

Section 8

LNG Facility Environmental Values and Management of Impacts

8.12 Visual Amenity

8.12.1 Introduction

A visual amenity assessment was conducted in relation to the LNG facility at China Bay on the south-west side of Curtis Island, near Gladstone. In addition an assessment was made of a potential bridge across Port Curtis, linking Friend Point (on the mainland) with Laird Point (on Curtis Island), together with the associated access road. The following section provides a summary of the assessment findings, including a description of the existing environmental values, assessment of potential visual impacts and recommended mitigation measures.

The assessment involved an analysis of the existing landscape character of the study area to provide the baseline against which the potential incremental impact of the proposed development has been assessed. The extent of the study area was determined by an initial analysis of the likely view shed or area from which the LNG facility is likely to be visible. The landscape character is described by identifying, describing and illustrating a series of Landscape Character Zones (LCZs) throughout the study area. The landscape quality of the study area was then assessed and the local, regional, state, national and international significance of the LNG facility site was then reviewed together with the potential for the site to absorb change.

A full description of the LNG facility used as the basis for the assessment is provided in Section 3.

Key findings of the visual amenity assessment for the LNG facility (and potential bridge and road) are described in the section, with a full copy of the assessment report provided in Appendix W2.

8.12.2 Methodology

The levels of significance of potential visual impacts were assessed through consideration of the combination of magnitude of visual change in the visual landscape character and the sensitivity of viewers who will see the change.

The level of significance of the potential visual impact of the proposed LNG facility development is dependent on the magnitude of change to existing views and the sensitivity of the viewers to that change.

The magnitude of change to existing views will depend on a combination of scale, extent and duration of the views. It is influenced by the:

- Extent of area from which components of the LNG facility development will be visible;
- Number and type of viewers who will see the development;
- Distance of the view to the proposed development;
- Duration of change to the view (i.e. temporary or permanent, continuous or intermittent) that will result from the development;
- Scale of change to the view that will result from the development (i.e. proportion of the view occupied by the proposed development);
- Degree of contrast of form, scale, line, height, colour and texture between components of the proposed development and the existing landscape in which they are viewed.

Viewer sensitivity is the extent to which a viewer is willing to accept the change to the landscape character that will result from the proposed LNG development without perceiving it as an adverse impact on the existing landscape character or the values attributed to the current view. Sensitivity of the viewers will depend on their location, expectations and activity. It will also be influenced by the perceived importance of the view, which may be reflected by the extent to which it is identified in tourist guides, referenced in publications as well as the availability of facilities for public access and interpretation.

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Categories of viewers with high sensitivity are likely to include people visiting lookouts or public parks or open space where enjoyment of views is a key aspect of the site. Residents of properties where the view is a key value associated with the property are also likely to have a high sensitivity to changes to that view. Low viewer sensitivity is most likely to be associated with people at their place of work, particularly at industrial plants, loading/unloading ships and construction sites. The level of visual sensitivity of motorists will vary depending on the purpose of their trip with those travelling to and from work less sensitive than tourists travelling by boat or car with the intention of enjoying views of the landscape.

The various levels of visual impact significance that are predicted to result from the combinations of magnitude of visibility and viewer sensitivity are presented in Table 8.12.1.

Table 8.12.1 Visual Impact Significance Matrix

	Viewer Sensitivity		
	Low	Medium	High
Visibility Magnitude			
High	Moderate	High	High
Medium	Low/Moderate	Moderate	High
Low	Low	Low/Moderate	Moderate
Negligible	Negligible	Negligible/Low	Low

Note: the levels of visual impact significance in shaded cells are not considered to be significant enough to constitute potential barriers of the proposed development. However mitigation measures may still be required.

The levels of visual impact significance are defined as:

- **Negligible visual impact** - only a very small part of the proposed LNG facility development will be discernible and/or it will be located at such a distance that it will be scarcely visible.
- **Low visual impact** - the proposed LNG facility development will constitute only a minor component of the wider view and might be missed by the casual observer; awareness of the development will not have a marked effect on the overall quality of the view.
- **Moderate visual impact** - the LNG facility development may form a visible and recognisable new element within the overall scene and may be readily noticed by an observer.
- **High visual impact** - the LNG facility development will form a significant and immediately apparent part of the view that will affect and change its overall character (the change may be positive or negative).

The predicted level of significance of potential visual impact of the LNG facility development was assessed by applying the methodology described previously to determine the magnitude of visibility. An assumed level of viewer sensitivity was then combined with the magnitude of visibility rating to determine the level of visual impact significance at each view situation in accordance with Table 8.12.1.

The visual amenity assessment process carried out as part of this EIS has involved:

- A review of documents and aerial photos to identify issues relevant to the existing landscape character of the LNG facility site, bridge and access road locations;
- A field inspection to identify key viewing situations to determine the extent to which the LNG facility site, bridge and access road locations are visible;
- Analysis of the various viewing situations, including the use of a helicopter, to determine the extent to which major structures in the facility will be visible from surrounding areas;
- Determination of the level of significance of potential visual impact that will result from the major components of the LNG facility, and potential bridge and access road;
- Identification of mitigation measures to minimise the potential visual impacts of the LNG facility, and potential bridge and access road.

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Particular attention was given to potential views of the LNG facility site from public roads and residential areas. In addition, the visibility assessment included detailed consideration to views from public lookouts located within the Gladstone urban area, views from Curtis Island National Park, as well as sections of Gladstone Harbour including Port Curtis, State Marine Park and Great Barrier Reef Marine Park (GBRMP).

Assessment of the potential significance of visual impact associated with the LNG facility, and potential bridge and access road developments involved identification of the extent to which they will be visible (visibility) and the significance of the change to the visual character of the landscape that will result from the development.

Visibility is a measure of the extent to which a particular activity or facility may be visible from surrounding areas, the relative number of viewers, the period of the view, view distance and context of the view. In assessing visibility the principle of inter-visibility is often used, which means that if an area or location is visible from the LNG facility then the LNG facility will be visible from the area or location.

The precise level of visibility was confirmed by visiting the sections of public road, lookouts, open spaces and areas of waterway. This involved the use of a helicopter hovering at the height of major components of the LNG facility, including the flare stacks, storage tanks and LNG train, to determine those areas from which the components will be visible.

8.12.3 Existing Environmental Values

The regional landscape setting of Gladstone is strongly defined by mountain ranges that form the skyline to views to the west from the city and by the tree-covered central ridge of Curtis Island to the north. These visually prominent natural landforms are often seen in the context of the water surface of Gladstone Harbour and Port Curtis, which contributes to the visual quality of many views.

The original landscape character in the area south of Port Curtis has been significantly changed by development of a number of industrial plants that are accessed from the Port Curtis Way. Structures within these industrial plants are generally geometric in form and include colours that visually contrast with the surrounding remnant woodland vegetation. The industrial plants generally appear as islands of structure set within a tree-covered natural landscape. Views of these plants from public roads are generally limited to the upper portions of structures due to the visual screening effect of vegetation at ground level. Visible emissions from a number of the industrial plant stacks create a dynamic but visually prominent element in the landscape. Views from elevated locations within Gladstone urban areas include the industrial plants, Gladstone Power Station and high voltage powerlines, which are seen against a backdrop of the visually prominent forest-covered mountains to the west of the city. Lighting on the existing industrial plants creates a strong contrast at night with the dark outline of the forest-covered mountains to the west.

The proposed LNG facility is to be located at China Bay on the southern edge of Curtis Island, which is located at the eastern edge of Port Curtis. While the hills and ridges that define the valley in which the site is located are visible from surrounding areas, the centre of the valley itself is generally screened from most surrounding areas. The forested hill slopes of Hamilton Point provide an important visual 'buffer' to the facility site when viewed from the Gladstone town area to the south. Consequently, the base in the valley which the site will be located is only directly visible from boats travelling along The Narrows waterway and from locations along the southern foreshore of The Narrows. The extent to which structures within the LNG facility would be visible from surrounding areas will depend on the height and size of individual structures. The visual assessment carried out for this EIS has involved individual consideration of the major structures within the proposed LNG facility.

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8.12.3.1 Landscape Character Zones

In order to understand the landscape context in which the LNG facility is located, an analysis of the landscape character of Gladstone was carried out. The landscape analysis involved identification of a series of LCZs that are shown on Figure 8.12.1 and described below. The LCZs are areas that are relatively consistent in terms of their combination of landform, vegetation, land use and development. While individual LCZs may incorporate substantial visual variation, they provide a broad baseline landscape context in which the LNG facility, potential bridge and access road will be located.

LCZ 1 - Forest-Covered Hills and Ridges

- Steep slopes and high elevation landforms include Curtis Island and hills to the west of Gladstone;
- Natural forest cover, predominantly eucalypt species;
- Absence of buildings and structures contributes to natural landscape character; and
- Visually prominent landscape features of regional significance that strongly influence the visual character of Gladstone.



Plate 8.12.1 LCZ 1 - Forest Covered Hills and Ridges

LCZ 2 - Mangroves and Tidal Mud-flats

- Flat landform in tidal zone;
- Visually distinctive landscape character created by tidal fluctuation covering the lowest elevation areas with water during high tide;
- Open views across mud-flats and salt marsh areas;
- Mangrove stands visually enclosed and provide limited visual screening to views from surrounding areas; and
- Contiguous stands of mangroves create distinctive natural landscape character along shoreline visible from waterways and adjoining sections of foreshore.

