the sensitivity of the viewer. | | | | |
| < 650 m | Will be visually dominant in the landscape from m viewing locations ("close-up" view of the Project). | | | | |
| | The Project dominates the landscape in which it is sited. | | | | |





| | Project | Queen | ensland Curtis LNG Project | | Title | Zones of Visual Influence |
|--|----------------------------------|----------|----------------------------|------------------------|---------------------------------------|--|
| A BG Group business | Client QGC - A BG Group business | | | usiness | for the Proposed Curtis Island Bridge | |
| | Drawn | JF/JB | Volume 5 | Figure 5.16.6 | Discla | imer: |
| FRM | Approved | d GB | File No: 0086165t | _EIS_VA_GIS008_F5.16.6 | Maps may n | and Figures contained in this Report may be based on Third Party Data, ot to be to scale and are intended as Guides only. |
| Environmental Resources Management Australia Pty Ltd | Date | 22.04.09 | Revision 1 | | ERM | does not warrant the accuracy of any such Maps and Figures. |

16.3.4 Landscape and Visual Impact Assessment Methodology

The stages of the LVIA are briefly outlined below.

- **Desktop landscape analysis:** Geographic Information System (GIS) mapping was used to define the viewshed and Zones of Visual Influence for the LNG Facility and Curtis Island Bridge/Road. An assessment of the location of residential properties within the viewshed was undertaken based on analysis of aerial photographs.
- Literature review: Landscape values were identified based on a review of international, national, state and local designations and plans, including World Heritage values, State Scenic Coastal Landscapes, the Curtis Coast Regional Coastal Management Plan and local planning scheme requirements.
- Site assessment of the landscape analysis: A three-day site assessment was undertaken to verify the findings of the desktop landscape analysis. Publically accessible viewpoints falling within the viewshed were identified at lookouts, public parks, along public roads, from waterways in the Port of Gladstone and The Narrows. The potential visibility of the project from residential properties on islands within The Port of Gladstone was assessed from nearby locations on the water. Panoramic photographs were taken at selected public viewpoints which were identified as having the greatest visual exposure to the Project, i.e. the greatest number of structures, or part thereof, visible from public locations. These were used for the preparation of photomontages representing a worst-case scenario.
- Identification of landscape character types: The outcomes of the desktop and site assessment were used to identify, map and assess landscape character types. Landscape character types were defined on the basis of scale, characteristic landscape features, topography, drainage, land use, vegetation, existing infrastructure in the area and manmade modifications to the landscape. Landscape values attributable to each landscape character type were considered to provide a rating of sensitivity.
- **3D modelling:** A basic 3D model of the LNG Facility and the Curtis Island Bridge was prepared using a computer program (3D Max), and placed within the Digital Terrain Model (DTM) for the preparation of photo-realistic colour photomontages.
- Seen area analysis: Areas within the viewshed from which the LNG Facility and Curtis Island Bridge/Road may be visible were mapped and identified using GIS, taking into consideration the screening effect of topography based on the 5 m DTM. The screening effect of vegetation, minor topographic changes and built forms, which can be expected to further reduce the visibility of these structures, were not taken into account in the seen area analysis. The outcomes therefore reflect a conservative map of potential visibility.

16.3.5 Evaluation of the Visual Impact on Landscape Significance

The process for evaluating the visual impacts of the LNG Facility and Curtis Island Bridge on landscape significance was undertaken through both quantitative and qualitative assessment. The quantitative assessment evaluated the magnitude of change in the landscape determined through examination of GIS mapping layers, photography and photomontages as representations of the potential impact of the Project on views from the surrounding areas. The qualitative assessment, or sensitivity of the landscape to changes of visual quality and landscape character, was evaluated against the assigned values under the various policy designations and the quality of the viewpoint. This provides the basis for identifying the relative significance of changes to landscape significance.

The magnitude of change is influenced by:

- location of the proposed development in the view
- compatibility of the development with the surrounding landscape
- duration of impacts in the construction and operation phases
- scale of the development
- reversibility of change
- potential blockage of view.

The sensitivity or quality of the viewpoint is influenced by:

- the distance to the development
- the number of observers present to see the development, i.e. whether the viewpoint has one observer or many observers
- whether the observer has a permanent or temporary view of the magnitude of change, i.e. from a living room window or a passing car
- whether the observer has the opportunity for alternative views in other directions.

Designated Landscape Values

The quality of a viewpoint is also influenced by the designated landscapes values within the view, which in turn relates to the recognition and designation of community values at a policy level, i.e. the international community values in relation to World Heritage Areas or national and state community values in relation to the Areas of State Significant (scenic coastal landscapes). Designated landscape values are often assigned through a process of comparative analysis which evaluates the rarity of a landscape type and quality of the landscape in comparison to similar landscape types.

The protection and management of designated landscapes, view corridors and landscape features may include the identification of threats to those landscape values, and planning/performance criteria to minimise threatening processes.

Using these parameters and designated landscape significance, the significance of the landscape and visual impacts are defined using the following terms in *Table 5.16.3* and described in the following sections.

Table 5.16.3 Significance of Visual Impact

| | Sensitivity / Quality | | | | | | | | |
|---------------|-----------------------|-------------------|-------------------|-------------------|--|--|--|--|--|
| of | | Low | Medium | High | | | | | |
| abu | Large | Moderate | Moderate to Major | Major to Critical | | | | | |
| gnitu Char | Medium | Minor to Moderate | Moderate | Moderate to Major | | | | | |
| Maç | Small | Minor | Minor to Moderate | Moderate | | | | | |
| | Negligible | Negligible | Negligible | Negligible | | | | | |

The visual impact of the Project on landscape significance was evaluated as follows:

Negligible Significance – little or no magnitude of change from a viewpoint with low, medium or high sensitivity, i.e. minute level of effect that is barely discernable over ordinary day-to-day effects. The assessment of "negligible" impact significance is usually based on visibility. That is, the Project or its relevant components are not visible even in good weather, or would be a minute element in the view across a man-modified landscape.

Minor Significance – small level of change from a viewpoint with low to medium sensitivity/quality, i.e. adverse effects that are noticeable but will not cause any significant adverse visual impacts. In most cases, mitigation will be effective in minimising or eliminating the impact.

Moderate Significance – small magnitude of change from a viewpoint with a medium to high sensitivity/quality, and/or medium magnitude of change from a viewpoint of low to high sensitivity/quality and/or large magnitude of change from a viewpoint with low to medium sensitivity/quality. A moderate impact may warrant being brought to the attention of the decision-maker, and deserves careful attention in the decision. Dependent on the nature of the visual/landscape impact, mitigation may be effective in minimising or eliminating the impact.

Major Significance – medium magnitude of change from a viewpoint with high sensitivity/quality and/or large magnitude of change from a viewpoint of medium to high sensitivity/quality, i.e. extensive adverse effects that cannot be completely avoided, remedied or mitigated. Impact warrants being given considerable weight in the decision. Alternative designs and options may be considered.

Critical Significance – large magnitude of change from a viewpoint with high sensitivity/quality i.e. extensive adverse effects that cannot be avoided, remedied or mitigated. Impact warrants being given considerable weight in the decision. Alternative options should be considered.

16.3.6 Assessment of the Impact of Night Lighting

Light impact assessment is a means of examining the relationship between a light-sensitive receptor (such as a marine turtle, a migratory bird, or a person), its environment, and how it might be affected by the introduction of artificial light to an area.

The impacts of artificial light have been assessed according to the following methodology:

- definition and description of the proposed light source(s)
- description of the existing conditions and potential physical change to the site and surrounding areas by the proposed development
- identify the light-sensitive receptors and describe their known susceptibility to light pollution
- define the habitation of light-sensitive receptors relative to the proposed light sources
- identify potential impacts resulting from the proposed change
- recommend remediation or design measures to improve or reduce potential impacts.

16.3.7 Study Limitations

The LVIA study is based on preliminary conceptual designs for both the LNG Facility and the proposed Curtis Island Bridge. While undertaking the LVIA study at this preliminary stage in the engineering design has its benefits in that the LVIA can inform development of the engineering design, lack of engineering detail limits accurate development of the 3D models and representative photomontages. These limitations are acknowledged in the report, and the photomontages should be considered as representative views of the Project in the landscape based on preliminary designs. These limitations will not affect the overall outcome of the LVIA.

At the time of undertaking the LVIA, detailed lighting plans were not available to assess the location, direction or output of individual luminaires. As such, this assessment is based on a generalised assessment of locating industrial lighting across the LNG Facility site and the impacts on the surroundings areas.

Species identified with susceptibility to light are based on desktop research into documented knowledge of light impacts. While all effort has been made to be comprehensive, it should be recognised assessment results are based on a preliminary investigation, and further detailed analysis may be required. The general study of light pollution and its effects on wildlife is a relatively new discipline with the exception of birds and sea turtles³. Published papers on the

³ Rich and Longcore (2006) *Ecological Consequences of Artificial Night Lighting*. Island Press, USA.

subject are generally theoretical and do not specifically address artificial lighting, making it difficult to conduct comprehensive literature reviews on the subject.

16.4 LEGISLATIVE PROVISIONS

Within the viewshed, landscape values held by the community have been identified through various legislative provisions. While there is a hierarchy of significance attached to these legislative provisions, classification uses a "nested scale" where broader legislative frameworks, such as those applying to the international and national level, can be scaled down to more detailed descriptions at the local/regional scale. Hence, internationally significant values identified in the Great Barrier Reef World Heritage Area cover a large area with broad, overarching values. The detail specific to these values, as applied at the local/regional level, is provided in the regional planning policies. The following is a brief summary of the legislative provisions applicable to the study area.

16.4.1 World Heritage Listing

16.4.1.1 Great Barrier Reef World Heritage Area

The LNG Facility and the Curtis Island Bridge are located within the Great Barrier Reef World Heritage Area, which extends 2000 km along the coast of Queensland and covers approximately 35 million hectares. *Figure 5.16.7* shows that the proposed LNG Facility is also located within the administrative extent of the Great Barrier Reef World Heritage Area but outside from the Great Barrier Reef Coast Marine Park (i.e. Mackay Capricorn Management Area). The proposed Curtis Island Bridge is close to the administrative boundary of the Great Barrier Reef Coast Marine Park (Mackay Capricorn Management Area).

The listing of the Great Barrier Reef Marine Park as a World Heritage Area (WHA) is based on a number of internationally significant values, including its outstanding aesthetic attributes under *Natural Criterion (VII) – Exceptional natural beauty and aesthetic importance*, as detailed in the *Department of Environment, Water, Heritage and the Arts – Australian Heritage Database* as follows:

Criterion: (VII) Contains superlative natural phenomena

The Great Barrier Reef provides some of the most spectacular scenery on earth and is of exceptional natural beauty. The World Heritage values include:

- a. the vast extent of the reef and island systems which produce unparallelled aerial vistas
- b. islands ranging from towering forested continental islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays
- c. coastal and adjacent islands with mangrove systems of exceptional beauty
- d. the rich variety of landscapes and seascapes, including rugged mountains with dense and diverse vegetation and adjacent fringeing reefs
- e. the abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs
- f. spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies
- g. migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish.

The great diversity of landscape types across the Great Barrier Reef World Heritage Area is part of its recognised value. This diversity includes passage landscape systems such as The Narrows, and coastal islands such as Curtis Island with fringeing mangroves as described in item (c) above.

