5 LAND USE AND INFRASTRUCTURE

This chapter describes the environmental values associated with land uses and infrastructure affected by the construction, operation and decommissioning of the LNG Component, including the LNG Facility, and impacts on land uses now and in the future. This chapter also describes proposed mitigations strategies.

5.1 DESCRIPTION OF PROJECT ENVIRONMENTAL OBJECTIVES

The Project environmental objectives for land use and infrastructure are: to minimise impacts on

- existing townships and infrastructure
- agricultural or rural activities and potential long term uses of land.

5.1.1 Methodology

Information relating to infrastructure within the Gladstone region provided in this chapter draws upon an assessment of Gladstone infrastructure[1] undertaken by GHD on behalf of QGC, the proponent of the QCLNG Project, and is included as *Appendix 5.3.*

The Project's consistency with state, regional and local plans for the area is addressed in *Volume 1.* However, for the purposes of assessing the potential impact of the Project on surrounding land uses, this chapter also considers the Project's consistency with key strategic plans for the Gladstone Region, with particular focus on the Gladstone State Development Area Development Scheme (prepared under the SDPWOA) and the Gladstone Port Authority Land Use Plan 1995, the statutory document prepared under the *Transport Infrastructure Act 1994*.

The 1995 *Port Authority Land Use Plan* identifies strategic port land and identifies environmental outcomes for this land. For clarity, the *GPC 50 year Strategic Plan (Update 2008)*, which provides broad projections for import and export of cargo through the Port of Gladstone, and specifically at each particular wharf facility, is not a statutory document.

Table 5.5.1 lists the potential components of the Project associated with the Gladstone area. The potential Project components in the Gladstone area not located on Curtis Island are collectively referred to throughout this chapter as the "mainland Project components".

1 GHD (2009) Queensland Curtis LNG Project Draft Gladstone Infrastructure Audit

Table 5.5.1 Project Components

Location	Project Component
Curtis Island	LNG Facility
	LNG Marine Facilities including Materials Offloading Facility (MOF) and LNG loading and propane unloading jetty
	Pipeline crossing route of The Narrows and potential roads and upgrades
Kangaroo Island	Curtis Island Bridge (approval for which is not sought by this EIS. However, EIS ToR required that this infrastructure be investigated)
Gladstone mainland	Export pipeline route east of the Targinie valley, Gladstone
	Access road extending north from Landing Road (associated with the Curtis Island Bridge and no longer supported by this EIS. However, EIS ToR required that this infrastructure be investigated)
	Construction ferry terminal, fabrication and laydown areas at Auckland Point
	Operations ferry terminal, RG Tanna Wharf, Alf O'Rourke Drive
	Construction camp option locations
	General operations administration building

The following methodology was used:

- Site visits were undertaken to Curtis Island and the mainland of Gladstone to examine the surrounding land uses.
- Existing land tenure details were determined from title searches and Digital Cadastre Database mapping (DCDB).
- Existing land uses were identified using aerial photography, topographical data and the mapping schemes of the former Gladstone City Council and Calliope Shire Councils.
- Potential future land uses and strategic planning policy directions within the Project area were determined through a review of key State Planning Policies (SPPs) and strategic policies/ documents.
- GIS mapping and spatial analysis was employed to synthesise data.

Once this data was analysed, the assessment methodology described in *Volume 1, Chapter 3* was applied to determine the overall significance of the Project's potential impact.

5.2 EXISTING ENVIRONMENT

5.2.1 Environmentally Sensitive Areas

Table 5.5.2 provides an overview of the environmentally sensitive areas identified in proximity to the LNG Facility or mainland Project components. It describes the environmental values of the areas or identifies the chapters of this Environmental Impact Statement (EIS) in which they are described.