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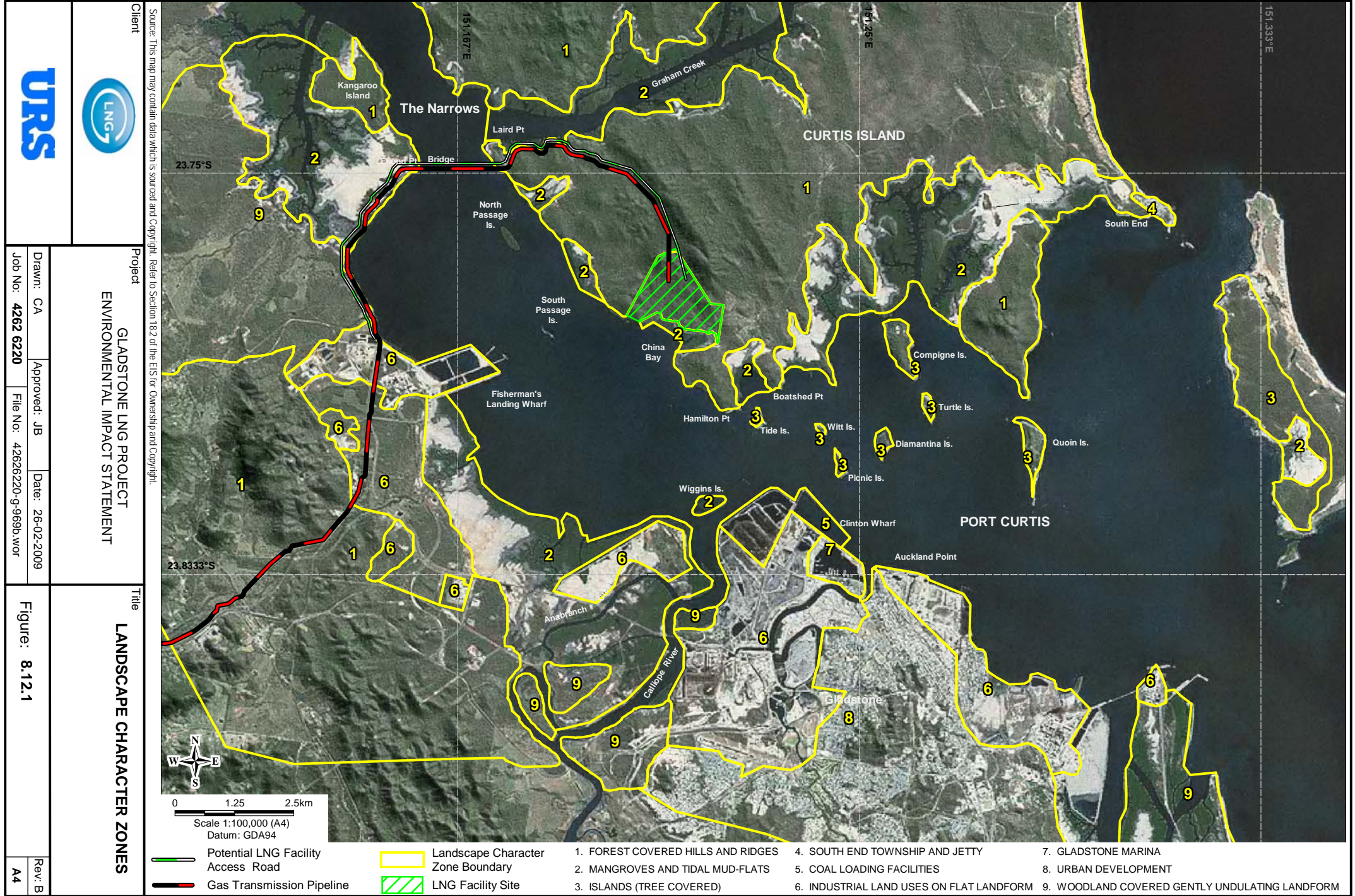
Plate 8.12.2 LCZ 2 - Mangroves and Tidal Mud-flats

LCZ 3 - Tree-Covered Islands

- Strongly undulating tree-covered landforms are visually prominent against the flat water surface of Gladstone Harbour and Port Curtis;
- Elevated views across Gladstone Harbour are available from locations on the Islands where vegetation has been cleared; and
- Limited number of residential buildings are located on the islands and they are generally oriented to the east; jetties and buildings on some islands diminish the generally natural landscape character.



Plate 8.12.3 LCZ 3 - Tree-Covered Islands



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Client

Project

Title

GLADSTONE LNG PROJECT
ENVIRONMENTAL IMPACT STATEMENT

LANDSCAPE CHARACTER ZONES

Drawn: CA
Job No.: 4262 6220
Approved: JB
File No.: 42626220-g-969b.wor
Date: 26-02-2009

Figure: 8.12.1

Rev: B
A4

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|---------------------------|-----------------------------------|------------------------------------|--|--|
| Potential LNG Facility | Landscape Character Zone Boundary | 1. FOREST COVERED HILLS AND RIDGES | 4. SOUTH END TOWNSHIP AND JETTY | 7. GLADSTONE MARINA |
| Access Road | LNG Facility Site | 2. MANGROVES AND TIDAL MUD-FLATS | 5. COAL LOADING FACILITIES | 8. URBAN DEVELOPMENT |
| Gas Transmission Pipeline | | 3. ISLANDS (TREE COVERED) | 6. INDUSTRIAL LAND USES ON FLAT LANDFORM | 9. WOODLAND COVERED GENTLY UNDULATING LANDFORM |

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LCZ 4 - South End Township and Jetty

- Flat to gently undulating landform sloping down to sandy beach and tidal flats;
- Remnant coastal woodland creates natural setting for beach;
- Residential development in South End township contrasts with the surrounding natural landscape; and
- Jetty structure and solar panels are visually prominent and contrast with the natural character of adjoining landscape and waterways.



Plate 8.12.4 LCZ 4 - South End Township and Jetty

LCZ 5 - Coal Loading Port Facilities

- Jetty structures, coal facilities and moored ships form a visually prominent industrial element along the foreshore of Gladstone Harbour;
- Movement of ships creates a visually dynamic element in the Harbour setting;
- Lighting for night loading is highly visible from the foreshore and locations throughout Gladstone urban areas; and
- Shore-based coal handling facilities include coal stockpiles and conveyors that form a visually distinctive element in the landscape.



Plate 8.12.5 LCZ 5 - Coal Loading Port Facilities

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- Earthworks have created extensive areas of exposed red-coloured soil that visually contrast with adjoining mangroves and water surface;
- Vegetation cover is generally grassland with few scattered trees and shrubs; and
- Perimeter security fence precludes public access to foreshore.

**Plate 8.12.6 LCZ 6 - Industrial Development Sites*****LCZ 7 - Gladstone Marina***

- Jetty structures and moored boats/yachts contrast with foreshore vegetation and water surface;
- Yacht masts form a distinctive visual vertical element;
- Boat movement creates visual interest within the well defined space of the marina; and
- Visually enclosed by vegetation located in Spinnaker Park to the north and by buildings along the southern and western foreshore.

**Plate 8.12.7 LCZ 7 - Gladstone Marina**

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LCZ 8 - Gladstone Urban Development

- Visual character dominated by mixed residential, commercial and public buildings;
- Diverse visual character with long distance views generally blocked by buildings but glimpses between buildings are available from some elevated areas and streets;
- Some views extend to Gladstone Harbour, the coal loader and Curtis Island ridgeline on the skyline; and
- The central commercial area is located along a ridge that provides a limited number of elevated views to the north, east and west.



Plate 8.12.8 LCZ 8 - Gladstone Urban Development

LCZ 9 - Remnant Woodland Areas

- Gently undulating landform with some areas of flat low elevation land adjoining the waterfront; and
- Predominant vegetation is eucalypt woodland that generally blocks views from roads.



Plate 8.12.9 LCZ 9 - Remnant Woodland Areas

8.12.3.2 Landscape Character of the LNG Facility Site

The visual character of the LNG facility site reflects a particular combination of landform and natural vegetation. The valley landform of the site adjoining China Bay is strongly defined by a major ridgeline to the north and secondary ridges, and a series of lower hills that extend south to the shoreline, which form

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the eastern and western sides of the valley. The major ridge to the north of the site forms part of the visually prominent tree-covered central ridgeline of Curtis Island. The extensive tree cover on the site, surrounding ridges and foreshore mangroves of China Bay together with the absence of structures or buildings, result in the site having a very natural landscape character. The photographs presented below, which were taken from a vessel in China Bay, illustrate the natural landscape character and indicate the approximate location of the LNG facility development.

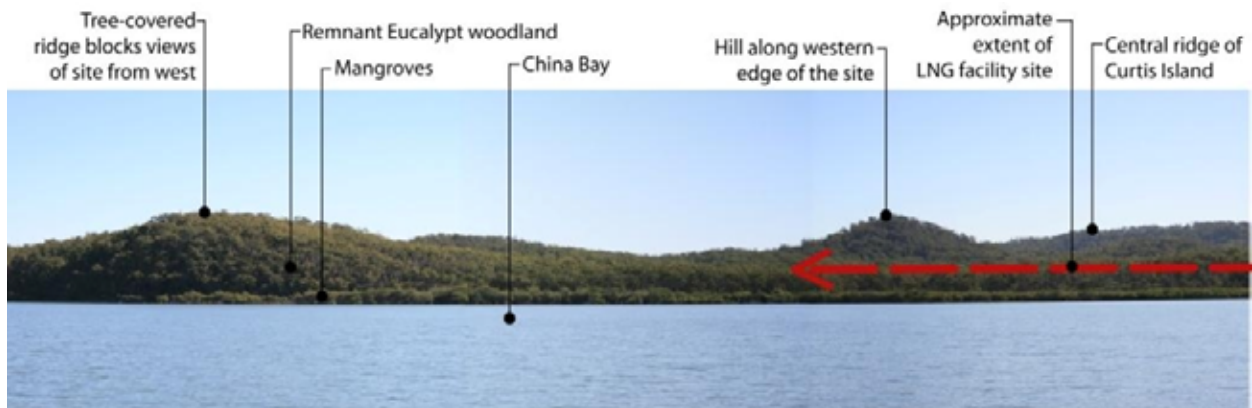


Plate 8.12.10 View to North-western Portion of the LNG Facility Site from China Bay