While the aesthetic importance of the Great Barrier Reef World Heritage Area is largely dependent on naturalness, the "exceptional natural beauty" common throughout the Great Barrier Reef area is punctuated in places by nodes of development, including the two large industrialised ports of Gladstone and Townsville. Within these urban/industrialised nodes, the values ascribed to the WHA do not directly apply, however the interface between natural undeveloped areas and urban areas is critical to the overall protection of WHA values. The management framework for this interface is set out in the Curtis Coast Regional Coastal Management Plan (refer Section 16.4.2.1)



Figure 5.16.7 Great Barrier Reef Administrative Boundaries

National Significance

The narrow channel between Curtis Island and the mainland known as The Narrows is listed on the Australian Heritage Commission Register of National Estate. The Statement of Significance as detailed on the Heritage database is as follows:

"The Narrows represent an uncommon passage landscape and are one of only five narrow tidal passages separating large continental islands from the mainland in Australia. Of the five passages, Pumicestone Passage and Great Sandy Strait separate large sand islands from the mainland, leaving only Hinchinbrook Channel and Howard Island (NT) as geologically comparable to The Narrows. In contrast to the subtropical Narrows, Hinchinbrook Channel and the Howard Passage are wide tropical estuaries at a much earlier stage of development.

The Narrows are also an important indicator of past geomorphological processes, as many of Queensland's headlands and coastal ranges have been joined to the mainland by sedimentation processes identical with those operating within The Narrows. The geomorphological system includes the distinctive features of Balaclava Island, Kangaroo Island, Targinie Creek, Graham Creek and The Narrows.

Balaclava Island and The Narrows are in a zone of overlap and transition between tropical and temperate littoral vegetation communities. Importantly, this determines a switch in the competitive balance between southern mangrove communities dominated bv the temperate/subtropical species, Avicennia Marina and northern mangroves dominated by the tropical species of Rhizophora. Three mangrove species are at, or near, their southern limit in the area.

The intertidal environments of Balaclava Island and The Narrows are influenced by two different hydrological systems, which interface at a tidal null point at Ramsay Crossing. The origin of the sedimentary environment of The Narrows from these two different hydrological systems has created a complex system of intertidal habitats.

The mangroves, saltmarsh and mud flats within the area are important to the maintenance of regional fish and crustacean populations. Targinie Creek is fringed by a well developed mangrove forest, and is an excellent example of a tidal channel within The Narrows. Graham Creek joins the southern end of The Narrows, and channels a significant portion of the freshwater runoff from the southern half of Curtis Island into The Narrows. The beach ridges at the southern end of Kangaroo Island contain a diverse assemblage of mangrove species."

The interface between The Narrows and the Port of Gladstone, the entrance to The Narrows, is the cadastral boundary of the Great Barrier Reef Marine Park, which runs parallel with Laird Point on Curtis Island and Friend Point/ Kangaroo Island adjoining the mainland. The significant aesthetic values of this "uncommon" passage landscape are not, however, limited to this administrative area but are continuous with the natural coastal landscape of Curtis Island fringeing the northern extent of the Port of Gladstone. Management of scenic values across this interface is detailed in the Curtis Coast Regional Coastal Management Plan (refer to Section 16.4.3.1).

16.4.2 State Significance

16.4.2.1 Curtis Coast Regional Coastal Management Plan

Areas of State Significance (Scenic Coastal Landscape) are identified in the Curtis Coast Regional Coastal Management Plan (*Map 10*) shown in *Figure 5.16.8.*

The designated areas of scenic coastal landscapes affected by the proposed Project include islands and offshore features, coastal wetlands, estuaries and inlets. The regional context section (*Section 2.7.1*) of the Curtis Coast Regional Coastal Management Plan, describes these areas as follows:

"Areas of State Significance (Scenic Coastal Landscapes) in the Curtis Coast region include the landscape features identified on Map 10. Incompatible development within these areas can adversely impact on their scenic landscape values, particularly in relation to the coastal islands, Mt Larcom and the coastal ranges and remote natural areas such as The Narrows."

"The Gladstone Region is identified to be of 'High Scenic Management Priority' with Curtis Island and the Capricorn Group being of Level 1 Scenic Quality."

The *"Desired coastal outcomes"* for Curtis Island as described in the Curtis Coast Regional Coastal Management Plan include:

"Maintenance of Curtis Island in a generally natural or non-urban state outside existing residential and tourist areas at South End, Black Head, Seal Hill and Station Point while providing opportunities for future development in appropriate locations."

And, "Development is sited and designed to protect the island's significant coastal resources and their values, including protection of the island's scenic coastal landscapes."

Future development pressures on Curtis Island are acknowledged, including the intent to develop future industry, port facilities and the proposed bridge to the mainland. Such future development in required to *"recognise the interconnectedness of coastal management issues on the island to ensure coastal resources and their values are not degraded"*.

The "Desired coastal outcomes", specific to the proposed LNG Facility within the Curtis Island Industry Precinct of the Gladstone State Development Area (south-west Curtis Island), include the requirement that future development "considers the design and location of development, ensuring any impacts on the coastal landscape values associated with the island are minimised".

The significant landscape values attributed to The Narrows are further detailed in the Curtis Coast Regional Coastal Management Plan, with the area "given the highest level of protection in recognition of its pristine state and significant coastal resources and values". In particular, the "maintenance of World Heritage values associated with the area's outstanding coastal landscape values, including its scientific values as an indicator of past geomorphic processes and its scenic amenity values".

The Areas of State Significance (Scenic Coastal Landscapes) relevant to the proposed Project are detailed in the following extracted section of *Schedule 1* of the Curtis Coast Regional Coastal Management Plan:

Figure 5.16.8 Location of the Project Within the Areas of State Significance



| Landscape | Sites | Description | Desired coastal outcomes | Measures |
|-------------------------------------|------------------|---|--|---|
| Islands and offshore features | Curtis Island | Large identifiable coastal islands close to shore and visually prominent from the mainland and harbour. These islands provide a strong structural element to the landscape and define the seaward edge of the coastal viewshed. They provide a high degree of contrast and visual diversity between intertidal and upland areas. | The landscape values of islands and their contribution to the landscape values of the Curtis Coast region are protected and maintained. Views from the mainland and viewpoints to the island are maintained and enhanced. | Ensure the development remains unobtrusive and compatible with landscape values |
| Coastal wetlands | The Narrows | Coastal wetlands in the Curtis Coast region comprise a range of mainly tidal wetlands such as mangroves, salt marsh and clay pan with some freshwater wetlands. Coastal wetlands contribute significantly to scenic quality in terms of vegetation, wildlife and naturalness. The landscape qualities of the tidal wetlands are generally appreciated from boats, access points such as boat ramps and elevated lookouts. | The landscape values and ecological integrity of coastal wetlands are maintained. The edges of mangrove vegetation in area of high scenic quality are managed to maintain or restore their visual continuity Degraded wetland areas are rehabilitated. | Minimise visual breaks in areas of continuous mangrove vegetation. Maintain existing vegetation along waterways to a maximum extent to form natural landscape edge and screen. |
| Estuaries and inlets | The Narrows | The landscape qualities of estuaries and waterways are generally appreciated from boats and access points such as jetties and boat ramps, the shoreline and elevated lookouts. Estuarine and freshwater systems are dominant in the lower reaches by mangroves, clay pans and salt marsh. Many areas have a high degree of naturalness and offer a "remote" experience. | The landscape values and ecological integrity of mangroves, inlets and waterways are maintained. The edges of mangrove vegetation in areas of high scenic quality are managed to maintain or restore their visual continuity. | Minimise visual breaks in areas of continuous vegetation. Maintain existing vegetation along waterways to a maximum extent to form a natural landscape edge and screen. Ensure infrastructure in areas of high visual quality does not obscure views to water or intrude on waterways. |

Table 5.16.4 Schedule 1 – Areas of State Significance (Scenic Coastal Landscapes)

16.4.2.2 Gladstone State Development Area

Future expansion of the Port of Gladstone either side of the Targinie Passage has been secured through the designation of the Gladstone State Development Area, in particular the Curtis Island Industrial Precinct and the Targinie Precinct, refer *Figure 5.16.9*. The proposed LNG Facility is located within the Curtis Island Industrial Precinct, which allows for High Impact Industry limited to natural gas (liquefaction and storage), Infrastructure Facility, Local Infrastructure and Materials Transport Infrastructure, with the potential for Extractive Industry and Forestry.

While this designation provides the strategic planning provisions for largescale industrial development (location and type of development), there remains the requirement for development to address the *"interconnectedness of coastal management issues"*. In particular, the landscape and visual impact of a project on designated values and the requirement to minimise impacts that may degrade these landscape values.

16.4.3 Local Planning Schemes

The LNG Facility site is located within the former Calliope Shire Planning Scheme's Rural Locality, however, policies within this zone are superseded by the Gladstone State Development Area designation.

The former Gladstone City Council Planning scheme does not encompass the LNG Facility site, however, planning policies refer to the landscape values attributable to the coastal hinterland and reiterate the Curtis Coast Regional Coastal Management Plan's requirement to ensure development is compatible with these values.

16.5 EXISTING LANDSCAPE CHARACTER AND SENSITIVITY

This section defines the existing landscape character and sensitivity of the study area within which the LNG Facility and the Curtis Island Bridge are proposed to provide the baseline against which impacts are assessed.



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 KP
 Volume 5
 Figure 5.16.9
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5

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16.5.1 Landscape Character

The classification of landscape character types is based on the identification of areas with similar visual characteristics in terms of topography, geological features, soil, vegetation and land use. Based on these characteristics, seven landscape character types have been identified within the study area, as follows:

- eucalyptus woodlands/forest on undulating to hilly terrain
- mountainous hills and ridges
- undulating rural landscapes
- industrial landscapes
- urban landscapes
- estuarine landscapes
- waterways.

The location of these landscape character types are mapped *Figure 5.16.10* to *Figure 5.16.16* below and described in the LVIA in *Appendix 5.18*.

Figure 5.16.10 Location of Eucalyptus Woodland / Forest on Undulating to Hilly Terrain





Figure 5.16.11 Location of Mountainous Hills and Ridges

Figure 5.16.12 Location of Rural Undulating Landscape







Figure 5.16.14 Location of Urban Landscape





Figure 5.16.15 Location of Estuarine Landscape

Figure 5.16.16 Location of Waterways



16.5.2 Landscape Sensitivity

Landscape sensitivity refers to the extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects to existing visual quality and landscape character. The extent to which a landscape can accept such change is dependent on both the physical characteristics of the landscape and the relative importance of the landscape values identified within each landscape character type.

Table 5.16.5 summarises the landscape sensitivity of the various landscape character types within the viewshed.

| Landscape character type | Level of importance* | Scenic values* | Landscape sensitivity* | | |
|--|--|--|---------------------------|--|--|
| Eucalyptus woodlands/forests on undulating to hilly terrain | State/regional | State significance in relation to Curtis Island and regional significance in relation to the mainland areas | High | | |
| Mountainous hills and ridges | State/regional | State significance | High | | |
| Undulating Rural Landscape | Local | Low | Low | | |
| Industrial landscape | None | None | Low | | |
| Urban landscape | None | None | Low | | |
| Estuarine Landscapes | International/ national and state/regional | When forming part of The Narrows: international/national significance | High | | |
| | | Port of Gladstone areas – state/regional significance | | | |
| Waterways | International/ national and state/regional | When forming part of The Narrows: international/national significance | High | | |
| | | Port of Gladstone areas – state/regional significance | | | |
| * Refer Section 16.3 for criteria for assigning landscape sensitivity and scenic amenity values. | | | | | |

Table 5.16.5 Landscape Sensitivity

16.6 IMPACT ASSESSMENT

This section summarises the results of the LVIA for the LNG Facility and Curtis Island Bridge. As previously discussed, the evaluation of impact significance took into account the international and legislative designations applicable to the study area, as well as the sensitivity of different landscape character types.