Table 5.5.2 Environmental Values of Environmentally Sensitive Areas

Environmentally Sensitive Area	Environmental Values
World Heritage Areas	The Great Barrier Reef World Heritage Area (GBRWHA) extends seaward from the low water mark on the Queensland coast, covering the waters and islands within the Port of Gladstone including Curtis Island. *Volume 5, Chapter 16*
National Heritage Places	The Great Barrier Reef is included on the register of National Heritage Places. *Volume 8, Chapter 9*
Marine Parks	The southern boundary of the Queensland State Great Barrier Reef Coast Marine Park (GBRCMP) crosses The Narrows between Friend Point on the mainland and Laird Point on Curtis Island. *Volume 5, Chapter 8*
National Parks	Curtis Island National Park extends north of Graham Creek, on the east side of Curtis Island. *Volume 5, Chapter 7*
Wilderness Areas	There are no wilderness areas in proximity to the LNG Facility.
State Forests	The Curtis Island State Forest is located approximately 10 km north-west of the LNG Facility on the northern side of Graham Creek. The Targinie State Forest is located close to the pipeline corridor and mainland access road.
Wetlands of International Importance - Ramsar Sites	There are no Ramsar wetlands in proximity to the LNG Facility. *Volume 5, Chapter 7 and 8*
Wetlands	The Directory of Important Wetlands in Australia (DOIW) lists Port Curtis, The Narrows, Graham Creek, and Northeast Curtis Island as Nationally Important Wetlands. *Volume 5, Chapter 8 and 9*
International migratory bird agreements (i.e. JAMBA, CAMBA and ROKAMBA).	*Volume 5, Chapter 7 and 8*
Wildflower Areas	There are no wildflower areas in proximity to the LNG Facility.
Rivers and Lakes	Construction Camp Option B is located close to the Calliope River. There are no lakes in proximity to the LNG Facility.
Endangered Regional Ecosystems	*Volume 5, Chapter 7*

Environmentally Sensitive Area	Environmental Values
Scientific Reserves	The LNG Facility is not within any Scientific Reserves.
Dugong Protection Areas (DPA)	The Narrows south of Graham Creek and east to Facing Island, encompassing the majority of Southern Curtis Island waters comprise the Rodds Bay DPA. *Volume 5, Chapter 7 and 8*
Migratory and Shorebird Habitat Areas	Mangrove and salt marsh habitat surrounding Curtis Island adjacent to the LNG Facility provide feeding habitat for waders listed as migratory under the *EPBC Act*. *Volume 5, Chapter 7 and 8*
Declared Fish Habitat Areas (FHA)	The closest declared FHAs to the LNG Facility site are the Colloseum Inlet FHA approximately 40 km south of Curtis Island and the Curtis Channel FHA 60 km south-east of the site.
Areas of State Significance	The Curtis Coast Regional Coastal Management Plan (CCRCMP) identifies the wetlands in the Port of Gladstone foreshore and adjacent to the LNG Facility as areas of State Significance (natural resources and scenic coastal landscapes). Refer *Volume 5, Chapter 16*. Land within the Gladstone State Development Area (GSDA) provides land for industrial development of regional, State or national significance.
Cultural Heritage Areas	*Volume 8, Chapter 9.*
Groundwater Vulnerability Areas	*Volume 5, Chapter 10*
Bushfire Hazard Zones	*Volume 5, Chapter 18*

Table 5.5.3 indicates the land tenure status of the properties affected by the proposed LNG Facility site and its associated infrastructure in the Gladstone region.