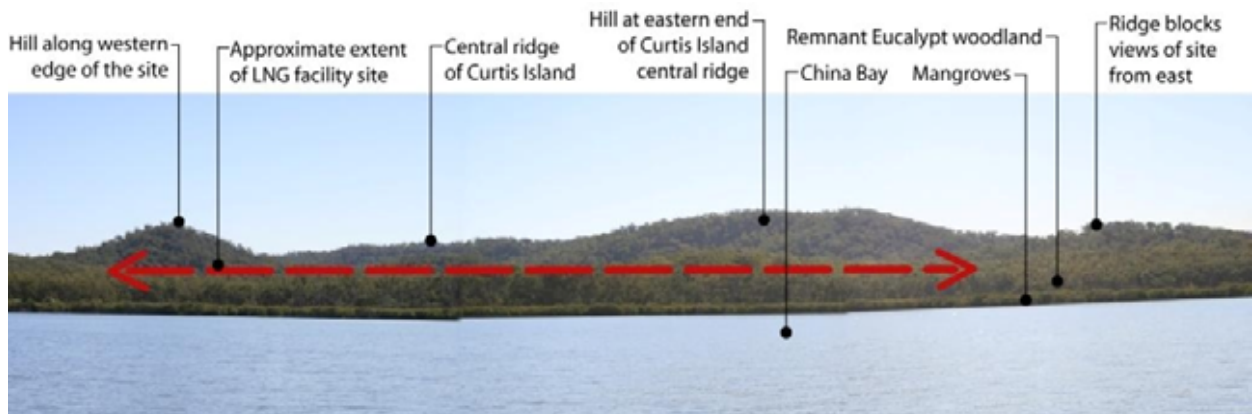


Plate 8.12.11 View to Central Portion of the LNG Facility Site from China Bay

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Plate 8.12.12 View to North-eastern Portion of the LNG Facility Site from China Bay

8.12.3.3 Landscape Quality of the LNG Facility Site

In order to provide a baseline against which to evaluate changes that will result from the LNG facility development, an assessment was carried out of the existing landscape quality of the site. The landscape quality was evaluated by applying an adapted methodology developed by the US Bureau of Land Management (BLM, 1984). The factors taken into account in determining an overall rating for the site are defined in Table 8.12.2 which also includes a numeric rating against each factor.

Table 8.12.2 Scenic Quality Ratings Table (Source: BLM)

Key	Ratings Criteria and Scores		
Landform	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops or severe surface variation or highly eroded formations or detailed features, dominant and exceptionally striking and intriguing. 5	Steep valleys, volcanic cones, hills or ridges; or interesting erosion patterns or variety in size and shape of landforms; or detailed features which are interesting though not dominant or exceptional. 3	Low rolling hills, foothills or flat valley bottoms or few or no interesting landscape features. 1
Vegetation	A variety of vegetative types has expressed in interesting forms, textures and patterns. 5	Some variety of vegetation, but only one or two major types. 3	Little or no variety or contrast to vegetation. 1
Water	Clear & clean appearing, still or cascading white water & any of which are a dominant factor in the landscape. 5	Flowing or still, but not dominant in the landscape. 3	Absent or present, but not noticeable. 0
Colour	Rich colour combinations, variety or vivid colour or pleasing contrast in the soil, rock, vegetation, water or snowfields. 5	Some intensity of variety in colours & contrast of soil, rock & vegetation, but not a dominant scenic element. 3	Subtle colour variations, contrast or interest; generally muted tones. 1

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Key	Ratings Criteria and Scores		
Influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. 5	Adjacent scenery moderately enhances overall visual quality. 3	Adjacent scenery has little or no influence on overall visual quality. 0
Scarcity	One-of-a-kind or unusually memorable or very rare within the region. 5	Distinctive, though somewhat similar to others within the region. 3	Interesting within its setting, but fairly common within the region. 1
Cultural modifications	Modifications add favourably to visual variety while promoting visual harmony. 2	Modifications add little or no visual variety to the area and introduce no discordant elements. 0	Modifications add variety, but are very discordant and promote strong disharmony. - 4

The maximum potential rating that could be achieved is 32, which would apply to a landscape that was assessed as meeting all of the criteria in the left hand column.

The Scenic Quality Rating Categories defined in the BLM system are:

- 19 - 32 = High
- 12 - 18 = Medium
- 11 or less = Low

An assessment of scenic quality of the LNG facility site was carried out and the results are presented in Table 8.12.3.

Table 8.12.3 Scenic Quality Rating of the LNG Site

Key Factors	Rating Applied
Landform	3
Vegetation	3
Water	3
Colour	3
Influence of adjacent scenery	5
Scarcity	3
Cultural modifications	0
Total	20

The rating of 20 out of a possible maximum of 32 indicates that the scenic quality of the LNG facility site is considered to be high.

8.12.3.4 Landscape Significance of LNG Facility Site

The landscape significance of the LNG facility site varies depending on whether it is considered in the local, regional, state, national or international context.

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Local Context

At a local level the site is highly significant, as it forms part of the northern shore of 'Port Curtis', which is visually dominated by the natural landscape character of Curtis Island. Local fisherman and pleasure boat operators use China Bay as well as Port Curtis. In addition, views to the north from a number of locations along the Mount Larcom – Gladstone Road on the southern side of Port Curtis between Calliope River and the Reid Road intersection include the LNG facility site at China Bay.

Regional Context

The LNG facility site is significant in a regional context due to its location on a visible portion of Curtis Island, which is a very significant natural feature of the Gladstone regional landscape. This regional significance is increased by the relationship of the site to Port Curtis as vessels travelling along this section of waterway pass close to the site. Port Curtis is used by pleasure and commercial craft travelling to and from Rockhampton, as well as ships berthing at the Fisherman's Landing wharf. The site is visible from a number of locations along Port Curtis Way, which carries significant volumes of regional traffic between Gladstone and Rockhampton. However, these views are at a distance of 7-8 kilometres, which is relatively long. The views extend across tidal mud flats and mangroves in the foreground to the visually prominent central ridge of Curtis Island, which forms a backdrop to the LNG facility site.

The Curtis Coast Regional Coastal Management Plan (Management Plan), which was prepared by the Environmental Protection Agency (EPA) in conjunction with the Queensland Parks and Wildlife Service (Queensland Government, 2003), identifies the whole of Curtis Island as an 'Area of State Significance'. The Management Plan includes a statement that Queensland State Policy is to identify areas of state significance (scenic coastal landscape) and to recognise and protect their diversity, quality and extent of scenic landscape values. The policy requires that regional planning strategies and local government planning schemes, which cover 'areas of state significance' (scenic coastal landscapes), are to include measures that protect areas with coastal values from incompatible land uses.

Schedule 1 of the Management Plan guides landscape change in the Curtis Coast region to ensure the scenic amenity values of 'areas of state significance (scenic coastal landscapes)' are not degraded. It lists Curtis Island in the category of 'Islands and offshore features'. The desired coastal outcomes for this category are that:

- *"The landscape values of islands and their contribution to the landscape values of the Curtis Coast region are protected and maintained; and*
- *Views from the mainland and viewpoints to the islands are maintained and enhanced."*

Specific measures are listed which include:

- *"Ensure that development remains unobtrusive and compatible with landscape values. For example, buildings should not be higher than mature tree height and not on the shorelines or ridgelines or visible from view points; and*
- *Screen access points and other development from viewpoints."*

The LNG facility site is also located within the Gladstone State Development Area (GSDA), which was established by the Queensland Government in 1993. In July 2008 the west coast of southern Curtis Island was added as an Industry Precinct to provide for the establishment of LNG facilities. To the east of this precinct an Environmental Management Precinct was designated and Kangaroo Island was added as a Restricted Development Precinct to link the GSDA.

One of the objectives of the GSDA is to ensure development recognises and protects environmental, cultural heritage and community values of area.

National and International Context

The LNG facility site is not located within a landscape that has been identified as significant at a national or international level. However, the eastern edge of Curtis Island adjoins the GBRMP, which is significant

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at a national and international level. The extent and zoning of the GBRMP in the vicinity of Curtis Island is shown on Map MPZ17, which was published by the Great Barrier Reef Marine Park Authority and Queensland Government on 24th April 2006. Map MPZ17 indicates that the portion of the GBRMP adjoining the eastern edge Curtis Island north of South End is zoned General Use Area. An area further north adjoining Curtis Island National Park is zoned as Marine National Park. The closest portion of this zone to the LNG facility site is approximately 12 km away. A high ridgeline immediately east of the LNG facility site as well as a system of hills visually separate the site from the GBRMP.

MPZ17 shows Graham Creek and the section of Port Curtis north of the proposed bridge between Friend Point and Laird Point as being zoned for Habitat Protection. The purpose of this zoning as stated on MPZ17 is to "...provide for the conservation of areas of the Marine Park by protecting and managing sensitive habitats and ensuring they are generally free from potentially damaging activities." The focus of the zoning is on conservation and management of ecological and biological values within the zone.

The 25 Year Great Barrier Reef World Heritage Area Strategic Plan, which was published by the Great Barrier Reef Marine Park Authority in 1994, provides details of the management objectives and strategies for the GBRMP. The focus of the Plan is clearly on conservation and management of biological and ecological values as well as cultural heritage values, particularly those associated with indigenous people. The Plan does not identify scenic values or visual landscape values in any of the objectives or strategies.

While the potential bridge between Friend Point and Laird Point will be visible from the section of Port Curtis immediately to the north and at the mouth of Graham Creek, as indicated on Figure 8.12.2, this is not an issue that is related to management of the GBRMP.