16.6.1 Seen Area Analysis Results

The seen area analysis was based on the design parameters defined in *Section 16.3.1* for the LNG Facility (including the loading berth) and *Section 16.3.2.1* for Curtis Island Bridge.

16.6.1.1 Areas from which the LNG Facility is Potentially Visible

Figure 5.16.17 shows the GIS-based mapping of visibility of the LNG Facility. These zones represent the number of structural elements potentially visible, where dark blue represents the greatest number of elements visible, through light blue representing the least number of structures visible.

The pattern of potential visibility across the viewshed correlates to the landform. Assessment of the mapping identifies the following key findings:

- The zone of greatest potential visibility of the LNG Facility is the adjoining waterways and channel running north-west to south-east through the study area.
- The linear ridge to the east of the LNG Facility site extending north from Ship Hill effectively blocks views towards the proposed LNG Facility from the Curtis Island Environmental Management Precinct and the settlement of South End to the east.
- The LNG Facility is not visible from Curtis Island National Park due to the distance from the site and intervening topography.
- The majority of the LNG Facility will not be visible from the waters of the Port of Gladstone and the outlying islands in this area. The tallest element of the LNG Facility (flare stacks) may be visible.
- The majority of Gladstone's urban areas will not have views of the proposed LNG Facility. Localised patches of potential visibility are located on elevated ground around Radar Hill and residential areas to the west. The distance from these areas to the proposed LNG Facility is approximately 11 km and therefore outside the distance at which the tallest element in the proposed plant will be visually significant.
- Port Curtis Way and Targinie foreshore have a high potential visibility of the proposed LNG Facility.
- The proposed road along Targinie foreshore will have a high potential visibility of the proposed LNG Facility.
- The hills and ridges of the Mount Larcom ranges block all views of the proposed Project to the west of the study area.
- Potential visibility of the LNG Facility extends north along the low-lying land adjoining The Narrows.
- The tallest elements of the LNG Facility are potentially visible from The Narrows channel, however the visual influence of these elements in the landscape is likely to only affect the entrance to the channels as distances from the entrance north exceed the 7 km sphere of visual significance.

16.6.1.2 Areas from which the Proposed LNG Loading Berth is Potentially Visible

Figure 5.16.18 shows the GIS-based mapping of visibility of the LNG loading berth. Since the proposed LNG loading berth is a relatively simple structure, only potential visible or not visible zones have been identified.

The pattern of potential visibility across the ZVI for the proposed LNG loading berth has been mapped and the following key findings identified:

- Potential visibility is very similar to other elements of the LNG Facility, indicating the loading berth is not significantly more visible than the other land-based elements of the LNG Facility.
- The location of the loading berth extending into the waters of Port of Gladstone increases the visibility of the LNG Facility from the waters north of The Narrows passage entrance. This visibility is unlikely to be significant as a result of the distance to The Narrows entrance, which exceeds the zone of visual influence at which the loading berth will have any significant visual influence.

16.6.1.3 Areas from which the Proposed Curtis Island Bridge is Potentially Visible

Figure 5.16.19 shows the GIS-based mapping of visibility of the proposed bridge. Since the proposed bridge and approach road are relatively simple structures compared with the proposed LNG Facility, only potentially visible or not visible zones have been identified.

The pattern of potential visibility across the viewshed for the proposed bridge has been mapped and the following key findings identified:

- The zone of greatest potential visibility of the proposed bridge is similar to the LNG Facility, in that it extends in a north-west to south-east direction, consistent with the alignment of the channel and ridgelines.
- Visibility of the proposed bridge from Curtis Island is limited to the immediate shoreline and extending along Graham Creek. Potential views from ridgelines on Curtis Island within close proximity to the site may be possible, however these locations are not accessible to the public.
- The proposed bridge is not visible from Curtis Island National Park due to the distance from the bridge to the park and intervening topography.
- Areas of potential visibility are indicated as extending north-east along the visual sightline of Graham Creek to the eastern side of Curtis Island. This is unlikely given the height of the bridge relative to the height of adjoining vegetation, which has not been included in the GIS model. This area is also well outside the extent of visual influence and therefore will not be significant.
- The proposed bridge will not be visible from the waters north of The Port of Gladstone and the outlying islands in this area.

- The majority of Gladstone's urban areas will not have views of the proposed bridge. In addition, areas which may have views will not be significantly affected by the proposed bridge due to the distance, which exceeds 10km.
- Port Curtis Way may potentially have views of the proposed bridge. However, as a result of the relatively low profile of the bridge, the impact will not be visually significant.
- The hills and ridges of the Mount Larcom ranges block all views of the proposed bridge to the west of the study area.
- Few areas of Targinie will have views of the bridge with the exception of the shoreline.
- The Targinie shoreline will have views of the approach road and bridge.
- The location of the bridge spanning the entrance to The Narrows, will have a visual impact on The Narrows passage landscape within the immediate vicinity of the bridge. However, the visual influence of the bridge on the passage landscape is likely to only affect the entrance to the channels and will not be visually significant beyond the 3.2 km sphere of visual influence.

16.6.1.4 Areas from which the Proposed LNG Facility and Curtis Island Bridge are Potentially Visible

The combined visibility mapping of the LNG Facility and the Curtis Island Bridge is shown in *Figure 5.16.20*.

The combined mapping of potential visibility across the viewshed confirms the areas of greatest potential visibility include the waters of the Port of Gladstone and The Narrows immediately adjacent to the proposed LNG Facility and the bridge. Targinie foreshore and areas extending inland to a distance of approximately 5 km also potentially have views of both structures. However, the screening potential of vegetation within these areas is likely to reduce this visibility significantly.

The linear ridgeline to the east of the site effectively blocks all views of both the LNG Facility and the bridge from the majority of Curtis Island.

Some areas of Gladstone potentially have views of both the LNG Facility and the bridge, however the distance between these structures and Gladstone renders them relatively insignificant.

16.6.1.5 Summary of the Seen Area (Visibility) Analysis

The visibility analysis shows that within a 7 km radius of the proposed LNG Facility (the approximate distance at which the tallest LNG structures becomes potentially noticeable in the landscape), the main areas of visibility comprise the waters of the Port of Gladstone, The Narrows, Targinie foreshore, and the industrialised waterfront land of Gladstone. Within 4.2 km of the site, (the approximate distance at which the tallest of the structures becomes visually

evident and can dominate the landscape), potential visibility of the Project is reduced to the waters of Port of Gladstone, the entrance to The Narrows, and only a section of Targinie Foreshore, in particular Fisherman's Landing and the shoreline extending to Friend Point (the proposed route of the approach road to the Curtis Island Bridge).

The GIS mapping confirmed the proposed LNG Facility would not be visible from the majority of Curtis Island due to the linear ridgeline running along the boundary of the Curtis Island Industrial Precinct and protecting the Curtis Island Environmental Management Precinct from visual impact to the east.

The mapping also confirmed the majority of Gladstone's urban areas will not have views of the LNG Facility or the Curtis Island Bridge, and any potential views will not be significantly affected due to the distance from the proposed Project.

These findings have been further tested on site through the selection and assessment of publicly accessible viewpoints.

16.6.2 Assessment of Visual Impacts During Construction

Construction, site clearing and bulk earthworks will be required over an area of approximately 300 hectares. It is expected that a large proportion of the construction workforce will be housed in a construction camp to be established on Curtis Island. The construction activities for the different stages of construction relevant to this assessment are outlined in *Volume 2, Chapter 13* and in the full LVIA attached as *Appendix 5.18*.

Stage 1 (Site Preparation) has the potential for a high level of visual impact. This will be due to the noticeable and permanent visual change associated with the removal of vegetation and presence of construction equipment and infrastructure.

Due to the construction activity and permanent visual change associated with the erection of permanent structures, Stage 2 (Civil Work, Foundations and Structures) and Stage 3 (Mechanical and Electrical Installation) also have the potential for a high level of visual impact from areas that can see the site.

Other than ongoing construction activity, there will be no additional visual impact during Stage 4 (Systems Strength and Integrity Testing) and Stage 5 (Commissioning of the LNG Facility) beyond that discussed in the previous stages.



| | Project Queensland Curtis LNG Project | | Title Visibility of the LNG Facility |
|--|---------------------------------------|--|--|
| A BG Group business | Client QGC - | A BG Group business | |
| | Drawn JF/JB | Volume 5 Figure 5.16.17 | Disclaimer: |
| FRM | Approved GB | File No: 0086165b_EIS_VA_GIS010_F5.16.17 | Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. |
| Environmental Resources Management Australia Pty Ltd | Date 24.04.09 | Revision 1 | ERM does not warrant the accuracy of any such Maps and Figures. |



| | Project Queensland Curtis LNG Project | | Title Visibility of LNG Loading Berth |
|--|---------------------------------------|--|--|
| A BG Group business | Client QGC - | A BG Group business | |
| | Drawn JF/JB | Volume 5 Figure 5.16.18 | Disclaimer: |
| FRM | Approved GB | File No: 0086165b_EIS_VA_GIS015_F5.16.18 | Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. |
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| OUEENSLAND CURTIS LNG | Project Queen | sland Curtis LNG Project | ^{Title} Visibility of Proposed Curtis Island Bridge |
|--|---------------|--|--|
| A BG Group business | Client QGC - | A BG Group business | |
| | Drawn JF/JB | Volume 5 Figure 5.16.19 | Disclaimer: |
| FRM | Approved GB | File No: 0086165b_EIS_VA_GIS009_F5.16.19 | Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. |
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| | Project | Queen | nsland Curtis LNG Project | | Title | Combined Visibility of the LNG Facility |
|--|----------------------------------|----------|---------------------------|--------------------------|-----------------------------------|--|
| A BG Group business | Client QGC - A BG Group business | | | business | and Proposed Curtis Island Bridge | |
| | Drawn | JF/JB | Volume 5 | Figure 5.16.20 | Disclai | imer: |
| FRM | Approved | GB | File No: 0086165 | b_EIS_VA_GIS012_F5.16.20 | Maps a may n | and Figures contained in this Report may be based on Third Party Data, ot to be to scale and are intended as Guides only. |
| Environmental Resources Management Australia Pty Ltd | Date | 24.04.09 | Revision 1 | | ERM o | loes not warrant the accuracy of any such Maps and Figures. |

16.6.3 Assessment of Visual Impacts from Publicly Accessible Viewpoints in Gladstone and Surrounding Areas

The selection of publicly accessible viewpoints provides representative views of the LNG Facility, Curtis Island Bridge and the approach road from publicly accessible locations within the viewshed. The selected viewpoints include all public lookouts within Gladstone with views northwards towards the LNG Facility site and proposed bridge location. Views were also assessed from publicly accessible roads in Gladstone and the Targinie area. The viewpoints selected represent a reasonable range of views upon which to evaluate the likely visual impact of the proposed structures on public viewpoints.

The following eight viewpoints locations were selected for Gladstone and surrounding areas (refer *Figure 5.16.21*). These viewpoints are described and illustrated in the LVIA in *Appendix 5.18*.

| VP1 | Auckland Point Lookout | VP5 | Round Hill Lookout |
|-----|------------------------|-----|-----------------------------------|
| VP2 | Spinnaker Park | VP6 | Port Curtis Highway |
| VP3 | Goondoon St, Gladstone | VP7 | Port Curtis Way at Calliope River |

- VP4 Radar Hill
- **VP8** Targinie Foreshore

The assessment of visual impacts from these publicly accessible viewpoints took into account the landscape character, scenic values and visual quality within the viewshed and their capacity to absorb the potential visual changes associated with the LNG Facility and Curtis Island Bridge both during construction and operation. Results of the assessment are summarised in the text below and in *Table 5.16.6* to *Table 5.16.13*.