Table 5.5.3 Land Tenure

Project Component	Lot/Plan	Indicative Area occupied	Tenure	Land ownership/ lessee
Curtis Island				
LNG Facility including construction camp options C and D.	Part of 10 and 27 on Crown Plan DS220	268 ha approx	GSDA fee simple	In February 2009 QGC finalised long term lease of this land from the Queensland Government.
LNG Marine Facilities including MOF and LNG loading jetty.	Additional proposed wet lease area (below highest astronomical tide [HAT])	71 ha approx	Lease	Gladstone Ports Corporation (GPC)

Project Component	Lot/Plan	Indicative Area occupied	Tenure	Land ownership/ lessee
	Esplanade The Esplanade is located on the foreshore/intertidal area, which adjoins the LNG Facility site and area below HWM.	9 ha approx of the wet lease area.		
Export pipeline route and access road (Approval for road is not sought by this EIS)	Lot 7 on Crown Plan DS220	8.9 ha	GSDA fee simple	Minister for Industrial Development Queensland
	Lot 10 on Crown Plan DS220	3.8 ha	GSDA fee simple	Minister for Industrial Development Queensland
	Lot 11 on Crown Plan DS220	14.9 ha	GSDA fee simple	Minister for Industrial Development Queensland
	Lot 28 on Crown Plan DS220	2.5 ha	GSDA fee simple	Minister for Industrial Development Queensland
	Lot 2 on RP602284	4.1ha	GSDA fee simple	Minister for Industrial Development Queensland
Possible Curtis Island Bridge (Approval for Bridge not sought by QGC)	Land below HAT			Gladstone Ports Corporation
Friend Point, Kangaroo Island				
The Narrows Export Pipeline	In the vicinity of Lot 2 on DT40146	189 ha	GSDA fee simple	Minister for Industrial Development Queensland
Possible Curtis Island Bridge (Approval for Bridge not sought by QGC)	In the vicinity of Lot 2 on DT40146	189 ha	GSDA fee simple	Minister for Industrial Development Queensland
Swing Basin, dredging and spoil disposal areas				
The new shipping approach channel will extend north-west from the Targinie Channel in Port Curtis to the southern edge of the proposed new swing basin adjacent to the LNG Facility site. Details of proposed dredging are provided in *Volume 6* of this EIS.				Gladstone Ports Corporation (GPC)

Project Component	Lot/Plan	Indicative Area occupied	Tenure	Land ownership/ lessee
Mainland				
Export Pipeline route	Multiple lots within local government boundary		GSDA	Multiple owners
Access road (Approval for road not sought by this EIS)	Lot 92 on Crown Plan 654	3 ha	Leasehold	Queensland Government
	Lot 98 on USL 39038	0.7 ha	Freehold	Queensland Government
	Lot 137 on FTY 1831	5.7 ha	Reserve	Queensland Cement Ltd
	Lot 32 on DS 469	5.3 ha	Freehold	Queensland Cement Ltd
Auckland Point logistics site[2].	Lot 300 on SP 120920	17.1ha	Freehold	Gladstone Ports Corporation
Operations ferry terminal to be located at the RG Tanna Wharf on Alf O'Rourke Drive.	Lot 210 on SP 120888	1 ha	Strategic Port land	Gladstone Ports Corporation (GPC)

Cadastral details of the LNG Facility and Project components in proximity to the LNG Facility are shown in *Volume 2, Chapter 4* (refer *Figure 2.4.7)*.

5.2.2 Land Use

Figure 5.5.1 illustrates existing land use in relation to the LNG Facility and mainland Project components.

5.2.2.1 Curtis Island

The LNG Facility pipeline and access road are to be located within the Curtis Island Industry precinct (CIIP) of the Gladstone State Development Area (GSDA) on the south-western end of the island. The CIIP has been designed to accommodate potentially up to five individual LNG Facility sites.

Prior to its compulsory acquisition by the Queensland Government, this land was previously used under leasehold for rural/grazing purposes. Some remnant structures relating to this rural period of use remain on site and the majority of previously cleared areas have re-established re-growth vegetation. The land is not publicly accessible.

As indicated on *Figure 5.5.2,* the balance of the land to the north-east of the

2 The construction phase laydown and pre-assembly area (Area 1), and car park and personnel assembly area (Area 2) is to be located on approximately 11.5 ha of GPC Strategic Port land at Auckland Point. Pipe laydown areas (Areas 3 and 4) are to be located on approximately 12 ha, and two new access roads (Access Road 1 – approximately 670 m in length, and Access Road 2 – approximately 190 m, with a total approximate area of 0.85 ha)

CIIP is within the Environmental Management Precinct of the GSDA. A ridgeline provides natural separation between the CIIP and the EMP.