8.12.3.5 Capacity of Site to Visually Absorb Change

The natural landscape character of the LNG facility site limits the capacity for it to visually absorb significant change. The introduction of structures higher than the existing tree layer will introduce man-made elements that contrast with the surrounding tree covered slopes. However, the ridges and spurs, which define the eastern, northern and western edges of the valley adjoining China Bay, generally block views from most directions, except from the south. As a result, the site has significant capacity to visually absorb change in relation to views from the east, north and west, provided structures do not extend above the level of the adjoining landforms. In relation to views from the south that extend into the valley, the site has limited capacity to visually absorb change. This capacity could be significantly increased by careful selection of colours on visible structural components of the facility to minimise the visual contrast between them and the tree-covered slopes that form the background against which they will be viewed.

8.12.4 Visual Impact Assessment

Having defined the existing landscape quality of the site, a visual impact assessment was undertaken. Further to the methodology provided in Section 8.12.2, the following sections detail the outcomes of each step of the visual impact assessment.

8.12.4.1 Identification of View Situations

View situations were identified: a total of 23 land based view situations and 4 water areas from which the LNG facility, potential bridge and access road could potentially be visible. They included public roads, bridges, urban areas, public lookouts, Gladstone marina, Gladstone Harbour and Port Curtis.

Visibility Assessment

The visibility of the major components of the LNG facility was assessed for each of the view situations. Photographs were taken from a helicopter hovering at the approximate height and location of the major components of the LNG facility. The photographs were analysed to determine the extent to which the individual components of the LNG facility will potentially be visible.

Results of the visibility assessment of the major components of the LNG facility from each of the view situations are presented in Table 8.12.4.

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Table 8.12.4 Visibility of Major Components of LNG Facility, Bridge and Access Roads

LNG Facility Components	LNG Train	LNG Storage Tank	Flare Stack	Flame	Material Offloading Facility (MOF)	Product Loading Facility (PLF)	Bridge	Curtis Island – Access Road	Mainland – Access Road
VIEW SITUATION									
1. South End township & jetty	N	N	P	Y	N	N	N	N	N
2. Facing Island settlement	N	N	P	Y	N	N	N	N	N
3. Quoin Island	N	N	P	Y	N	N	N	N	N
4. Turtle Island	P	P	P	Y	N	N	N	N	N
5. Witt Island	P	P	P	Y	N	N	N	N	N
6. Tide Island	P	P	P	Y	N	N	N	N	N
7. Auckland Lookout	N	N	P	Y	Y	Y	Y	N	N
8. Spinnaker Park	N	N	P	Y	N	N	N	N	N
9. Gladstone Commercial Centre	N	N	P	Y	N	N	N	N	N
10. Gladstone Urban Area	N	N	P	Y	N	N	N	N	N
11. Round Hill Lookout	N	N	P	Y	Y	Y	Y	N	N
12. Hanson Rd.	N	N	P	Y	N	N	N	N	N
13. Hanson Rd. at Power Station	N	N	N	N	N	N	N	N	N
14. Bridge over Calliope River	N	N	P	Y	N	N	N	N	N
15. Mt. Larcom-Gladstone Rd.	Y	Y	Y	Y	N	N	N	N	N
16. Calliope River Anabranche Bridge	Y	Y	Y	Y	N	N	N	N	N
17. Mt. Larcom-Gladstone Rd.	Y	Y	Y	Y	N	N	N	N	N
18. Reid Rd./Mt. Larcom-Gladstone Rd.	Y	Y	Y	Y	N	N	N	N	N
19. Mt. Larcom-Gladstone Rd. (west of Reid Rd.)	N	N	N	N	N	N	N	N	N
20. Mt. Larcom-Gladstone Rd. (west of Landing Rd. intersection)	N	N	N	N	N	N	N	N	N
21. Landing Rd.	N	N	N	N	N	N	N	N	N
22. Landing Rd. foreshore	N	N	P	Y	N	N	Y	N	N
23. Yarwun township	N	N	N	N	N	N	N	N	N
24. Port Curtis	Y	Y	Y	Y	Y	Y	Y	Y	Y
25. Port Gladstone	N	N	P	Y	N	N	N	N	N
26. North Channel (south section)	N	N	P	Y	N	N	N	N	N
27. North Channel (north section)	N	N	P	Y	N	N	N	N	N

Y – Yes Visible N – Not visible P – Partly visible (upper portion of the structure)

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Key findings of the visibility assessment are summarised by the following points:

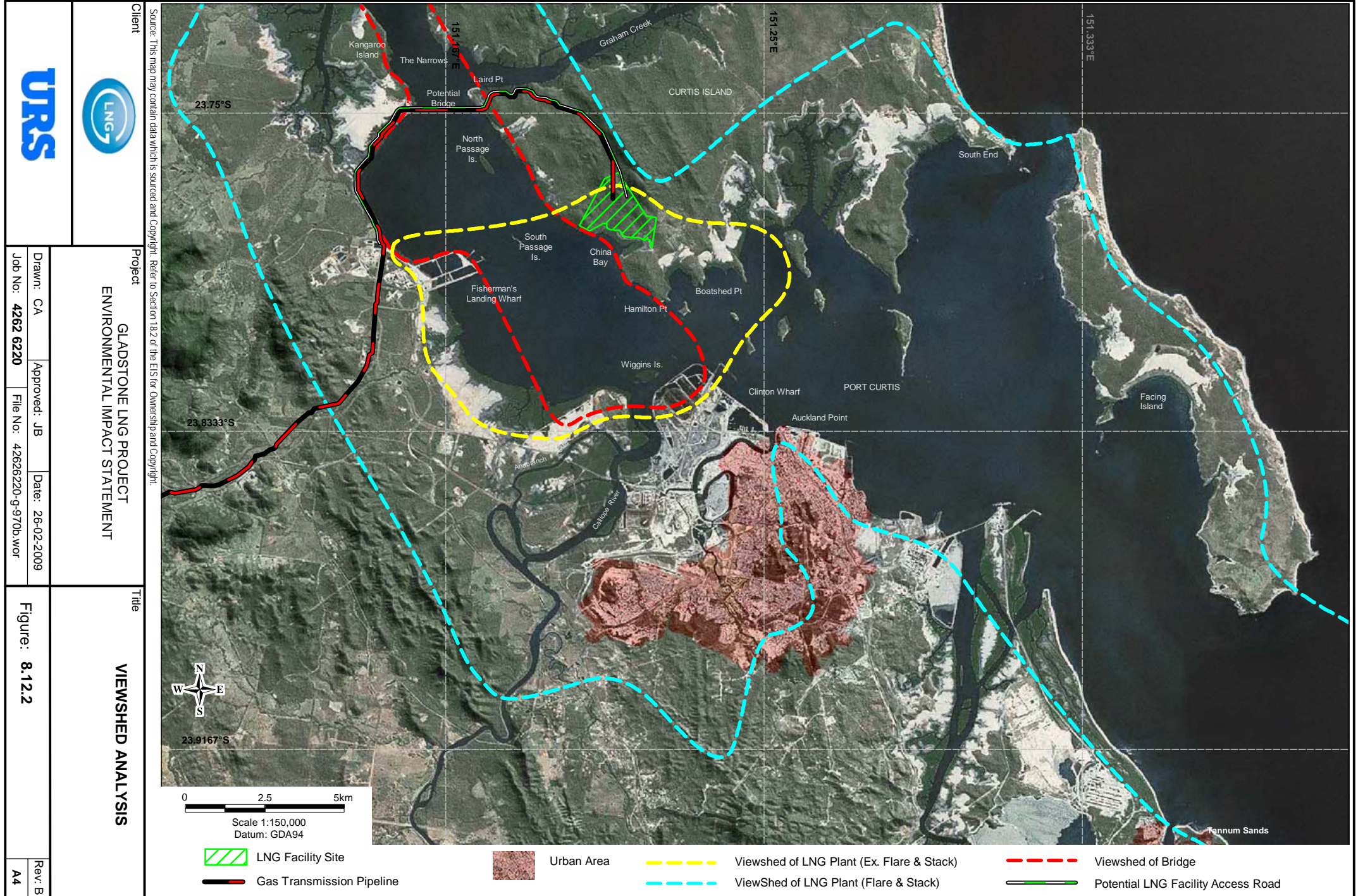
- All components of the LNG facility as well as the potential bridge and access roads will be visible from Port Curtis;
- The flare stack and flame will be visible to varying degrees from most of the view situations identified, with the exception of those sections of the Mt Larcom-Gladstone Road from which views are blocked by roadside vegetation and sections of Hanson Road;
- The LNG train and storage tanks will not be visible from most view situations due to visual screening created by the tree-covered ridges that define the valley in which the LNG facility will be located. However, these structures will be visible from Port Curtis and adjoining sections of Mount Larcom-Gladstone Rd. and the upper portions the structures will be visible from Tide, Witt and Turtle Islands;
- The LNG facility, including the flare stack, will not be visible from the portion of the GBRMP zoned Marine National Park that is located along the eastern edge of Curtis Island or Curtis Island National Park, due to the system of hills and ridges in the centre of Curtis Island;
- The potential bridge and access roads will not be visible from most view situations due to screening by vegetation and/or landforms; however it will be highly visible from Port Curtis. The bridge will also be visible from the Auckland and Round Hill public lookouts even though the views to the potential bridge are from a distance of 13 km and 16 km respectively;
- LNG carriers (LNGC) moored at the Product Loading Facility (PLF) at China Bay will be visible from Port Curtis and sections of the Mount Larcom-Gladstone Road. These LNGCs will be visually prominent due to their size and the visual contrast between ship and the natural landscape character of Curtis Island which will form a visual background. When a ship is moored at the PLF it will block views of the land-based components of the LNG facility; and
- Ships/barges/ferries moored at the Material offloading Facility (MOF) at China Bay will also be visible from Port Curtis and sections of the Mount Larcom-Gladstone Road. These ships/barges/ferries will be less visually prominent compared to the LNGCs, but due to their size and the visual contrast between ships/barges/ferries and the natural landscape character of Curtis Island which will form a visual background.