16.6.3.1 Viewpoint 1 – Auckland Point Lookout

Views of the proposed LNG Facility from this location will largely be screened by intervening topography and vegetation to the south-east of the site, including Hamilton Point. The proposed Curtis Island Bridge at 14 km from this location may be visible during clear weather, however this visibility will be limited to a thin line on the horizon with no discernable impact on the visual quality of The Narrows landscape from this location. The magnitude of change in the landscape from this vantage point is therefore small as a result of the limited visibility and distance.

16.6.3.2 Viewpoint 2 – Spinnaker Park

The scenic values of Curtis Island and the waters of the Port of Gladstone are evident from this location, although affected by the industrialised waterfront of the port. The proposed LNG Facility and Curtis Island Bridge will not be visible from this location due to the screening of views to the north-east by the RG Tanna Coal Terminal. In addition, proposed expansion of port facilities, notably Wiggins Island Coal Terminal, which is proposed to the north-east of the existing structures, will further block views towards the LNG Facility and bridge from this location.



Figure 5.16.21 Selected Viewpoints from Publicly Accessible Locations in Gladstone and Surrounding Areas

The landscape sensitivity of this location is high. However as the Project results in no change to the visual quality of the location, there is no alteration to landscape values.

16.6.3.3 Viewpoint 3 – Goondoon Street, Gladstone

The proposed LNG Facility is located approximately 10km to the north of this viewpoint, and will be screened from the town by topography and intervening port facilities which form a buffer between the urban/retail areas of Gladstone City and the waterfront. The proposed Curtis Island Bridge will also not be visible from this location due to the distance (15 km).

As the LNG Facility and the bridge will not be visible from this location, there is no change to visual quality or alteration to landscape values.

16.6.3.4 Viewpoint 4 – Radar Hill

This viewpoint and adjacent residential areas was identified in the Seen Area Analysis as potentially having views of the LNG Facility site and the bridge. Evaluation of the view from this elevated location indicate the proposed
LNG Facility and Curtis Island Bridge will not significantly affect visual quality due to the distance to these sites, intervening topography and industrial/port facilities in the Port of Gladstone.

The magnitude of change on the sensitive landscape areas of Curtis Island and The Narrows is negligible.

16.6.3.5 Viewpoint 5 – Round Hill Lookout

The site for the proposed LNG Facility is 11.8 km from this viewpoint. The tallest of the LNG structures will be visible from this viewpoint due to the angle of viewing from higher ground reducing the screening potential of topography and vegetation. However, at this distance the visual impact is low. The reflectivity of construction materials used for major elements such as the LNG tanks is likely to influence visibility. Similarly, the proposed Curtis Island Bridge will be visible as a thin line on the horizon, however at 16 km this will have minimal visual impact on the landscape quality from this viewpoint. In addition, the major port infrastructure already visible along the waterfront will increase as a result of future approved development within the Port of Gladstone, including the proposed Wiggins Island Coal Terminal.

While this panoramic view encompasses a wide expanse of highly sensitive landscape areas extending across the horizon, the foreground and middleground views are of moderate to low visual quality. Construction of the LNG Facility on Curtis Island will result in a permanent change in the landscape character, however from this distance the visual impact will not be significant.

16.6.3.6 Viewpoint 6 – Port Curtis Highway

The site for the proposed LNG Facility is 8.7 km from this viewpoint. The proposed LNG Facility may be visible from this direction as a slight visual change in the background of the view. Since the majority of this view is industrialised landscape with low visual quality the impact of a slight change in the distance will not have a significant impact on landscape values.

16.6.3.7 Viewpoint 7 – Port Curtis Way at Calliope River Anabranch Bridge

The site for the proposed LNG Facility is 7.2 km from this viewpoint. The LNG Facility may be visible from this direction but visibility will be limited due to intervening topography and vegetation. In addition, future major industry proposed for the reclaimed land to the north of the Anabranch will modify the existing view to a more industrialised character and screen views to Curtis Island from this location.

Construction of the LNG Facility on Curtis Island will result in a negligible to minor change to the visual quality of the landscape from this viewpoint. The proposed bridge across The Narrows will not be visible from this location.

16.6.3.8 Viewpoint 8 – Unnamed Track along Targinie Foreshore

This viewpoint is directly opposite the proposed LNG Facility on Curtis Island and close to the alignment of the proposed approach road to the Curtis Island Bridge. The proposed LNG Facility will be visible from this location. The closest structure, at a distance of about 4 km, will be the marine loading berth. The main LNG Plant will be set back behind the line of mangroves, which are to be retained where possible along the intertidal zone. This will assist in reducing the impact of the proposed LNG Facility on the water's edge. The visual bulk of the proposed LNG Facility will also be set below the vegetated ridgeline of Ship Hill and therefore not intrude onto the skyline. The proposed bridge will be visible at a distance of 3.5 km from this location at the entrance to The Narrows.

Existing development on Fisherman's Landing affects views from this location. The visual impact of industrial structures extending above the skyline creates prominent elements in the landscape and this, in conjunction with the manmodified water's edge of Fisherman's Landing, creates a significant impact in the immediate area.

The visual impact of the proposed Project in the landscape has been represented in the photomontages prepared for this location, refer *Figure 5.16.22* and *Figure 5.16.22*.

The magnitude of change in the landscape as a result of the construction and operation of the LNG Facility has been rated as medium due the low profile of the structures in relation to the ridgeline in the background, the retention of the natural shoreline (in part) and the presence of existing industry within the viewshed. The proposed bridge has also been rated as medium as it conforms to similar criteria.

Table 5.16.6 Visual Impacts from Viewpoint 1 – Auckland Point

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|----------------------|---------------------------|---------------------------|
| Landscape sensitivity | High | High | High |
| Viewer numbers | High | High | High |
| Distance to nearest Project structures | Approx. 8.5 km south | Low | Low |
| Visibility of the Project structure (LNG Facility) | Limited | Low | Low |
| Visibility of the Project structure (Bridge) | Limited | Low | Low |
| Magnitude of change (LNG Facility) | Negligible | Negligible | Negligible |
| Magnitude of change (Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG Facility – Negligible | LNG Facility – Negligible |
| | | Bridge – Negligible | Bridge – Negligible |

Table 5.16.7 Visual Impacts from Viewpoint 2 – Spinnaker Park

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|---|---------------------------|---------------------------|
| Landscape sensitivity | High but affected by intrusive industrial development | Moderate | Moderate |
| Viewer numbers | High | High | High |
| Distance to nearest Project structures | Approx. 8 km | Low | Low |
| Visibility of the Project structure (LNG Facility) | Negligible | Negligible | Negligible |
| Visibility of the Project structure (Bridge) | Negligible | Negligible | Negligible |
| Magnitude of change (LNG Facility) | Negligible | Negligible | Negligible |
| Magnitude of change (Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG Facility – Negligible | LNG Facility - Negligible |
| | | Bridge – Negligible | Bridge – Negligible |

Table 5.16.8 Visual Impacts from Viewpoint 3 – Goondoon Street, Gladstone

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|---------------|---------------------------|---------------------------|
| Landscape sensitivity | Low | Low | Low |
| Viewer numbers | High | High | High |
| Distance to nearest Project structures | Approx. 10 km | Low | Low |
| Visibility of the Project structure (LNG Facility) | Negligible | Negligible | Negligible |
| Visibility of the Project structure (Bridge) | Negligible | Negligible | Negligible |
| Magnitude of change (LNG Facility) | Negligible | Negligible | Negligible |
| Magnitude of change (Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG Facility – Negligible | LNG Facility – Negligible |
| | | Bridge – Negligible | Bridge – Negligible |

Table 5.16.9 Visual Impacts from Viewpoint 4 – Radar Hill

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|---------------|---------------------------|---------------------------|
| Landscape sensitivity | Low | Low | Low |
| Viewer numbers | High | High | High |
| Distance to nearest Project structures | Approx. 10 km | Low | Low |
| Visibility of the Project structure (LNG Facility) | Limited | Low | Low |
| Visibility of the Project structure (Bridge) | Negligible | Negligible | Negligible |
| Magnitude of change (LNG Facility) | Negligible | Negligible | Negligible |
| Magnitude of change (Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG Facility – Negligible | LNG Facility – Negligible |
| | | Bridge – Negligible | Bridge – Negligible |

Table 5.16.10 Visual Impacts from Viewpoint 5 – Round Hill

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|---|----------------------------------|----------------------------------|
| Landscape sensitivity | Majority of the areas is low, with high sensitivity in the background | Medium | Medium |
| Viewer numbers | High | High | High |
| Distance to nearest Project structures | Approx. 11 km | Low | Low |
| Visibility of the Project structure (LNG Facility) | Limited | Low | Low |
| Visibility of the Project structure (Bridge) | Low | Low | Low |
| Magnitude of change (LNG Facility) | Small | Small | Small |
| Magnitude of change (Bridge) | Small | Small | Small |
| Overall significance of the visual impact | | LNG Facility – Minor to Moderate | LNG Facility – Minor to Moderate |
| | | Bridge – Minor to Moderate | Bridge – Minor to Moderate |

Table 5.16.11 Visual Impacts from Viewpoint 6 – Port Curtis Highway

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|--------------|---------------------------|------------------------|
| Landscape sensitivity | Low | Low | Low |
| Viewer numbers | High | High | High |
| Distance to nearest Project structures | Approx. 9 km | Moderate | Moderate |
| Visibility of the Project structure (LNG Facility) | Limited | Low | Low |
| Visibility of the Project structure (Bridge) | Negligible | Negligible | Negligible |
| Magnitude of change (LNG Facility) | Small | Negligible | Small |
| Magnitude of change (Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG Facility – Negligible | LNG Facility – Minor |
| | | Bridge – Negligible | Bridge – Negligible |

Table 5.16.12 Visual Impacts from Viewpoint 7 – Port Curtis Way at Calliope River Anabranch Bridge

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|--------------|---------------------------|------------------------|
| Landscape sensitivity | Low | Low | Low |
| Viewer numbers | High | High | High |
| Distance to nearest Project structures | Approx. 7 km | Moderate | Moderate |
| Visibility of the Project structure (LNG Facility) | Limited | Low | Low |
| Visibility of the Project structure (Bridge) | Negligible | Negligible | Negligible |
| Magnitude of change (LNG Facility) | Small | Negligible | Small |
| Magnitude of change (Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG Facility – Negligible | LNG Facility – Minor |
| | | Bridge – Negligible | Bridge – Negligible |

Table 5.16.13 Visual Impacts from Viewpoint 8 – Unnamed Track along Targinie Foreshore

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|-----------------------------------|----------------------------------|----------------------------------|
| Landscape sensitivity | High with some intrusive industry | High | High |
| Viewer numbers | Low | Low | Low |
| Distance to nearest Project structures | Approx. 4 km | High | High |
| Visibility of the Project structure (LNG Facility) | High | High | High |
| Visibility of the Project structure (Bridge) | High | High | High |
| Magnitude of change (LNG Facility) | Medium | Medium | Medium |
| Magnitude of change (Bridge) | Medium | Medium | Medium |
| Overall significance of the visual impact | | LNG Facility – Moderate to Major | LNG Facility – Moderate to Major |
| | | Bridge – Moderate to Major | Bridge – Moderate to Major |

Figure 5.16.22 Photomontage of the Proposed LNG Facility from Targinie Foreshore (Viewpoint 8)



Figure 5.16.23 Photomontage of the Proposed Curtis Island Bridge from Targinie Foreshore (Viewpoint 8)



16.6.3.9 Summary of Visual Impact Significance of the Project from Publicly Accessible Viewpoints in Gladstone and Surrounding Areas

The landscape sensitivity and magnitude of change resulting from the construction and operation of the LNG Facility and the Curtis Island Bridge, and the significance of the visual impact has been summarised in *Table 5.16.14* and *Table 5.16.15*.