The EMP extends to the eastern edge of Curtis Island and is intended:

- to recognise, protect and maintain areas of high ecological significance
- to provide areas for open space where remnant vegetation, wetlands, waterways and areas of ecological significance can remain and where revegetation can occur.
- to restrict incompatible land uses from establishing near the CIIP.[3]

The closest residential settlement is located at South End, approximately 9 km south-east of the LNG Facility site (although individual residences are located on islands in Gladstone Harbour closer than 9 km to the site). An existing 4WD access track leads from South End through the site to Laird Point. The Project intends that this track will remain undeveloped.

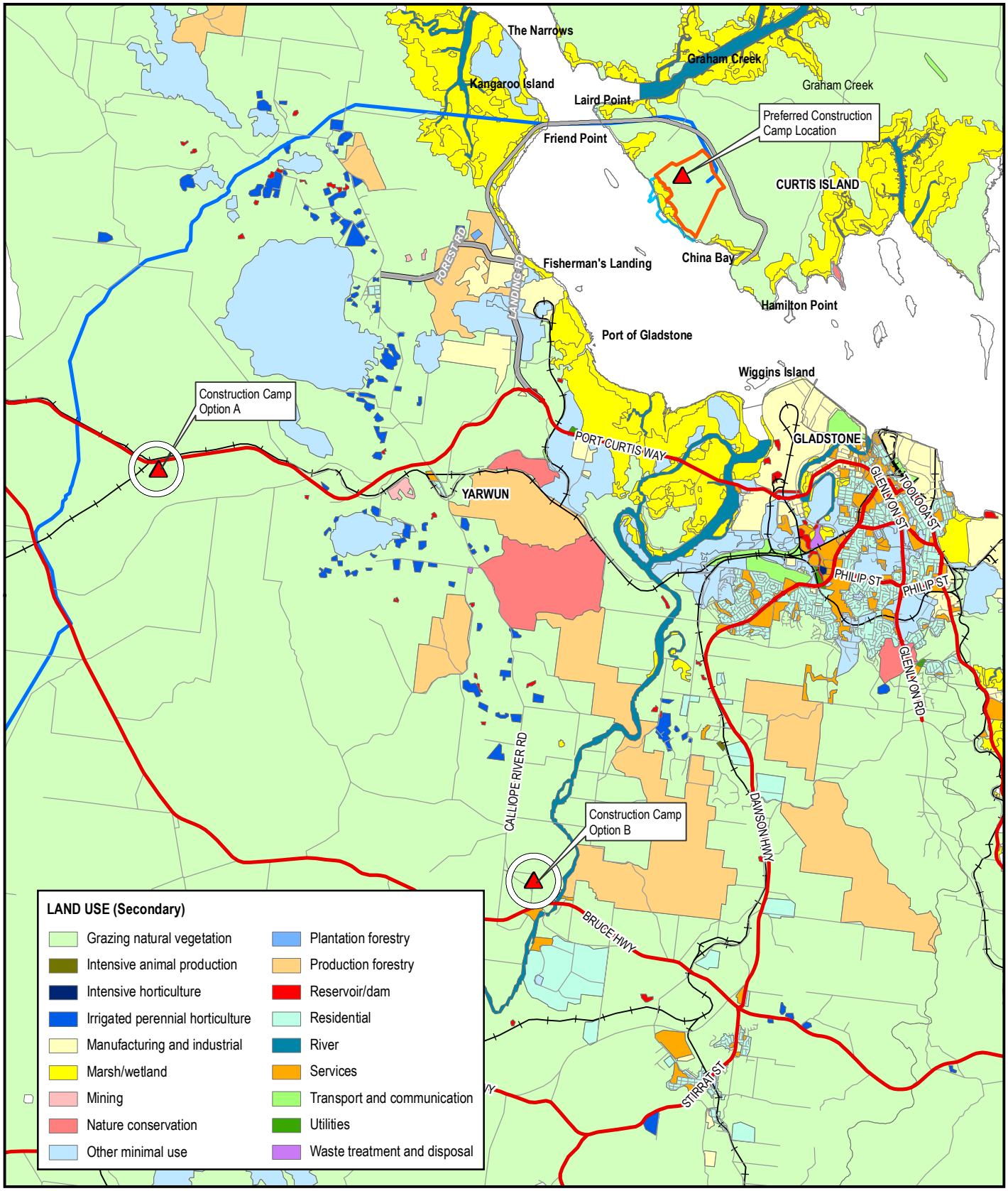
South End is a small community of approximately 100 dwellings which are predominantly used for holiday accommodation. A small number of the existing dwellings are permanently occupied, with a week night population of approximately 20 people. On the weekend and during holiday periods this population increases to more than 100 people.