8.12.4.2 Identification of View Sheds

Based on the results of the visibility assessment, the primary view sheds of the LNG facility, the flare stacks, the potential bridge and access road were identified. The primary view shed is defined as the approximate area from which the structure or flare is likely to be visible. It should be noted however, that within the view shed there are likely to be locations from which the structure or flare will not be visible as a result of the view being blocked by local landform, vegetation or structures. Similarly, the view may include only part of the structure due to partial screening by local landform, vegetation or structures.

Key aspects of the view sheds shown in Figure 8.12.2 are that:

- The view shed of the flare is much larger than the LNG facility, bridge and access road;
- The view shed of the LNG facility (excluding the flare stack) is relatively confined by the visual screening provided by the landform of the valley in which it will be located;
- The view shed of the bridge/access road is generally confined to Port Curtis and adjoining foreshore areas;
- The extent and shape of the three view sheds vary significantly; and
- The only area in which the three view sheds overlap is the section of Port Curtis adjoining the LNG facility site at China Bay.



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8.12.4.3 Significance of the Potential Visual Impact

Finally, for each of the view situations, an assessment was undertaken to quantify the level of significance of the potential visual impact. This is dependent on the magnitude of change to existing views and the sensitivity of the viewers to that change.

The various criteria used to determine the magnitude of potential visual impacts of the LNG facility, bridge and access road development are listed in Table 8.12.5. The levels of magnitude of visibility resulting from the combination of the various criteria are presented in Table 8.12.6.

Table 8.12.5 View situation assessment criteria

Criteria	Description	Definition
View Distance	Long	> 5 km
	Medium	1 – 5 km
	Short	200 – 1000 m
	Very Short	< 200 m
Period of View	Long term	> 2 hrs
	Moderate term	1 minute to 2 hours
	Short term	< 1 minute
Number of Viewers	High	>5,000 people per day
	Moderate	1,000 - 5,000 people per day
	Low	100 - 1,000 people per day
	Very Low	< 100 people per day

Table 8.12.6 Magnitude of visibility matrix

	Long Distance			Medium Distance			Short Distance			Very Short Distance		
	L	M	S	L	M	S	L	M	S	L	M	S
Period of View L=long, M=medium, S=short												
No. of viewers - High	M	L	L	H	M	M	H	H	M	H	H	H
No. of viewers - Medium	L	L	N	M	M	L	H	M	M	H	H	M
No. of viewers - Low	L	N	N	M	L	L	M	M	L	H	M	M
No. of viewers - Very Low	N	N	N	L	N	N	L	L	L	M	L	L

Magnitude of Visibility: N= negligible L= low M=medium H= high

The categories of magnitude of visibility are defined below.

- **Negligible** - very minor loss or alteration to one or more key element/features/characteristics of the baseline visual character (i.e. pre-development landscape or view) and/or introduction of elements that are not uncharacteristic to the existing landscape, which approximates the 'no change' situation.
- **Low** - minor loss of, or alterations to, one or more key elements/features/characteristics of the baseline visual character (i.e. pre-development landscape or view) and/or introduction of elements that are not uncharacteristic of the existing landscape.
- **Medium** - partial loss of, or alteration to, one or more key elements/features/characteristics of the baseline visual character (i.e. pre-development landscape or view) and/or introduction of elements that may be prominent but not considered substantially uncharacteristic of the existing landscape.

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- **High** - total loss of key elements/features/characteristics of the baseline visual character (i.e. pre-development landscape or view) and/or introduction of elements considered to be totally uncharacteristic of the existing landscape.

8.12.4.4 LNG Facility

There is a significant difference in the extent to which the flare stack and flame are visible compared to the other major components of the LNG facility, which include the LNG train, storage tanks and PLF. This difference is primarily due to the significantly greater height of the flare stack and flame. In addition, the occurrence of the flame at the flare stack is intermittent and irregular, while the other structures are permanent. Consequently, the assessment of potential visual impact has considered the flare stack and flame separately from the other components of the LNG facility.

LNG Train, Storage Tanks and PLF

Table 8.12.7 presents the results of the assessment of the visual impact predicted to result from the LNG train, storage tanks and PLF while Table 8.12.8 presents the results of the separate assessment of the flare stack and flame.

Table 8.12.7 Visual impact assessment of the LNG train, storage tanks and PLF

Assessment Criteria	Category of Viewer	Approximate Distance to Site	Approximate Period of View	Relative No. of Viewers	Magnitude of Visibility	Viewer Sensitivity	Visual Impact Significance	Comments
View Situation								
1. South End township & jetty	Residents & visitors						N	Facility not visible
2. Facing Island settlement	Residents & visitors						N	Facility not visible
3. Quoin Island	Residents						N	Facility not visible
4. Turtle Island	Residents	L	L	VL	N	H	L	Not visible from houses
5. Witt Island	Residents	M	L	VL	L	H	M	Not visible from houses
6. Tide Island	Residents	M	L	VL	L	H	M	Not visible from houses
7. Auckland Lookout	Visitors						N	Facility not visible
8. Spinnaker Park	Visitors						N	Facility not visible
9. Gladstone Commercial Centre	Workers & Visitors						N	Facility not visible
10. Gladstone Urban Area	Residents						N	Facility not visible
11. Round Hill Lookout	Visitors	L	M	L	N	H	L	MOF, PLF & ship visible
12. Hanson Road	Motorists						N	Facility not visible
13. Hanson Rd. at Power Station	Motorists						N	Facility not visible
14. Bridge over Calliope River	Motorists						N	Facility not visible
15. Mt. Larcom-Gladstone Rd. (west of Calliope River)	Motorists	L	M	M	L	H	M	Low hill partly blocks view to site
16. Bridge over Calliope River Anabranch	Motorists	L	S	M	N	H	L	Low hill partly blocks view to site

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Assessment Criteria	Category of Viewer	Approximate Distance to Site	Approximate Period of View	Relative No. of Viewers	Magnitude of Visibility	Viewer Sensitivity	Visual Impact Significance	Comments
17. Mt. Larcom-Gladstone Rd.	Motorists	L	M	M	L	H	M	Open view across tidal mud flats, Mangroves block part of site
18. Mt. Larcom-Gladstone Rd. /Reid Rd. intersection	Motorists	L	S	M	L	H	M	Open view across tidal mud flats, Mangroves block view of site foreshore
19. Mt. Larcom-Gladstone Rd. (west of Reid Rd.)	Motorists						N	Facility not visible
20. Mt. Larcom-Gladstone Rd.	Motorists						N	Facility not visible
21. Landing Rd.	Motorists						N	Facility not visible
22. Landing Rd. foreshore	Visitors						N	Facility not visible
23. Yarwun township	Residents						N	Facility not visible
24. 'Port Curtis'	Passengers & crew	S	M	L	M	H	H	Open views from boats to site & bridge
25. Port Gladstone	Passengers & crew						N	Views to site blocked by islands & Hamilton Point
26. North Channel (south)	Passengers & crew						N	Views to site generally blocked by islands & ridge
27. North Channel (north)	Passengers & crew						N	Views to site generally blocked by Chinaman Is.

Visual impact significance: N=negligible L=low M=medium H=high

Key aspects of the visual impact assessment of the LNG train, storage tanks, MOF and PLF, which are presented in Table 8.12.7, include:

- The only view situation in which the level of visual impact is predicted to be high is passengers and crew of vessels on Port Curtis. This includes pleasure craft as well as ships entering and leaving the Fisherman's Landing Wharf;
- View situations from which the level of visual impact is predicted to be moderate include Witt and Tide Island as well as the section of the Mount Larcom - Gladstone Road between Calliope River the Reid Road intersection;
- View situations in which the potential visual impact is predicted to be low include Turtle Island, Round Hill Lookout, and the bridge over Calliope River; and
- The level of visual impact in all other view situations identified in Table 8.12.7 is predicted to be negligible.

The structures and storage tanks to be constructed as part of the LNG facility and the associated alteration of landforms will not result in obstruction of sunlight on areas adjoining the development. The materials to be used in the LNG facility structures will be selected with the aim of avoiding reflections that will impact on areas of land and water adjoining the LNG facility.

Given that the only local situation from which the site is visible is the adjoining portion of Port Curtis, particularly China Bay, then the significance of the potential visual impact associated with clearing of vegetation is predicted to be low to moderate. Retention of a strip of mangroves along most of the

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foreshore will provide partial screening of views to the site works from China Bay. In addition, the potential number of viewers will be low. Potential views of vegetation clearing operations from other locations adjoining the site will be screened by the valley landform in which the construction works are to be carried out.

There are no existing light sources within the LNG facility site and immediately surrounding areas. Consequently, lighting associated with the LNG facility will introduce a new source of illumination into to predominantly natural landscape setting. The visual simulations presented in Section 8.12.4.6 illustrate the level of illumination that will be visible in views from the key view situations identified in the visual assessment. However, as the portion of Curtis Island adjacent to the LNG facility is undeveloped remnant woodland there will not be any impact on existing residents. The main category of viewer that will be impacted by lighting on the LNG facility will be crew and passengers of recreation craft on Port Curtis waterway and ships berthing at the Fisherman's Landing Wharf. While the illumination of the LNG facility will be visible from other locations listed in Table 8.12.7 assessed as medium or low visual impact, most of these include existing lighting associated with urban development or port facilities.

Flare Stack and Flame

The assessment of predicted visual impact of the flare stack and flame presented in Table 8.12.8 indicates that the number of view situations impacted is higher than for the LNG train, tanks and PLF, which are addressed in Table 8.12.7. This more extensive visual impact results from the greater height of the stacks, but more significantly from the flame that will be highly visible at night. It should however, be emphasised that flaring at night is only expected to occur on a limited number of occasions during the year.