Table 5.16.14 Summary of Visual Impact Significance from Publicly Accessible Viewpoints during the Construction Phase

| Viewpoint | Location | Impact Significance – LNG Facility | Impact Significance – Bridge |
|-----------|--------------------------------------|---------------------------------------|---------------------------------|
| VP 1 | Auckland Point | Negligible | Negligible |
| VP 2 | Spinnaker Park | Negligible | Negligible |
| VP 3 | Goodoon St, Gladstone | Negligible | Negligible |
| VP 4 | Radar Hill | Negligible | Negligible |
| VP 5 | Round Hill | Minor to Moderate | Minor to Moderate |
| VP 6 | Port Curtis Way | Negligible | Negligible |
| VP 7 | Port Curtis Way at Calliope River | Negligible | Negligible |
| VP 8 | Unnamed track Targinie Foreshore | Moderate to Major | Moderate to Major |

Table 5.16.15 Summary of Visual Impact Significance from Publicly AccessibleViewpoints during the Operations Phase

| Viewneint Leastien | Leastian | Impact Significance | Impact Significance |
|--------------------|-------------------------------------|---------------------|---------------------|
| viewpoint | viewpoint Location | LNG Facility | Bridge |
| VP 1 | Auckland Point | Negligible | Negligible |
| VP 2 | Spinnaker Park | Negligible | Negligible |
| VP 3 | Goodoon St, Gladstone | Negligible | Negligible |
| VP 4 | Radar Hill | Negligible | Negligible |
| VP 5 | Round Hill | Minor to Moderate | Minor to Moderate |
| VP 6 | Port Curtis Way | Minor | Negligible |
| VP 7 | Port Curtis Way at Calliope River | Minor | Negligible |
| VP 8 | Unnamed track Targinie Foreshore | Moderate to Major | Moderate to Major |

16.6.4 Assessment of Visual Impacts from Surrounding Waterways

The spectacular scenery of the Great Barrier Reef Marine Park is often most easily appreciated from the water. Tourism and recreational boating in particular are important vehicles for people's appreciation of the landscape values from the waterways of the Port of Gladstone. While not everyone has access to the water, those people who do travel on the waterways for recreation generally place a high degree of significance on the landscape qualities of the area. The pristine natural landscape of The Narrows passage as experienced from the water is an important consideration, as is the interface between The Narrows and the Port of Gladstone.

Eight viewpoint locations were selected from the adjoining waterways shown on *Figure 5.16.24* These viewpoints are described and illustrated in the LVIA in *Appendix 5.18.*

- VP 9 Port of Gladstone adjoining North Passage Island
- VP 10 The Narrows 500 m south of proposed bridge
- VP 11 The Narrows 1 km north of proposed bridge
- VP 12 The Narrows 5 km north of proposed bridge
- VP 13 Turtle Island
- VP 14 Witt Island
- VP 15 Tide Island
- VP 16 The Port of Gladstone Channel

The assessment of visual impacts from surrounding waterways took into account the landscape character, scenic values and visual quality within the viewshed and its capacity to absorb the potential visual changes associated with the LNG Facility and Curtis Island Bridge both during construction and operation. Results of the assessment are summarised in the text below and in *Table 5.16.16* to *Table 5.16.23*.

16.6.4.1 Viewpoint 9 – Port of Gladstone Adjoining North Passage Island

The proposed LNG Facility will be clearly visible from this location and likely to be visually dominant given the close proximity of the viewpoint within 1 km of the LNG Facility site. A photomontage of the proposed LNG Facility has been prepared from this location, refer Figure 5.16.25.

The magnitude of change in the landscape as a result of the construction and operation of the LNG Facility has been rated as medium to large as, although the Project retains some of the natural shoreline and the presence of existing industry within the viewshed moderates the sensitivity, the LNG tanks from this direction are higher than the ridgeline in the background hence breaching the horizon. This interruption of the skyline increases the prominence of the LNG Facility in the landscape and hence the rating has been increased as a result of this impact.



Figure 5.16.24 Selected Viewpoints from Adjoining Waterways

Views north from this viewpoint will include the bridge, similar to those shown in VP 10 (refer *Figure 5.16.26*) and will have a major level of visual significance.

16.6.4.2 Viewpoint 10 – The Narrows 500 m South of the Proposed Bridge Crossing

The proposed Curtis Island Bridge will visually dominate the landscape from this location. A photomontage of the proposed bridge has been prepared for this location (refer *Figure 5.16.26*).

The magnitude of change in the landscape as a result of the construction and operation of the bridge across The Narrows has been rated as large as a result of: the scale of the bridge, the incompatibility of the structure in the landscape, prominence of the structure across the skyline and the operational impacts of traffic, in particular heavy transport vehicles on the landscape values. This, in combination with the significant landscape values of The Narrows' national recognition as a place of wilderness and pristine natural state, results in the impact of the proposed bridge on visual quality and landscape values as being rated as having major to critical significance.

Views south from this viewpoint will include the LNG Facility, similar to those shown in VP 11 (refer *Figure 5.16.27* and *Figure 5.16.28*) and will have a medium magnitude of change in the landscape, and results in a moderate to major impact significance.

16.6.4.3 Viewpoint 11 – The Narrows 1 km North of the Proposed Bridge Crossing

The proposed bridge across The Narrows entrance will be clearly visible from this location and may dominate the view due to the close proximity of the viewpoint. The LNG Facility on Curtis Island will also be visible in the background. A photomontage of the proposed bridge and LNG Facility has been prepared (refer *Figure 5.16.27* and *Figure 5.16.28*).

As for the previous viewpoint (VP 10), the magnitude of change in the landscape as a result of the construction and operation of the bridge across The Narrows has been rated as large.

The sensitivity of the landscape is rated as medium to high as a result of the impacts of existing large-scale industry on the visual quality and landscape values of the area. The landscape impact of the bridge when viewed against the backdrop of the Port of Gladstone has been rated as major to critical.

The visual impact of the LNG Facility is rated as moderate as although the view of the proposed plant is similar to Viewpoint 9, the LNG Facility has a lower profile in the landscape and is viewed from a greater distance, hence reducing the scale of impact.

16.6.4.4 Viewpoint 12 – The Narrows 5 km North of Proposed Bridge Crossing

The proposed bridge across The Narrows entrance will be visible from this location, however, at 5 km away, the visual influence will not be significant. The magnitude of change in the landscape as a result of the construction and operation of the bridge has been rated as small. This rating results from the reduced scale of the bridge in the landscape although the compatibility of the structure across The Narrows entrance remains intrusive.

The LNG Facility is not visible from this location therefore the visual impact is negligible.

16.6.4.5 Viewpoint 13 – Turtle Island

The visibility analysis indicated a number of the taller LNG structures may potentially be visible from this location. The flare stacks at 59.4 m (RL 65.4 m AHD) are higher than the adjoining ridgeline when viewed from this direction as a result of a low point in the crest of the ridge of approx 45 AHD. These ridges are vegetated with eucalyptus woodland to an approximate height of 15 to 20 m, which would increase the screening potential to approximately 60 to 65 m AHD.

The flare stacks may therefore be slightly visible above the wooded ridgeline, however, this visual impact will result in a small magnitude of change in the landscape. The one residential property on the island faces north-east, and is screened from the proposed LNG Facility and Curtis Island Bridge by intervening topography. The high landscape sensitivity, low number of viewers and low magnitude of change results in a minor significance of visual impact.

16.6.4.6 Viewpoint 14 – Witt Island

Views from the north-eastern side of Witt Island are similar to those from Turtle Island, except the view range to Curtis Island is shorter. The flare stacks of the LNG Facility may potentially be visible above the tree line but this alteration in the landscape will be slight. The one residential property on the island faces north-east, and is screened from the proposed LNG Facility and Curtis Island Bridge.

The high landscape sensitivity, low number of viewers and small magnitude of change results in a minor significance of visual impact for the LNG Facility during operation.

16.6.4.7 Viewpoint 15 – Tide Island

Views from the north-eastern side of Tide Island are similar to previous viewpoints (VP 13 & 14), except the close proximity of Curtis Island and in particular Hamilton Point provide a greater level of screening, effectively blocking views of the proposed LNG Facility and proposed bridge.

The residential property on the island faces east, and does not have views towards the LNG Facility or the Curtis Island Bridge.

The screening provided by Hamilton Point results in a negligible visual impact for the LNG Facility during construction and operation from this viewpoint.

16.6.4.8 Viewpoint 16 – The Port of Gladstone Channel

This viewpoint is approximately on the cruise route of the ferry to South End and Heron Island. The LNG Facility and proposed bridge will not be visible from this location as a result of intervening topography on Curtis Island.

The proposed project will result in no magnitude of change in the landscape and negligible visual impact.

Table 5.16.16 Visual Impact from Viewpoint 9 – Port Curtis Adjoining North Passage Island

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|-------------|----------------------------|----------------------------|
| Landscape sensitivity | High | High | High |
| Viewer numbers | Low | Low | Low |
| Distance to nearest project structures | Approx. 1km | High | High |
| Visibility of the Project structure (LNG Facility) | High | High | High |
| Visibility of the Project structure (Bridge) | High | High | High |
| Magnitude of change (LNG Facility) | Large | Large | Large |
| Magnitude of change (Bridge) | Large | Large | Large |
| Overall significance of the visual impact | | LNG Facility – Major | LNG Facility – Major |
| | | Bridge – Major to Critical | Bridge – Major to Critical |

Figure 5.16.25 Photomontage of Proposed LNG Facility from North Passage Island (Viewpoint 9)



Table 5.16.17 Visual Impact from Viewpoint 10 – The Narrows 500 m South of the Proposed Bridge Crossing

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|---------------|----------------------------------|----------------------------------|
| Landscape sensitivity | High | High | High |
| Viewer numbers | Low | Low | Low |
| Distance to nearest project structures | Approx. 500 m | High | High |
| Visibility of the Project structure (LNG Facility) | Moderate | Moderate | Moderate |
| Visibility of the Project structure (Bridge) | High | High | High |
| Magnitude of change (LNG Facility) | Medium | Medium | Medium |
| Magnitude of change (Bridge) | Large | Large | Large |
| Overall significance of the visual impact | | LNG Facility – Moderate to Major | LNG Facility – Moderate to Major |
| | | Bridge – Major | Bridge – Major |

Figure 5.16.26 Photomontage of Proposed Bridge Looking North from Viewpoint 10



Table 5.16.18 Visual Impact from Viewpoint 11 – The Narrows 1 km North of the Proposed Bridge Crossing

| Item | Description | Evaluation (Construction) | Evaluation (Operation) | |
|--|--------------|----------------------------------|----------------------------------|--|
| Landscape sensitivity | Medium/High | Medium/High | Medium/High | |
| Viewer numbers | Low | Low | Low | |
| Distance to nearest project structures | Approx. 1 km | High | High | |
| Visibility of the Project structure (Bridge) | High | High | High | |
| Visibility of the Project structure (LNG Facility) | Moderate | Moderate | Moderate | |
| Magnitude of change (Bridge) | Large | Large | Large | |
| Magnitude of change (LNG Facility) | Medium | Medium | Medium | |
| Overall significance of the visual | | LNG Facility – Moderate to major | LNG Facility – Moderate to major | |
| Impact | | Bridge – Major | Bridge – Major | |

Figure 5.16.27 Photomontage of Proposed Bridge and LNG Facility Looking South-East from Viewpoint 11