An accommodation lodge also serves as a general store, takeaway facility and fuel outlet. South End provides a base for outdoor recreational opportunities including fishing and bush walking. Curtis Ferry services operate a vehicular ferry with regular services connecting the community with Gladstone.

5.2.2.2 Kangaroo Island (Curtis Island Bridge)

As noted in *Volume 2, Chapter 11*, the Queensland Government is investigating the possibility of building road and bridge access to the CIIP, although the proposed road and bridge are not part of the QCLNG Project. The proposed bridge would extend from Friend Point on Kangaroo Island to Laird Point in the CIIP of the GSDA. Approval for the Curtis Island Bridge is not sought under this EIS. However, Terms of Reference (ToR) issued for this EIS required that the impact of this bridge both on the Project and the environment be assessed.

3 Gladstone State Development Area - Development Scheme.



Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Proposed Export Pipeline
- Possible Curtis Island Road/ Bridge Corridor
- Main Highways
- Local Roads
- Railway
- Construction Locations

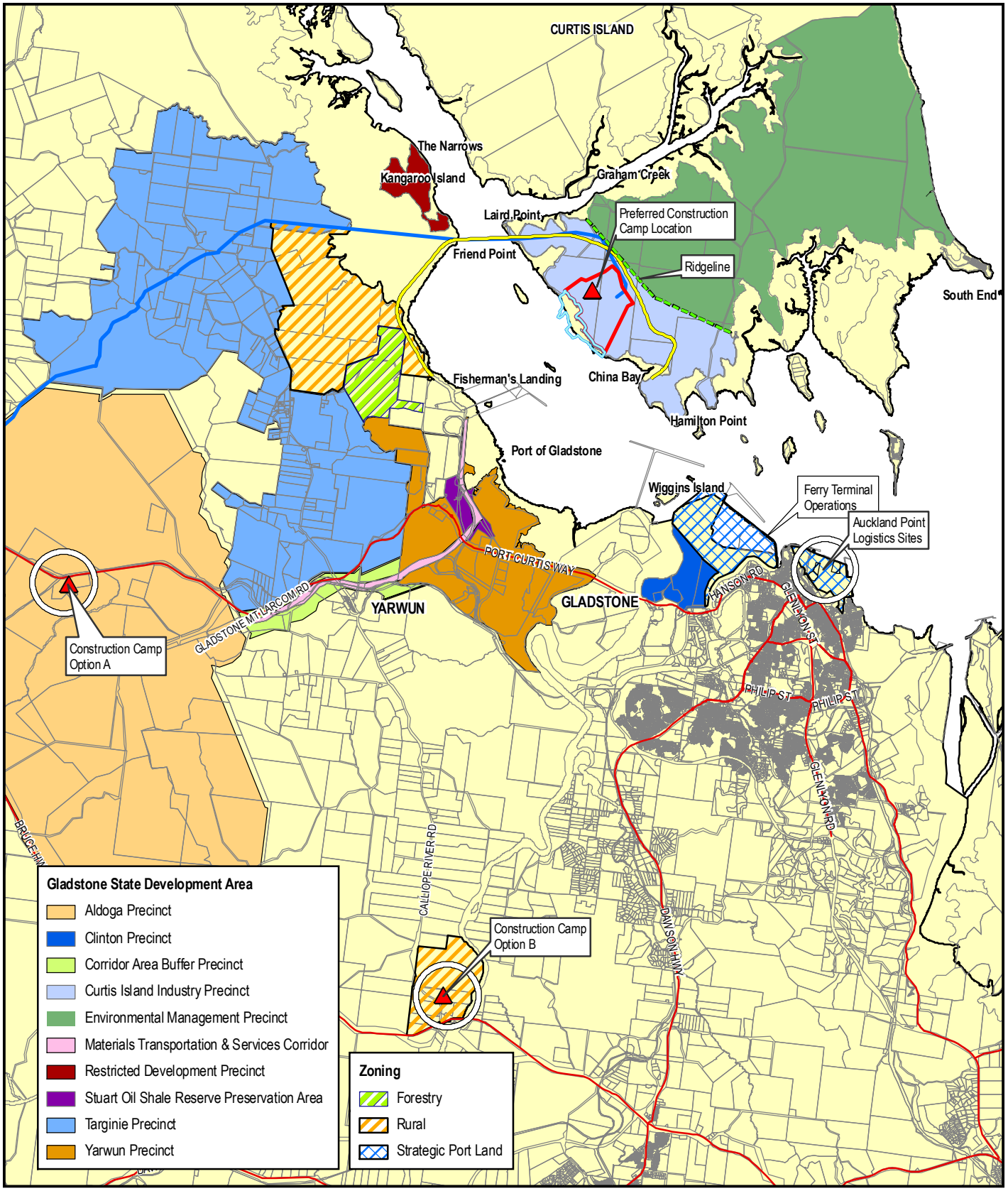
Source Note:
StreetPro Australia - Pitney Bowes MapInfo
Curtis Island Road/Bridge - Connell Wagner
Cadastral/Land Use Currency: August 2008,
Department of Environment & Resource Management

Projection: UTM MGA Zone 56 Datum: GDA 94

0 1 2 4 km

N