Table 8.12.8 Visual Impact Assessment of the LNG Facility Flare Stack and Flame

Assessment Criteria	Category of Viewer	Approximate Distance to Site	Approximate Period of View	Relative No. of Viewers	Magnitude of Visibility	Viewer Sensitivity	Visual Impact Significance	Comments
View Situation								
1. South End township & jetty	Residents & visitors	L	M	L	N	H	L	Trees generally block views from houses
2. Facing Island settlement	Residents & visitors	L	M	L	N	H	L	Houses oriented west
3. Quoin Island	Residents	L	M	VL	N	H	L	Houses oriented west
4. Turtle Island	Residents	L	M	VL	N	H	L	House oriented to east
5. Witt Island	Residents	M	M	VL	N	H	L	House oriented to east
6. Tide Island	Residents	M	M	VL	N	H	L	House oriented to east
7. Auckland Lookout	Visitors	L	M	L	N	M	N	Coal loader mid distance
8. Spinnaker Park	Visitors	L	M	L	N	M	N	Coal loader in foreground
9. Gladstone Commercial Centre	Workers & Visitors	L	M	H	L	M	L	Views generally blocked by buildings
10. Gladstone Urban Area	Residents	L	M	H	L	M	L	Views generally blocked by buildings
11. Round Hill Lookout	Visitors	L	M	L	N	H	L	View distance 12km
12. Hanson Road	Motorists	L	M	M	L	M	L	Views generally blocked

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Assessment Criteria	Category of Viewer	Approximate Distance to Site	Approximate Period of View	Relative No. of Viewers	Magnitude of Visibility	Viewer Sensitivity	Visual Impact Significance	Comments
								by buildings
13. Hanson Rd. at Power Station	Motorists						N	Views generally blocked by buildings & trees
14. Calliope River Bridge	Motorists	L	S	M	N	M	L	No stopping on bridge
15. Mt. Larcom-Gladstone Rd. (west of Calliope River)	Motorists	L	M	M	L	M	L	Low hill partly blocks view to site
16. Bridge over Calliope River Anabran	Motorists	L	S	M	N	M	L	Low hill partly blocks view to site
17. Mt. Larcom-Gladstone Rd.	Motorists	L	M	M	L	M	M	Open view across tidal mud flats, Mangroves block view to lower portion of site
18. Mt. Larcom-Gladstone Rd. /Reid Rd. intersection	Motorists	L	S	M	N	M	M	Open view across tidal mud flats, Mangroves block view of site foreshore
19. Mt. Larcom-Gladstone Rd. (west of Reid Rd.)	Motorists						N	Views from road blocked by trees
20. Mt. Larcom-Gladstone Rd.	Motorists						N	Views from road blocked by trees
21. Landing Rd.	Motorists						N	Views from road blocked by trees
22. Landing Road foreshore open space area	Visitors	L	M	L	N	H	L	Views partly blocked by Mangroves
23. Yarwun township	Residents						N	View to site blocked by landform & vegetation
24. Port Curtis	Passengers & crew	S	M	L	M	H	H	Open views from boats to site & bridge
25. Port Gladstone	Passengers & crew	L	M	L	N	H	L	Views to site blocked by islands & Hamilton Point
26. North Channel	Passengers & crew	L	M	L	N	H	L	Views to site blocked by islands & ridge
27. North Channel	Passengers & crew	L	M	L	N	H	L	Views to site generally blocked by Chinaman Is.

Visual Impact Significance: N=negligible L=low M=medium H=high

The Civil Aviation Authority (CASA) requires lights to be used to identify obstacles as set out in the *Manual of Standards Part 139 – Aerodromes*. Three types of lights are used depending on the nature of the obstacle:

- Low intensity obstacle lights;
- Medium intensity obstacle lights; and
- High intensity obstacle lights.

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Due to the height of the flare stacks, medium intensity obstacle lights are required. There are three types of medium intensity obstacle lights:

- Flashing white lights (although these are likely to be unsuitable for use in environmentally sensitive locations and near built-up areas);
- Flashing red lights (suitable for all applications); and
- Steady red lights (used where there is opposition to the use of flashing red lights in environmentally sensitive locations).

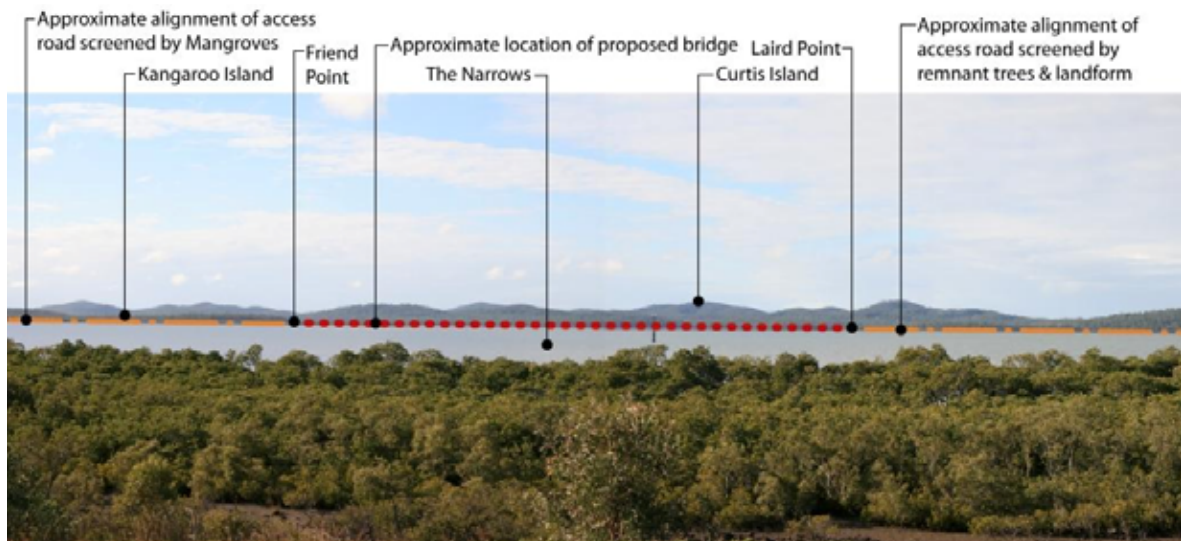
As the light will be seen against the backdrop of the central ridge of Curtis Island, an environmentally sensitive location, steady red lights will be used. These lights will be visible from all directions.

In views from areas south west of the site the red light will be seen together with the lighting of the LNG against a backdrop of the tree-covered central ridge of Curtis Island. The cumulative visual impact of the aircraft safety lighting is not predicted to be high as it will be seen in the context of general lighting of the LNG facility. Refer to Section 10 and Appendix CC for more details on CASA requirements.

8.12.4.5 Potential Bridge and Access Road

The potential bridge and the associated access road are linear elements and generally separated from the LNG facility. Their potential visual impact has been assessed separately.

One of the few locations currently accessible to the public from which the potential bridge crossing point can be seen is the foreshore public open space at the northern end of Landing Road. The annotated photograph below shows the approximate extent of the bridge and access road.



6. View north to proposed bridge location from north end of Landing Road (View Situation 22)

Plate 8.12.13 View north to proposed bridge location from north end of Landing Road (View Situation 22)

It should be noted that the location in this photograph is currently accessed by an unsealed gravel track from the northern end of Landing Road and the track is primarily used by fishermen gaining access to the foreshore. However, it is the potential location for an intersection between the new access road to Curtis Island and the existing road to the Fisherman's Landing wharf. Due to the slightly elevated landform at this location, the potential bridge to Curtis Island will be visible from the proposed intersection.

The primary view situation from which the potential Curtis Island bridge will be visible is from vessels travelling along Port Curtis or moored at the Fisherman's Landing wharf. The likely level of significance of visual impact for crews and passengers on vessels will vary significantly depending on the nature of their

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activities. Passengers on pleasure craft travelling through Port Curtis are likely to experience a higher level of visual impact than the crew of commercial vessels using the Fisherman's Landing wharf. However, for many pleasure craft passengers the visual impact may not necessarily be negative, as the new bridge will form a visual gateway that will clearly mark the northern boundary of Port Curtis. It will form a landmark structure separating the port, with its predominantly industrial character, from the natural landscape character of the state marine park.

An assessment of the visual impact of the potential bridge is presented in Table 8.12.9.