QUEENSLAND CURTIS LNG

Figure 5.16.28 Photomontage of Proposed Bridge Looking South-West from Viewpoint 11



 Table 5.16.19 Visual Impact from Viewpoint 12 – The Narrows 5 km North of the Proposed Bridge Crossing

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|--|--------------|---------------------------|------------------------|
| Landscape sensitivity | High | High | High |
| Viewer numbers | Low | Low | Low |
| Distance to nearest Project structures | Approx. 5 km | Low | Low |
| Visibility of the Project structure (LNG Facility) | Low | Low | Low |
| Visibility of the Project structure (Bridge) | Low | Low | Low |
| Magnitude of change (LNG Facility) | Negligible | Negligible | Negligible |
| Magnitude of change (Bridge) | Small | Small | Small |
| Overall significance of the visual impact | | LNG – Negligible | LNG – Negligible |
| | | Bridge – Moderate | Bridge – Moderate |

Table 5.16.20 Visual Impact from Viewpoint 13 – Turtle Island

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|---|-------------|---------------------------|-------------------------|
| Landscape sensitivity | High | High | High |
| Viewer numbers | Low | Low | Low |
| Distance to nearest project structures | Approx. 7km | Low | Low |
| Visibility of the project structure (LNG Facility and Bridge) | Low | Low | Low |
| Magnitude of change (LNG Facility and Bridge) | Small | Negligible | Small |
| Overall significance of the visual impact | | LNG & Bridge – Negligible | LNG & Bridge – Moderate |

Table 5.16.21 Visual Impact from Viewpoint 14 – Witt Island

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|---|---------------|---------------------------|-------------------------|
| Landscape sensitivity | High | High | High |
| Viewer numbers | Low | Low | Low |
| Distance to nearest Project structures | Approx. 5.3km | Medium | Medium |
| Visibility of the Project structure (LNG Facility and Bridge) | Low | None | Low |
| Magnitude of change (LNG Facility and Bridge) | Small | Negligible | Small |
| Overall significance of the visual impact | | LNG & Bridge – Negligible | LNG & Bridge – Moderate |

Table 5.16.22 Visual Impact from Viewpoint 15 – Tide Island

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|---|----------------|---------------------------|---------------------------|
| Landscape sensitivity | High | High | High |
| Viewer numbers | Low | Low | Low |
| Distance to nearest Project structures | Approx. 4.2 km | Moderate | Moderate |
| Visibility of the Project structure (LNG Facility and Bridge) | Negligible | Negligible | Negligible |
| Magnitude of change (LNG Facility and Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG & Bridge – Negligible | LNG & Bridge – Negligible |

Table 5.16.23 Visual Impact from Viewpoint 16 – The Port of Gladstone Channel

| Item | Description | Evaluation (Construction) | Evaluation (Operation) |
|---|----------------|---------------------------|---------------------------|
| Landscape sensitivity | Medium | Medium | Medium |
| Viewer numbers | Medium | Medium | Medium |
| Distance to nearest Project structures | Approx. 6.5 km | Moderate | Moderate |
| Visibility of the Project structure (LNG Facility and Bridge) | Negligible | Negligible | Negligible |
| Magnitude of change (LNG Facility and Bridge) | Negligible | Negligible | Negligible |
| Overall significance of the visual impact | | LNG & Bridge – Negligible | LNG & Bridge – Negligible |

16.6.4.9 Summary of Visual Impact Significance of the Project from Surrounding Waterways

The landscape sensitivity and magnitude of change resulting from the construction and operation of the LNG Facility and Curtis Island Bridge, and the significance of the visual impact has been summarized in *Table 5.16.24* and *Table 5.16.25*.

Table 5.16.24 Summary of Visual Impact Significance from Waterways DuringConstruction

| Viewpoint | Location | Impact Significance – LNG Facility | Impact Significance – Bridge |
|-----------|--|---------------------------------------|---------------------------------|
| VP9 | Port of Gladstone adjoining North Passage Island | Major | Major |
| VP10 | The Narrows – 500m south of proposed bridge | Moderate to Major | Major |
| VP11 | The Narrows 1 km north of proposed bridge | Moderate to Major | Major |
| VP12 | The Narrows 5 km north of proposed bridge | Negligible | Moderate |
| VP13 | Turtle Island | Negligible | Negligible |
| VP14 | Witt Island | Negligible | Negligible |
| VP15 | Tide Island | Negligible | Negligible |
| VP16 | The Port of Gladstone Channel | Negligible | Negligible |

Table 5.16.25 Summary of Visual Impact Significance from Waterways DuringOperation

| Viewpoint | Location | Impact Significance – LNG Facility | Impact Significance –Bridge | |
|-----------|--|---------------------------------------|--------------------------------|--|
| VP9 | Port of Gladstone adjoining North Passage Island | Major | Major | |
| VP10 | The Narrows – 500m south of proposed bridge | Moderate to Major | Major | |
| VP 11 | The Narrows 1 km north of proposed bridge | Moderate to Major | Major | |
| VP 12 | The Narrows 5 km north of proposed bridge | Negligible | Moderate | |
| VP 13 | Turtle Island | Moderate | Negligible | |
| VP 14 | Witt Island | Moderate | Negligible | |

| Viewpoint | Location | Impact Significance – LNG Facility | Impact Significance –Bridge | |
|-----------|----------------------------------|---------------------------------------|--------------------------------|--|
| VP 15 | Tide Island | Negligible | Negligible | |
| VP 16 | The Port of Gladstone Channel | Negligible | Negligible | |

16.6.5 Assessment of Visual Impacts from Residential Properties

This section provides an assessment of potential visual impacts caused by the proposed LNG Facility and Curtis Island Bridge on the surrounding residential properties identified in *Figure 5.16.29*.

Figure 5.16.29 Dwellings and Clusters of Dwellings within the Viewshed of the LNG Facility and Bridge



Residential areas and individual dwelling locations

Figure 5.16.29 shows that there are few residential dwellings within the viewshed of the proposed LNG Facility or the proposed bridge. Furthermore, the viewshed and zones of visual influence described in *Table 5.16.1* and *Table 5.16.2* established that the major visual impact of the Project is within 4.2 km of the LNG Facility and within 2 km of the bridge.

Overall, the impact on residential properties is not significant as a result of the following:

- There are no residential properties with views of the LNG Facility within 4.2 km of the LNG Facility site and within 2 km of the proposed bridge. Therefore there are no properties where views of the LNG Facility will be visually dominant in the landscape.
- Residential properties within the viewshed (7 km) of the LNG Facility are limited in number. The residential properties within the Targinie Industrial Precinct are subject to the GDSA legislative provisions.
- There are no residential properties within the viewshed of the proposed bridge (3.2 km).
- The majority of residential areas in Gladstone are outside the viewshed. Viewpoint analysis undertaken from Gladstone confirm views to Curtis Island and The Narrows from these areas are affected by industrial development, and the LNG Facility or bridge will not significantly impact these views.

For these reasons, it is considered that the visual impact to residential properties as a result of the construction and operation of the proposed LNG Facility and proposed bridge will be low to negligible.

16.6.6 Assessment of Visual Impacts of Night Lighting

Light impacts on fauna species within the vicinity of the LNG Facility have been based on information obtained from terrestrial and marine ecology impact assessments (refer to *Volume 5, Chapter 7 and 8*).

This section summarises the assessment of visual impacts of night lighting on light-sensitive receptors (humans, reptiles and amphibians, birds and mammals) within the area of potential light spill from the LNG Facility. More detailed information on the possible effects of lights on these receptors is provided in the LVIA attached as *Appendix 5.18*, with further discussion of potential impact on specific marine species provided in *Volume 5*, *Chapter 8*.

16.6.6.1 Changes to Ambient Light Conditions Resulting from the LNG Facility

The site of the proposed LNG Facility has no existing artificial light sources located within it, however, as the site is opposite the existing industrial facilities on Fisherman's Landing, Targinie Precinct and Port of Gladstone facilities, Curtis Island is expected to be subjected to light spill caused by the adjacent artificial illumination. The introduction of an LNG Facility on Curtis Island is expected to alter the existing levels of ambient lighting. Additionally, the areas immediately surrounding the LNG Facility are also expected to be illuminated to some extent. A level of glow is also expected to emanate from the proposed LNG Facility visible from adjacent waterways and mainland areas with views of the LNG Facility.

Marine traffic is expected to increase within the Port of Gladstone and in particular the Targinie passage, owing to the proposed LNG Facility and other future industrial developments. These increases in marine use are expected to generate varying levels of artificial illumination, however, this illumination will be intermittent and generally "in motion" and therefore has less potential for impacts than fixed and constant lighting.

16.6.6.2 Identification and Mapping of Light-Sensitive Receptors

Species expected to inhabit or migrate through the study area have been identified and rated on their susceptibility to impacts caused by artificial light pollution. Based on available literature, humans, reptiles (except marine turtles), amphibians, terrestrial and marine mammals and fish were rated as having low potential susceptibility to impacts caused by light pollution. Birds and marine turtles were rated as having high potential susceptibility to impacts caused by light pollution.

The viewshed maps were overlaid with a habitat map for marine turtles and birds to determine the potential visibility for sensitive fauna and human habitation (refer to *Figure 5.16.30*).

16.6.6.3 Potential Impacts on Humans

Two main factors determine the impact on human perception of the LNG Facility night lighting as follows:

- the location of the Project on Curtis Island, a relatively natural landscape with no man-modified night lighting impacts, and situated within the Great Barrier Reef World Heritage Area (GBRWHA)
- the classification of the site as part of an industrial precinct under the Gladstone State Development Area (GSDA) designation.

The perception of artificial illumination within and immediately surrounding the LNG Facility site has the potential to reduce the perceived value of this section of natural coastline. However, limited visibility of the site from Gladstone and surrounding residential areas will reduce the significance of this perceived impact. High levels of existing industrial lighting surrounding the Port of Gladstone will also reduce the significance of night impact when viewed from the mainland areas.

16.6.6.4 Potential Impacts on Reptiles and Amphibians

The terrestrial field surveys identified 19 reptiles and nine frog species. For both reptiles and amphibians, impacts such as increased foraging and predation are expected to be moderate within the impact zone. However, these localised impacts are not expected to affect the greater populations of either amphibians or terrestrial reptiles.



| | Project Queensland Curtis LNG Project | | | NG Project | Title Potential Light Spill Areas |
|---|---------------------------------------|----------|--|----------------|--|
| A BG Group business | Client QGC - A BG Group business | | | usiness | and Fauna Habitat Locations |
| ERM Environmental Resources Management Australia Pty Ltd | Drawn | JF/JB | Volume 5 | Figure 5.16.30 | Disclaimer: |
| | Approved | GB | File No: 0086165b_EIS_VA_GIS013_F5.16.30 | | Maps and Figures contained in this Report may be based on Third Party Data, may not to be to scale and are intended as Guides only. |
| | Date (| 06.02.09 | Revision 1 | | ERM does not warrant the accuracy of any such Maps and Figures. |

The eastern, seaward-facing beaches are used as breeding sites by a number of sea turtles, including the Flatback (*Natator depressus*) and Loggerhead (*Caretta caretta*). These nesting beaches are indicated on *Figure 5.16.30*, however, none are expected to be subjected to light spill.

With no lighting impact from the proposed Project on the nesting beaches, adult marine turtles are not expected to be affected. The ambient glow from the proposed LNG Facility is also not expected to affect marine turtle hatchlings due to the distance from the nesting areas.

Table 5.16.26 summarises impacts to threatened and nocturnal species likely to be affected by night lighting at the LNG Facility site.