QUEENSLAND CURTIS LNG A BG Group business	Project	Queensland Curtis LNG Project	Title Land Use
	Client	QGC - A BG Group business	
ERM Environmental Resources Management Australia Pty Ltd	Drawn JB	Volume 5 Figure 5.5.1	Disclaimer: 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. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved RS	File No: 0086165b_EIS_LUP_GIS002_F5.5.1	
	Date 10.06.09	Revision 3	



Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Construction Location
- Proposed Export Pipeline
- Possible Curtis Island Road/ Bridge Corridor
- Main Highways
- Ridgeline

Source Note:
StreetPro Australia - Pitney Bowes MapInfo
Curtis Island Road/Bridge - Connell Wagner
Cadastral Currency: August 2008, Department of Natural Resource and Water
Zoning - Calliope Shire Council & Gladstone City Council

Projection: UTM MGA Zone 56 Datum: GDA 94

0 1 2 4 km

N

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Title	Gladstone State Development Area Precincts

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	Volume 5	Figure 5.5.2
Approved	RS	File No:	0086165b_EIS_LUP_GIS005_F5.5.2
Date	10.06.09	Revision	3

Kangaroo Island (above high water mark) was incorporated into the GSDA in 2008 and designated a Restricted Development Precinct. This precinct provides for the establishment of essential infrastructure facilities and materials transport infrastructure within the GSDA while retaining protected areas for vegetation and wildlife.