Table 8.12.9 Visual Impact Assessment of Potential Bridge

Assessment Criteria	Category of Viewer	Approximate Distance to Site	Approximate Period of View	Relative No. of Viewers	Magnitude of Visibility	Viewer Sensitivity	Visual Impact Significance	Comments
View Situation								
1. South End township & jetty	Residents & visitors						N	Bridge site not visible
2. Facing Island settlement	Residents & visitors						N	Bridge site not visible
3. Quoin Island	Residents						N	Bridge site not visible
4. Turtle Island	Residents						N	Bridge site not visible
5. Witt Island	Residents						N	Bridge site not visible
6. Tide Island	Residents						N	Bridge site not visible
7. Auckland Lookout	Visitors	L	M	L	N	H	L	View distance 13km
8. Spinnaker Park	Visitors						N	Coal loader blocks view to bridge site
9. Gladstone Commercial Centre	Workers & Visitors	L	M	H	L	M	L	View distance 13km
10. Gladstone Urban Area	Residents	L	M	H	L	M	L	View distance 13km
11. Round Hill Lookout	Visitors	L	M	L	N	H	L	View distance 16km
12. Hanson Road	Motorists						N	Bridge site not visible
13. Hanson Rd. at Power Station	Motorists						N	Bridge site not visible
14. Bridge over Calliope River	Motorists	L	S	M	N	M	L	View distance 12km
15. Mt. Larcom-Gladstone Rd. (west of Calliope River)	Motorists						N	Bridge site not visible
16. Bridge over Calliope River Anabran	Motorists						N	Bridge site not visible
17. Mt. Larcom-Gladstone Rd.	Motorists						N	Bridge site not visible
18. Mt. Larcom-Gladstone Rd. /Reid Rd. intersection	Motorists						N	Bridge site not visible
19. Mt. Larcom-Gladstone Rd. (west of Reid Rd.)	Motorists						N	Bridge site not visible
20. Mt. Larcom-Gladstone	Motorists						N	Bridge site not visible

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Assessment Criteria	Category of Viewer	Approximate Distance to Site	Approximate Period of View	Relative No. of Viewers	Magnitude of Visibility	Viewer Sensitivity	Visual Impact Significance	Comments
Rd.								
21. Landing Rd.	Motorists						N	Bridge site not visible
22. Landing Road foreshore open space area	Visitors	M	M	VL	N	H	L	
23. Yarwun township	Residents						N	Bridge site not visible
24. Port Curtis	Passengers & crew	VS	M	L	M	H	H	Some boats will pass under bridge
25. Port Gladstone	Passengers & crew						N	Views to bridge blocked by coal loader & Hamilton Pt.
26. North Channel (Picnic Is. to Tail Point)	Passengers & crew						N	Views to bridge blocked by Curtis Island
27. North Channel (Tail Point to South End)	Passengers & crew						N	Views to bridge blocked by Curtis Island

Visual impact significance: N=negligible L=low M=medium H=high

One section of the new road that may be constructed to provide access to the LNG facility will run along the western side of Port Curtis, from a new intersection at the north end of Landing Road to the western end of the bridge at Friend Point. The other section of access road may run from the eastern end of the bridge at Laird Point along the southern side of Graham Creek, before turning south east to run along a valley to the LNG facility at China Bay.

North of the Landing Road intersection the access road may run parallel to the foreshore but it will not generally be visible from vessels moving through Port Curtis, due to the visual screening by the strip of mangroves growing in the intertidal zone as well as a strip of remnant eucalypt woodland that will be retained along most of the eastern edge of the road corridor. The section of access road that will run across the tidal flats south of Friend Point is to be constructed on an embankment and will have less screening by the mangroves. This section of the access road will be partly visible from vessels travelling along Port Curtis.

Mangroves growing along the southern edge of Graham Creek will screen potential views of the access road from vessels travelling through Port Curtis and along Graham Creek. The section of access road that will run along the valley west of the central ridge of Curtis Island will be screened from view by the tree-covered hills and ridges west of the valley.

The headlights of vehicles travelling along the section of access road north of the intersection with Landing Road are not expected to be visible due to the screening effect of the mangroves and remnant eucalypt woodland. However, vehicles travelling at night along the section of access road immediately south west of the bridge as well as the potential bridge itself will be visible from Port Curtis.

Lighting on the bridge, which will include any required navigational lighting, will create a new reference marker for vessels travelling along Port Curtis.

The vehicle headlights along the section of access road on Curtis Island are not expected to be visible from Port Curtis or vessels berthing at Fisherman's Landing Wharf due to the screening effect of the tree-covered hills and ridges to the south of the access road route.

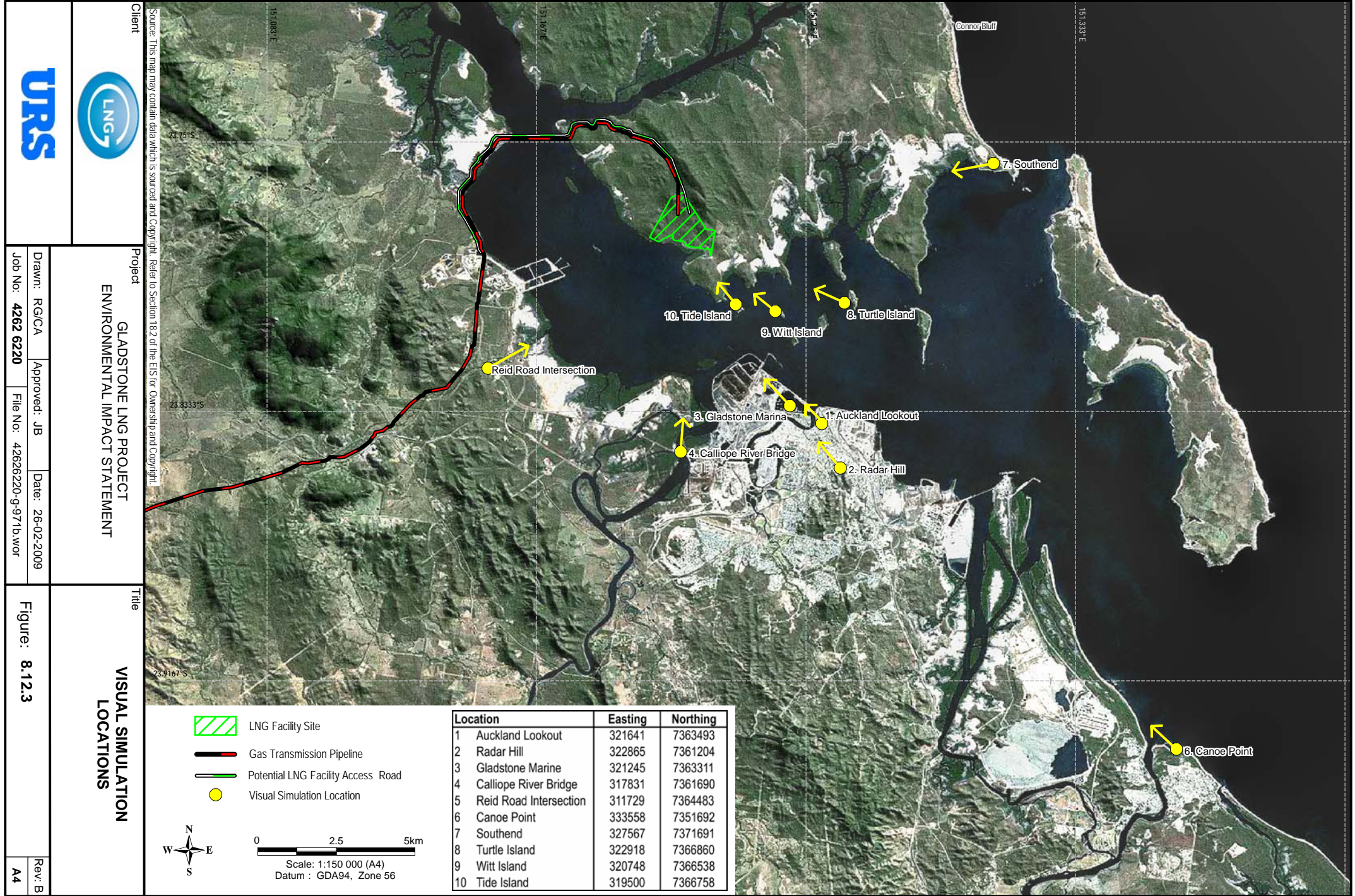
Section 8**LNG Facility Environmental Values and Management of Impacts****8.12.4.6 Visual Simulations**

A series of visual simulations of the LNG facility, the potential bridge, Curtis Island and the access road has been prepared. In the case of the potential bridge/road the view is from an aircraft. The visual simulations have been prepared to show both day and night views. The night view visual simulations include the appearance when flare stacks are operating as well as normal lighting of the facility when the flare is not operating.

The locations of the views used to prepare the visual simulations are shown on Figure 8.12.3.



Plate 8.12.14 Visual Simulation 1a – Evening View from Auckland Park Lookout towards the LNG facility site with coal loader in mid distance and Curtis Island forming skyline



Source: This map may contain data which is sourced and Copyright. Refer to Section 18.2 of the EIS for Ownership and Copyright.

Legend

- LNG Facility Site
- Gas Transmission Pipeline
- Potential LNG Facility Access Road
- Visual Simulation Location

Scale: 1:150 000 (A4)
Datum: GDA94, Zone 56

North Arrow

Location	Easting	Northing
1 Auckland Lookout	321641	7363493
2 Radar Hill	322865	7361204
3 Gladstone Marine	321245	7363311
4 Calliope River Bridge	317831	7361690
5 Reid Road Intersection	311729	7364483
6 Canoe Point	333558	7351692
7 Southend	327567	7371691
8 Turtle Island	322918	7366860
9 Witt Island	320748	7366538
10 Tide Island	319500	7366758

Client

Project

GLADSTONE LNG PROJECT
 ENVIRONMENTAL IMPACT STATEMENT

Title

VISUAL SIMULATION
 LOCATIONS

Drawn: RG/CA

Job No: **4262 6220**

Approved: JB

File No: 42626220-9-971b.wor

Date: 26-02-2009

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Figure: **8.12.3**

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Plate 8.12.15 Visual Simulation 1b - View from Auckland Park Lookout with LNG facility intermittent flare on skyline



Plate 8.12.16 Visual Simulation 2a - View from Radar Hill with Gladstone urban area in foreground and Curtis Island on horizon

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Plate 8.12.17 Visual Simulation 2b - View from Radar Hill with coal loader lighting on left and LNG facility intermittent flare right of the centre of the photo



Plate 8.12.18 Visual Simulation 3a - View from Gladstone Marina with Curtis Island central ridge visible on horizon

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Plate 8.12.19 Visual Simulation 3b - View from Gladstone Marina at night with LNG facility intermittent flare visible on horizon



Plate 8.12.20 Visual Simulation 4a - View from Calliope River Bridge with Curtis Island visible on horizon

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Plate 8.12.21 Visual Simulation 4b - View from Calliope River Bridge at night with LNG facility intermittent flare visible on horizon



Plate 8.12.22 Visual Simulation 5a - View from Mount Larcom to Gladstone Road at Reid Road intersection, with the LNG facility visible on Curtis Island (white LNG storage tanks in centre of photo, flare stack above right hand tank, LNG train to right of tanks)