Table 5.16.26 Potential Impacts on Threatened and Nocturnal Reptile and AmphibianSpecies

| Light Receptor | Likelihood of Occurrence | Species Significance Rating | | Expected Potential Impact (Range of Impact) |
|---|-----------------------------|-----------------------------------|-------------|--|
| Reptiles and Amphibians | | NC Act | EPBC Act | |
| Caretta caretta (Loggerhead Turtle) | Potentially within region | Е | E, M | Negligible/Low (Regional) |
| Chelonia mydas (Green Turtle) | Potentially within region | V | V, M | Negligible/Low (Regional) |
| <i>Dermochelys coriacea</i> (Leatherback Turtle) | Potentially within region | | V, M | Negligible/Low (Regional) |
| <i>Egernia rugosa</i> (Yakka Skink) | Potentially within region | | V | Negligible/Low (Regional) |
| <i>Eretmochelys imbricate</i> (Hawskbill Turtle) | Potentially within region | | V, M | Negligible/Low (Regional) |
| <i>Lepidochelys olivacea</i> (Pacific Ridley, Olive Ridley) | Potentially within region | | E, M | Negligible/Low (Regional) |
| Natator depressus (Flatback Turtle) | Potentially within region | V | V, M | Negligible/Low (Regional) |

E = Endangered, V = Vulnerable, R = Rare, M = Migratory

NC Act = Nature Conservation Act 1992 (Qld)

EPBC Act = Environment Protection and Biodiversity Conservation Act 1999 (Cth)

16.6.6.5 Potential Impacts on Birds

The nesting and foraging habitat areas for birds identified during the terrestrial field surveys are indicated on *Figure 5.16.30*. Of the roosting and foraging areas identified to exist within and surrounding the LNG Facility site, those to the south and west of the site are expected to be subjected to light spill.

Impacts on the following species have been assessed based on their conservation preservation status, and proximity to the LNG Facility site: Beach Stone-Curlew, Eastern Curlew, Powerful Owl, Square-tailed Kite, Black-chinned Honeyeater, Southern Boobook and Barking Owl.

For the roosting sites, any potential impacts on these locations are expected to be low to moderate, and difficult to differentiate from natural fluctuations or trends.

Within the foraging site, however, an increase in food source is expected with the introduction of artificial illumination. This could also result in adverse effects caused by increased foraging competition, and ultimately predation. Similar to the roosting sites, the impacts are also expected to be cumulative, and without quantitative data the extents of such impacts are unknown.

It should be noted for all bird species (particularly migratory species) that robust impact quantification is difficult without population numbers. The levels of impact should be used as a guide only, with further studies recommended.

Table 5.16.27 summarises impacts to threatened and nocturnal species likely to be affected by night lighting at the LNG Facility site.

| Light Receptor | Likelihood of Occurrence | Species Significance Rating | | Expected Potential Impact |
|---|-----------------------------|-----------------------------------|-------------|------------------------------|
| Birds | | NC Act | EPBC Act | |
| <i>Erythrotriorchis radiatus</i> (Red Goshawk) | Low | | V | Low (Regional) |
| Esacus neglectus (Beach Stone Curlew) | Confirmed | V | | High (Regional) |
| <i>Numenius madagascariensis</i> (Eastern Curlew) | Confirmed | R | | High (Local) |
| <i>Lophoictinia isura</i> (Square- Tailed Kite) | Moderate | R | | Low (Regional) |
| <i>Melithreptus gularis gularis</i> (Black-Chinned Honeyeater) | Moderate | R | | Low (Regional) |
| <i>Podargus strigoides</i> (Tawny Frogmouth) | Confirmed | No | ne | Moderate (Local) |
| Ninox connivens (Barking Owl) | Confirmed | No | ne | High (Local) |
| <i>Ninox novaeseelandiae</i> (Southern Boobook Owl) | Confirmed | No | ne | High (Local) |
| Ninox strenua (Powerful Owl) | Confirmed | V | | High (Local) |

16.6.6.6 Potential Impacts on Mammals

The following native species were recorded during spotlighting:

- Micropchiropteran bats (observed)
- Megachiropteran bats (observed)
- Sugar Glider (observed and heard)
- Squirrel Glider (observed and heard)
- Yellow-bellied Glider (observed)
- Brushtail Possum (observed).

No listed threatened or migratory terrestrial mammal species were recorded during field surveys.

Without quantitative data on mammal numbers, and relative proximity to a greater population, the extents of such impacts are unknown. However, the following impacts of low to moderate significance are expected to occur to a localised population of mammals:

- disruption of foraging behaviour
- disruption of biological clocks
- decrease in viable roosting and nesting habitat
- increased death in collisions on roads and through predation
- disruption of dispersal movements and corridor use.

Two species of dolphin are found in the area, Snubfin (*Orcaella heinsohni*) and Indo–Pacific Humpback Dolphin (*Sousa chinensis*). As indicated previously, dolphins may indirectly be attracted to lighted structures in marine environments as these areas tend to attract marine fauna, creating food sources. Impacts on behaviour would be localised and of minor significance.

Table 5.16.28 summarises impacts to threatened and nocturnal species likely to be affected by night lighting at the LNG Facility site.

16.6.6.7 Potential Impacts on Fishes

Estuarine fish species have been identified to exist within The Narrows, and along the intertidal area along the southern boundary of the LNG Facility site.

While it is recognised that fish activity is expected to increase with the introduction of artificial illumination, this is expected to be localised.

| Light Receptor | Likelihood of Occurrence | Species Significance Rating | Expected Potential Impact |
|---|-----------------------------|--------------------------------|---------------------------------|
| Mammals | | NC Act EPBC Act | |
| <i>Trichosurus vulpecula</i> (Brush- tailed Possum) | Confirmed | None | Low (Local) |
| <i>Chalinolobus picatus</i> (Little Pied Bat) | Low | R | Moderate (Local) |
| <i>Pteropus alecto</i> (Black Flying Fox) | Confirmed | None | Moderate (Local) |
| <i>Petaurus breviceps</i> (Sugar Glider) | Confirmed | None | Moderate (Local) |
| <i>Petaurus norfolcensis</i> (Squirrel Glider) | Confirmed | None | Moderate (Local) |
| Petaurus australis australis (Yellow-bellied Glider) | Likely | None | Moderate (Local) |
| <i>Orcaella heinsohni</i> (Snubfin Dolpin) | Confirmed | М | Low (Local) |
| Sousa chinensis (Indo – Pacific Humpback Dolphin) | Confirmed | М | Low (Local) |

Table 5.16.28 Potential Impacts on Threatened and Nocturnal Mammal Species

The existing illumination of nearby coastline suggests that impacts caused by artificial illumination already exist, and any increase caused by the proposed development could contribute to cumulative impacts. Such impacts, however, are generally difficult to discern from natural fluctuations in population.

Table 5.16.29 summarises impacts to fish likely to be affected by night lighting at the LNG Facility site.

Table 5.16.29 Potential Impacts on Fish Species

| Light Receptor | Likelihood of occurrence | Species Significance Rating | Expected Potential Impact (Range of Impact) |
|----------------|--------------------------------|--------------------------------|---|
| Fishes | On site and surrounding waters | None | Low (Local) |

16.6.7 Assessment of Cumulative Visual Impacts

The EIS has undertaken a screening of proposed future projects in the Gladstone area to determine which projects will be considered in the assessment of cumulative impacts. Of the projects identified for this purpose (*Volume 1*), the following five projects fall within the viewshed of the LNG

Facility and Curtis Island Bridge and have therefore been considered in the assessment of cumulative visual impacts in the LVIA.

Major industrial developments with completed Environmental Impact Assessments:

- Wiggins Island Coal Terminal
- Gladstone Pacific Nickel Project
- Gladstone LNG Project Fisherman's Landing

Major industrial developments under investigation:

- Sun LNG Fisherman's Landing
- Gladstone LNG Project (Santos) Curtis Island

The following assessment of cumulative impacts is based on the level of information available. While consideration has been given to the two projects under investigation, limited detail on the projects has subsequently limited the extent of evaluation.

16.6.7.1 Wiggins Island Coal Terminal

Views towards the proposed site of the LNG Facility and proposed bridge from Gladstone include the RG Tanna Coal Terminal. The proposed Wiggins Island Coal Terminal will increase the number of wharfs in this area and further inhibit views towards Curtis Island and The Narrows from Gladstone. The existing coal terminal also creates significant night lighting impact, which will further increase as a result of the proposed development. The Wiggins Island Terminal will therefore increase the industrialised waterfront around Gladstone and provide further screening to the QCLNG Project from Gladstone urban areas.

16.6.7.2 Gladstone Pacific Nickel Project

The site for the Gladstone Pacific Nickel refinery is within the viewshed of a number of major industrial facilities and, as such, will increase the extent and scale of the industrial landscape, although this change is a continuation of the industrialised precinct extending from Gladstone to Targinie.

In relation to the proposed LNG Facility on Curtis Island, the proposed refinery will not have a significant impact on the existing viewshed of the LNG Facility and therefore the cumulative impact will not be significant.

16.6.7.3 Gladstone LNG Project and Sun LNG Project – Fisherman's Landing

Fisherman's Landing has a significant impact on the natural shoreline character, being an artificially created bunding with no vegetation in contrast to the natural vegetated estuarine landscape of The Narrows and Curtis Island.

The visual impact of the proposed LNG facilities on Fisherman's Landing will increase the industrial character within this section of Port of Gladstone.

Fisherman's Landing is almost directly opposite the site for the proposed LNG Facility on Curtis Island. The presence of large-scale industrial development either side of the passage to the Narrows will significantly alter the existing character within this section of the passage landscape. The location of the proposed bridge across The Narrows will visually enclose these waters, and with industrial and infrastructure elements either side of the Targinie passage, the landscape character will be significantly altered. This will be in stark contrast to the existing natural landscape on Curtis Island merging with the natural wilderness of The Narrows.

16.6.7.4 Gladstone LNG Project (Santos) – Curtis Island

The position of the proposed Santos LNG Facility, in close proximity to the QCLNG Facility, will create a continuous high-impact industrial development on Curtis Island, broken only by the retention of vegetated ridgelines between the two sites.

It can be assumed that two LNG Facilities in close proximity will significantly alter the existing landscape character of this section of the Curtis Island shoreline. Retaining natural topographic features and vegetation between the two proposed facilities will provide important visual breaks when viewed from the surrounding areas, as well as providing screening between the two sites at a local level.

16.6.7.5 Summary of Cumulative Impacts

The most significant cumulative visual impact will be the combined visual impacts of the QCLNG Facility and the Santos LNG Facility with the proposed expansion of the industrial facilities on Fisherman's Landing. The positioning of the industrial/infrastructure elements of the proposed bridge, LNG Facilities on Curtis Island and LNG facilities on Fisherman's Landing will have the visual effect of enclosing this section of Port Curtis and separating it from The Narrows.

The location of large industry within the viewshed, where these elements are visually dominant in the landscape, will alter the existing character of the areas, creating an industrialised precinct, and visual linking with the industrial landscapes of Gladstone waterfront.

16.7 *MANAGEMENT AND MITIGATION MEASURES*

16.7.1 Proposed Management and Mitigation of Construction Phase Visual Impacts

There are no landscape techniques that can be employed to mitigate the visual impacts associated with the construction activities. However construction management practices will be employed to maintain construction areas in a safe, neat and orderly manner.

Once the LNG Facility is fully operational and, over time, the Project construction methodology will allow for disturbed areas of mangroves to reestablish as much as practicable along the shoreline of the LNG Facility.