It is also designed to prevent the establishment of uses that may be incompatible with, adversely affect or constrain industry establishing within the CIIP or Targinie Precincts. The land has no existing use. Kangaroo Island is identified in the former Calliope Shire Planning scheme as the site for Gladstone's second airport. However, its incorporation into the GSDA potentially precludes this.

The southern boundary of the State Great Barrier Reef Coast Marine Park (GBRCMP) crosses The Narrows between Friend Point on the mainland and Laird Point on Curtis Island. The road and bridge corridor (not part of the Project) is, therefore, partially located within the Habitat Protection Zone of the GBRCMP, as defined within the Marine Park (Great Barrier Reef Coast) Zoning Plan 2004.

5.2.2.3 Gladstone

Pipeline

The pipeline route enters Gladstone Regional Council (GRC) area close to Mt Larcom, north-west of Gladstone City.

The pipeline route then traverses the Targinie Precinct of the GSDA (refer *Figure 5.5.2*). The Targinie Precinct of the GSDA was established in 2002 to cater for future industry, infrastructure corridors and buffer areas. The purpose of the Targinie Precinct is to encourage the establishment of industries that require access to strategic port logistics and maritime facilities; and provide transport linkages to surrounding transport networks and areas within the GSDA.

Prior to its incorporation into the GSDA the Targinie area was a centre for commercial fruit and vegetable production. After the proclamation of the Targinie Precinct in 2002, land in the area has been progressively purchased by the Queensland Government for future industrial use. While the level of farming activity in the area has diminished, land use on the pipeline route is still characterised largely by agriculture, mostly grazing and cropping.

Yarwun, located approximately 9 km from the proposed LNG Facility, is the closest mainland residential community. Yarwun is a small rural community and in 2006 had a population of approximately 600 people. Land uses in Yarwun are predominately residential or rural residential interspersed with agricultural and horticultural uses.

As the pipeline approaches the coast it traverses the Key Resource Area (KRA)[4] as identified in the former Calliope Shire Council Planning Scheme (refer *Figure 5.5.4*).[5] A dirt boat ramp is located north of where the pipeline crosses into the water.

The portion of the pipeline crossing The Narrows between the mainland and Curtis Island is located within the limits of Port Curtis, within the boundary of the GBRWHA, and outside the boundary of the GBRCMP. The area identified in the World Heritage listing is also included on the register of National Heritage Places. The marine crossing falls within the boundaries of the Rodds Bay Dugong Protection Area (DPA). The Narrows and Port Curtis Wetlands are listed in the Directory of Important Wetlands (DOIW) in Australia.

Access road

Land along the route of the proposed mainland access road (approval for which is not sought under this EIS) comprises intertidal mudflats and partially cleared areas currently used for grazing and other rural purposes. The proposed road would be an extension of Landing Road, extending northwards from the site of the Cement Australia Plant at Fisherman's Landing.

As indicated on *Figure 5.5.2,* the land along the southern section of the proposed road is predominantly zoned rural under the former Calliope Shire Planning Scheme. The road alignment intersects the north-east corner of the Targinie State Forest and this parcel of land is zoned forestry.

The road alignment runs through the Queensland Energy Resources (QERL) mining lease application area which extends north from Landing Road along the foreshore, above the high water mark, for approximately 5 km (refer *Figure 5.5.4*). The road alignment does not traverse the mining lease area. However, the road alignment is within the KRA identified in the former Calliope Shire Council Planning Scheme.[6]

The Targinie Creek Boat ramp (unformed) is located adjacent to the route of the access road and is a publicly accessible recreational facility.[7]

Auckland Point logistics area

Auckland Point area includes four existing wharves ranging in length from 172 m to 217 m. It is used for export and storage and handles more than 1.4 million tonnes of cargo each year.[8] The land proposed to be used for the

4 State Planning Policy 2/07 Protection of Extractive Resources identifies locations across Queensland which contain sand or rock resource of regional or State importance. These KRA are mapped in the local government planning schemes to protect them from incompatible land development.