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Plate 8.12.23 Visual Simulation 5b - View from Mount Larcom to Gladstone Road at Reid Road intersection, with flame created by intermittent flaring visible above skyline



Plate 8.12.24 Visual Simulation 5c - View from Mount Larcom to Gladstone Road at Reid Road intersection, with LNG facility lighting visible to right and Fisherman's Landing Wharf lighting to left

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Plate 8.12.25 Visual Simulation 5d - View from Mount Larcom to Gladstone Road at Reid Road intersection, with LNG facility lighting and intermittent flare visible to right and Fisherman's Landing Wharf lighting visible to left



Plate 8.12.26 Visual Simulation 6a - View from Canoe Point, Tannum Sands with Curtis Island visible on horizon near centre

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Plate 8.12.27 Visual Simulation 6b - View from Canoe Point, Tannum Sands with LNG facility intermittent flare visible on horizon



Plate 8.12.28 Visual Simulation 7a - View from South End township with Mount Larcom on horizon in centre and Curtis Island to right

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Plate 8.12.29 Visual Simulation 7b - View from South End with LNG facility intermittent flare near centre



Plate 8.12.30 Visual Simulation 8a - View from near Turtle Island with LNG facility flare stacks in right and Mount Larcom in left portion of photo

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Plate 8.12.31 Visual Simulation 8b - View from near Turtle Island with LNG Facility lighting and intermittent flare



Plate 8.12.32 Visual Simulation 9a - View from near Witt Island with LNG facility flare stacks and upper portions of storage tanks and other structures on skyline

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Plate 8.12.33 Visual Simulation 9b - View from near Witt Island with LNG facility lighting



Plate 8.12.34 Visual Simulation 9c - View from near Witt Island with LNG facility lighting and intermittent flare

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Plate 8.12.35 Visual Simulation 10a - View from near Tide Island with LNG facility flare stacks, tanks and structures visible on skyline



Plate 8.12.36 Visual Simulation 10b - View from near Tide Island with LNG facility intermittent flare stacks and flame created by flaring visible against sky

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Plate 8.12.37 Visual Simulation 10c - View from near Tide Island with LNG facility lighting



Plate 8.12.38 Visual Simulation 10d - View from near Tide Island with LNG facility lighting and intermittent flare

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Plate 8.12.39 Visual Simulation 11a - View from above Curtis Island looking south over potential bridge across Port Curtis and the mainland Access Road



Plate 8.12.40 Visual Simulation 11b - View looking north over potential bridge across Port Curtis to Curtis Island

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8.12.5 Potential Impacts and Mitigation Measures

While the overall potential visual impact of the LNG facility on most of the view situations has been assessed as generally low to moderate, mitigation measures are recommended in order to minimise the potential visual impacts. The mitigation measures are considered particularly necessary due to the high landscape quality of the LNG facility site and potential bridge and mainland access road location, which is recognised by the Curtis Coast Regional Coastal Management Plan as an 'Area of State Significance'.

The primary objectives of mitigation measures are to:

- Minimise the visual contrast between the LNG facility structures and the tree-covered slopes of Curtis Island, which form the backdrop against which the structures will be viewed;
- Minimise the height of structures in order to maximise the visual screening that is provided by the system of tree-covered ridges and hills that define the valley in which the LNG facility is to be located;
- Minimise the visibility of structures and flames associated with flaring operations in the LNG facility; and
- Minimise the visibility of lighting that could be seen against the dark tree-covered slopes of Curtis Island that will form the backdrop to the LNG facility.

In order to meet the above objectives the following mitigation measures will be considered:

- Adopting of ground level flare option to minimise the visual impact of flaring, particularly at night;
- Planning and management of site works to minimise tree clearing, with revegetation works on disturbed areas to be implemented as quickly as possible after completion of earthworks;
- Retention of mangrove vegetation along the foreshore of China Bay to provide partial visual screening of the ground level components of the LNG facility;
- Design of the LNG facility lighting to minimise light spill (e.g. using light hoods) and avoid direct views of lights from outside the plant, in particular Port Curtis (and any navigational vessels using Port Curtis) and view situations located south of Port Curtis;
- Installation of aircraft safety lighting on the flare stacks (steady red light) in accordance with clause 9.4.2.4 (c) of the *CASA Manual of Standards Part 139 – Aerodromes*;
- Avoid the use of obstacle markings (e.g. red and white paint on the upper portions of the flare stacks);
- Planning of the potential bridge's construction works to include minimising the area of vegetation clearing at the bridge approaches and implement revegetation works as soon as possible;
- Design of the LNG facility access road to minimise tree clearing and retain foreshore vegetation as a buffer to block views from 'Port Curtis' as well as public land-based view situations; and
- Design of the MOF and PLF to minimise the visual bulk, particularly when viewed from Port Curtis waterway and from view situations to the south.

Implementation of the above mitigation measures will involve on-going collaboration between the design engineers, landscape architects and relevant GPC authorities (e.g. Harbour Master) as required during the detailed design and documentation process as well as during implementation of the works to minimise disruption to vessels using Port Curtis.

8.12.5.1 Cumulative Impacts

Including the GLNG project there are a number of industrial facilities that are proposed for Curtis Island (as described in section 1.7). There is limited information available as to the planned development of these proposed projects or the scale and timing of their development. However, a qualitative assessment can be made of the possible cumulative impacts.

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The southern portion of the Curtis Island GSDA has been designated for future industrial development. Should other industrial developments (including potential LNG projects) proceed in the GSDA area on Curtis Island, there will be cumulative impacts to the visual amenity values of the Port Curtis area along the western shoreline of Curtis Island. Depending on their location, structure and layout, the broader visual impact of these additional facilities are likely to be visible from parts of the mainland and Port Curtis. Flare stacks, if installed, will also be visible. Lighting typical of industrial facilities will also increase.

It is anticipated that similar mitigation measures to those identified in this EIS will need to be considered and implemented by other future developments.

Table 8.12.10 provides a summary of potential visual amenity impacts and mitigation measures for the LNG facility.

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Table 8.12.10 Potential Visual Impacts and Mitigation Measures

Aspect	Potential Impact	Mitigation Measure	Objective
Construction			
LNG facility change of visual amenity	Reduced visual amenity for people using The Narrows waterway and motorists using the Mt. Larcom-Gladstone Road.	<ul style="list-style-type: none"> Minimise vegetation clearing. Timely revegetation. 	Minimise visual contrast of the LNG facility against background.
Bridge between Friend Point and Laird Point	Reduced visual amenity for people using The Narrows waterway.	<ul style="list-style-type: none"> Minimise vegetation clearing. Timely revegetation of bridge approaches. 	Maximise visual quality of bridge.
Access road to bridge	Change of visual from a mudflat to a road.	<ul style="list-style-type: none"> Minimise vegetation clearing. Retain foreshore vegetation. 	Minimise visual impact from The Narrows waterway and Graham Creek.
Operation			
LNG facility prolonged flaring	Visual impact of flaring on the community.	<ul style="list-style-type: none"> Investigate ground level flare option. 	Minimise flare visibility.
LNG facility lighting	Lighting will change the visual amenity.	<ul style="list-style-type: none"> Minimise light spill. Control direction of lights. Use hoods where practicable. 	Minimise visibility of lighting.
Aircraft safety lighting and marking	Visual impact of safety lighting on the community.	<ul style="list-style-type: none"> Comply with CASA requirements. Avoid flare stacks obstacle markings. 	Ensure aircraft safety whilst minimising visual impact.
Decommissioning			
Removal of structures and site rehabilitation	Changed visual amenity.	<ul style="list-style-type: none"> Rehabilitate as rapidly as possible in compliance with approved plan. 	Render site suitable for agreed subsequent land use.

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The visual assessment concludes that construction of the proposed LNG facility would result in a fundamental change to the existing landscape character of the site on Curtis Island. This change would result from the removal of existing woodland vegetation, implementation of earthworks and construction of the LNG facility structures. However, the visual impact assessment also found that most components of the proposed LNG facility would only be visible from a limited number of view situations that are accessible to the general public. Potential views of the LNG trains, storage tanks and other structures would generally be blocked by the system of hills and ridges that define the valley in which the LNG facility is to be located. The forested hill slopes of Hamilton Point provide an important visual 'buffer' to the facility site when viewed from the Gladstone town areas to the south. The result would be a low to moderate visual impact for most view situations, with the exception of The Narrows waterway, where the visual impact is predicted to be high due to availability of direct views into the proposed LNG facility site.

The visual impact from the vertical flare stack will be significantly greater than other components of the LNG facility. While flaring is predicted to occur irregularly and for limited periods of time, it will be highly visible due to its height and the visual contrast with the natural landscape setting of Curtis Island against which it will be seen. The visual impact will be greatly increased when flaring occurs at night. Adopting a ground level flare option will reduce such visual impacts, and the practicality of this design option will be considered as part of the FEED process.

The potential bridge and access roads will not be visible from most view situations due to screening by vegetation and/or landforms; however it will be highly visible from Port Curtis. The bridge will also be visible from the Auckland and Round Hill public lookouts and from the northern end of Landing Road.

The primary view situation from which the potential Curtis Island bridge will be visible is from vessels travelling along Port Curtis or moored at the Fisherman's Landing wharf. The likely level of significance of visual impact for crews and passengers on vessels will vary significantly depending on the nature of their activities. Passengers on pleasure craft travelling through Port Curtis are likely to experience a higher level of visual impact than the crew of commercial vessels using the Fisherman's Landing Wharf. However, for many pleasure craft passengers the visual impact may not necessarily be negative, as the new bridge will form a visual gateway that will clearly mark the northern boundary of Port Curtis. It will form a landmark structure separating the port, with its predominantly industrial character, from the natural landscape character of the state marine park.