16.7.2 Proposed Management and Mitigation of the Visual Impact of the LNG Facility

The scale and function of any LNG facility precludes significant modification to the design for the purpose of mitigating visual impact. However, the preliminary stage of the QCLNG Project enables some design principles to be established as design parameters for further development of the engineering design. The LVIA has been based on a "mitigated" design, i.e. it is based on the assumption that the construction of Project features is undertaken as summarised in *Section 16.3.1*.

The following subsections describe how the proposed management and mitigation measures will allow the Project to meet, or partially meet, the desired outcomes for the protection of Areas of State Significant (Coastal Landscape) values as detailed in the Curtis Coast Regional Coastal Management Plan (Schedule 1) even though the area has been incorporated into the GSDA and heavy impact industry development in this location has been addressed by the GSDA designation.

16.7.2.1 Curtis Island

The desired outcomes to protect and maintain the landscape values of Curtis Island and *"ensure the development remains unobtrusive and compatible with landscape values"* will partially be met through the following management and mitigation measures:

- Screening of the LNG Facility from the vast majority of Curtis Island and in particular the adjoining Environmental Management Precinct, has been achieved through the location of the facility in relation to the Ship Hill linear ridgeline located to the north. Vegetation along these ridgelines is to be retained and protected.
- Retaining the vegetated ridges and hills on the skyline will also assist in reducing the visual impact by retaining the natural landscape horizon.

- The landscape values of Curtis Island as viewed from Gladstone are largely maintained due to the retention of the minor ridgeline to the south-east of the site. Vegetation along these hills and ridgelines is to be managed and maintained to ensure their long-term integrity as important screening elements in the landscape.
- Views of Curtis Island from Targinie and the waters of the Port of Gladstone opposite the site do not have the benefit of the screening potential of topography or vegetation. Retention of the mangroves along the shoreline, where possible, will contribute to reducing the visual impact by maintaining a continuity of the natural shoreline on Curtis Island and softening the interface between the constructed edge of the LNG Facility and the water's edge.

16.7.2.2 The Narrows

The desired outcomes to protect and maintain the landscape values of The Narrows will partially be met through the following management and mitigation measures:

- The main bulk of the LNG Facility has been located behind the mangrove line, with only the Marine Facilities extending beyond the shoreline. This retains the edges of mangrove vegetation and visual continuity of the shoreline and achieves the desired outcome to "maintain existing vegetation along waterways to a maximum extent to form a natural landscape edge and screen". While the screening potential of the mangroves is low due to their low growth height (approximately 5 m), their importance lies in retaining continuity of the natural shoreline.
- The requirement to "ensure infrastructure in areas of high visual quality does not obscure views to water or intrude on waterways" is partially achieved through setting the main LNG Facility back from the shoreline.

16.7.3 Proposed Management and Mitigation of the Visual Impact of the Curtis Island Bridge and Approach Roads

As for the LNG Facility, the scale and function of the proposed Curtis Island Bridge precludes significant modification for the purpose of mitigating visual impact. The preliminary stage of the Curtis Island Bridge design, however, does enable some design principles to be established for the reduction of visual impact. As noted previously, these mitigation measures are recommendations only as QGC is not the proponent for the bridge and associated approach roads.

The following section describes how the proposed management and mitigation measures meet, or partially meet, the desired outcomes for the protection of Areas of State Significant (Coastal Landscape) values as detailed in the Curtis Coast Regional Coastal Management Plan.

16.7.3.1 Curtis Island

The desired outcomes to protect and maintain the landscape values of Curtis Island and *"ensure the development remains unobtrusive and compatible with landscape values"* will partially be met through the following management and mitigation measures:

- screening of the approach roads and abutment to the proposed bridge with endemic planting on embankments and disturbed areas
- detailed design of abutments to minimise visual impact, such as the use of rock and planting
- retention of the mangroves shoreline, where possible, by limiting the extent of disturbance during construction and reinstatement as part of the landscape rehabilitation process
- Use of recessive materials, colours, and textures on the bridge to reduce light reflection and increase compatibility with the landscape setting.

16.7.3.2 The Narrows

The desired outcomes to protect and maintain the landscape values of The Narrows will partially be met through the following management and mitigation measures:

- The measures outlined for Curtis Island also apply to the reduction of visual impact on the landscape values of The Narrows.
- The requirement to "ensure infrastructure in areas of high visual quality does not obscure views to water or intrude on waterways" is difficult to achieve with a structure that crosses the waterway. However, minor reduction in visual intrusion can be achieved through design of the support structure, which should be as slender and few as possible within the parameters of the structural requirements.

16.7.4 Proposed Management and Mitigation of the Visual Impact of Night Lighting

There is no single solution to light impacts on sensitive receptors. As such, the implementation of a range of management strategies should be considered to provide sufficient management and mitigation of the potential impacts. These are outlined in the following subsections.

16.7.4.1 Lighting Design Guidelines

As there is no singular solution to light impacts on sensitive receptors, detailed lighting design for the LNG Facility will be undertaken consistent with the safety of the plant operators, and to meet the requirements to minimise light spill and reduce light glow.

The lighting design will be undertaken using software that permits the use of efficient floodlights aimed to establish lux goals for each unique location. The software enables an iterative design process to be undertaken to establish lighting levels while minimising light visible from outside the plant.

Where possible, lighting will not be installed where it can be avoided. For example, consideration will be given in detailed design to limiting perimeter fence illumination through use of infrared-sensing cameras and motion-detection instead.

The lighting design will be done in 3D to enable micrositing of Lux sources to minimise the lighting impact.

16.7.5 Summary of Impacts

16.7.6 Visual Impact of the LNG Facility

The impact of the LNG Facility on visual quality within the viewshed is summarised below:

- The level of visual impact of the LNG Facility on views from residential areas in Gladstone would be of negligible to minor adverse significance, mainly owing to the attenuating effects of distance and intermediate topography.
- The level of visual impact on views from the Targinie foreshore would be of moderate to major adverse significance. This viewpoint was the only location on the mainland affected at this level of significance.
- No locations on the mainland are expected to be affected to a major to critical level by the proposed LNG Facility.
- There would be no significant difference in the visual impact of the LNG Facility during the construction and operational stages when viewed from the mainland.
- The level of visual impact on views from the waterways of the Port of Gladstone and The Narrows would increase in significance within approximately 4.2 km of the LNG Facility site, as at this distance the project becomes potentially visually dominant in the view.
- Views of the LNG Facility, within approximately 4.2 km of the site, are expected to have a level of visual impact which would be rated as moderate to major adverse significance.
- Views of the LNG Facility from the adjoining waterway, within approximately 1.4 km of the site, are expected to have the highest identified level of visual impact which would be rated as major adverse significance.
- The level of visual impact on views of the LNG Facility from within The Narrows and 1 km north of the entrance are expected to be of moderate to

major adverse significance.

- The level of visual impact on views of the LNG Facility from 5 km north of The Narrows entrance are expected to be of negligible significance.
- The level of visual impact on views of the LNG Facility from the waterways adjoining Turtle, Witt and Tide islands is expected to be of negligible significance during construction and moderate significance during operation. The visual impact during operation is expected to be higher owing to the height and occasional operation of the flare stacks (noting that visual impacts associated with flaring have not been assessed in detail).
- The LNG Facility is expected to have negligible visual impact on views from residential properties within the viewshed.

16.7.7 Visual Impact of the Proposed Curtis Island Bridge

The impact of the proposed bridge and approach road on visual quality within the viewshed is summarised below:

- The level of visual impact on views of the proposed Curtis Island Bridge from Gladstone and surrounding areas is expected to be low to negligible in significance, mainly owing to distance.
- The level of impact on views within approximately 2 km of the bridge and access road from the waterways of The Narrows and the Port of Gladstone would be of major adverse significance when viewed from the south against the backdrop of The Narrows. A level of critical adverse significance was considered, however the presence of modification and industrial elements in the viewshed reduces the critical level to the next highest level of significance.
- The level of visual impact on views of the proposed bridge from the north of The Narrows against the background of the Port of Gladstone is expected to be of major adverse significance.
- The level of visual impact on views of the proposed bridge from 5 km north of The Narrows entrance is expected to be of moderate significance.
- Targinie foreshore is the only location on the mainland which would have uninterrupted views of the bridge which are expected to have a visual impact of moderate to major adverse significance owing to the proximity to the viewpoint.
- The bridge is not expected to cause visual impact of major to critical adverse significance on views from the mainland.
- No substantial difference is expected in the level of visual impact of the bridge on views from the mainland during the construction and operation stages. The level of visual impact of the access roads would be lower during the operation phase owing to the implementation of landscape mitigation measures along the road easement.

- There would be no views of the bridge from the waters adjoining Turtle, Witt and Tide islands.
- The bridge is expected to have negligible visual impact on residential properties.

16.7.8 Impact of the Project Lighting

The proposed LNG Facility and Curtis Island Bridge would substantially alter the lighting levels of the immediate areas which are natural landscapes.

The impact of the LNG Facility lighting would not significantly affect residential areas as a result of the distance between the site and these residential areas, as well as the effect of existing industrial lighting in the area.

The navigation of waterways would not be affected as a result of night lighting of the LNG Facility as the Port of Gladstone and Targinie foreshore (Fisherman's Landing) already include substantial levels of industrial lighting.

Some species will be affected by the LNG Facility lighting, and management and mitigation measures will be applied to reduce these impacts. Overall, the substantial level of lighting within the Port of Gladstone area is unlikely to be increased significantly by the development of any one project, including the QCLNG Project.

16.7.9 *Cumulative Impact of the Project*

The cumulative impacts of the Project in combination with other planned future developments within the viewshed, is expected to be most significant in relation to the proposed industrial projects on Curtis Island and Fisherman's Landing. The cumulative effect of industry on either side of the narrow waterway leading to The Narrows passage would substantially alter the character of the area. This alteration in landscape character would be consistent with the proposed expansion of the Port of Gladstone and the GSDA.

The proposed Curtis Island Bridge across the entrance to The Narrows would create a permanent definable boundary between The Narrows' pristine natural landscape and the expanded port facilities. The bridge would visually enclose the Targinie passage, separating the two areas and disrupting the continuity of the shoreline.

16.8 CONCLUSION

The proposed LNG Facility, Curtis Island Bridge and approach road are not expected to significantly impact on visual amenity from local residences.

The LNG Facility is expected to impact on landscape values of major significance on Curtis Island, however, the impact on the Great Barrier Reef World Heritage Area is already attenuated in this location by the presence of the Port of Gladstone in the viewshed. Therefore, this area is not 'pristine' or representative of the "exceptional natural beauty" assigned to the World Heritage and National Heritage values. In addition, the designation of the Curtis Island Industry Precinct as an extension to the Gladstone State Development Area (GSDA) reflects the intent of the Queensland Government to develop the area as an industrial precinct. Given this, the landscape and visual impact of the proposed LNG Facility is consistent with the designated land use and general expansion of industry around the Port of Gladstone.

The pristine natural wilderness area of The Narrows passage landscape as recognised at international, national and state level would be affected by the proposed bridge and approach road, resulting in an adverse effect on landscape values of major significance. A level of critical adverse significance was considered, however the presence of modification and industrial elements in the viewshed reduces the critical level to the next highest level of significance.

A summary of the impacts outlined in this chapter is provided in *Table 5.16.30* below.

| Impact assessment criteria | Assessment outcome |
|----------------------------|------------------------------------|
| Impact assessment | Negative |
| Impact type | Direct |
| Impact duration | Long-term for LNG Facility |
| | Permanent for Curtis Island Bridge |
| Impact extent | Local |
| Impact likelihood | High |

 Table 5.16.30 Summary of impacts for Visual Amenity

Overall assessment of impact significance: major, due to impacts on landscape values that are recognised at an international, national and state level.