5 Calliope Shire Council Planning Scheme (2007) Extractive and Mining Resources Overlay, Series 05, Map 38.

6 Calliope Shire Council Planning Scheme (2007), Extractive and Mining Resources Overlay, Series 05, Map 38.

7 Gladstone Harbour Protection and Enhancement Strategy, (2003) Figure 11, Existing Public Access Points.

8 Gladstone Port Authority (2009)

ferry terminal, car park, personnel assembly, embarkation/disembarkation areas, fabrication, laydown, and pipe storage areas is strategic port land under the *Transport Infrastructure Act 1994* (refer *Figure 5.5.2*).

This land is an open grassed area that is currently vacant and has been intermittently used for various Port related purposes in the past such as a logistics area for military exercises.

Operations ferry terminal

The proposed site of the ferry terminal for the operational phase of the LNG Facility is currently vacant land adjacent to the RG Tanna coal terminal (refer *Figure 5.5.2*).

Construction Camp

The preferred location for the construction camp for the proposed LNG Facility is within the boundary of the LNG Facility on Curtis Island. This option is preferred as it not only minimises the Project's footprint but also has significantly reduced social and traffic impacts on local communities on Curtis Island and the mainland of Gladstone.

5.2.3 Native Title

Native title describes the rights and interests of Aboriginal and Torres Strait Islander people in land and water, according to their traditional laws and customs. Native title may exist in areas where it has not been extinguished by an act of government.

As a common law right, native title may exist over areas of Crown land or waters, irrespective of whether there are any claims or determinations in the area. Native title may exist over Australian water seaward of the coastline (extending from the low water mark) and may also exist over waters such as rivers, lakes, and intertidal zones. The validly granted rights of others who use and access the waters (including for navigation and passage of vessels) are unchanged.

A native title claim under the *Native Title Act (1993)* (Cth) has been registered covering the Gladstone and Bundaberg region. This claim includes Curtis Island. This is an active claim that has been registered with the National Native Title Tribunal (the Port Curtis Coral Coast claim, Tribunal File Number QC01/29) meaning that while a determination has yet to be made, any development to be undertaken within the boundaries of the claim will require consultation with the Applicants' Representative Queensland South Native Title Services Ltd.

Details of the Claim as registered with the Native Title Tribunal, as well as a map showing the full extent of the claim boundary, are included in *Volume 8.*

The tenure of the proposed LNG Facility was formerly grazing homestead perpetual lease but is now held in fee simple by the Queensland Government. The LNG Facility site is, therefore, not subject to native title.

QGC's native title and indigenous cultural heritage strategy for the Project is outlined in *Volume 8.*

5.2.4 *Indigenous Cultural Heritage*

Searches of the Department of Environment and Resource Management (DERM), formerly the Department of Natural Resources and Water, database of indigenous cultural heritage places and the Queensland Environmental Protection Agency (EPA) Cultural Heritage Information Management System, have not identified indigenous cultural heritage places within the proposed LNG Facility site or in the location of the LNG Marine Facilities.

Indigenous cultural heritage clearance surveys have been undertaken for the pipeline route, as well as the LNG Facility on Curtis Island. The outcomes of the surveys will inform the development of Cultural Heritage Management Plans (CHMPs) that have been or are currently being negotiated between the proponent and the relevant Aboriginal parties.

Volume 8 details the indigenous cultural heritage assessment undertaken for the Project.

5.2.5 *Non-Indigenous Cultural Heritage*

Searches of the Queensland Heritage register were undertaken and have not identified non-indigenous cultural heritage places within the proposed LNG Facility site or in the location of the LNG Marine Facilities.

Volume 8, Part B of the SIA details the non-indigenous heritage assessment undertaken for the Project.

5.2.6 *Commercial and Recreational Boating and Fishing Activities and Values*

Volume 5, Chapter 15 provides details of shipping activities relating to the Project.

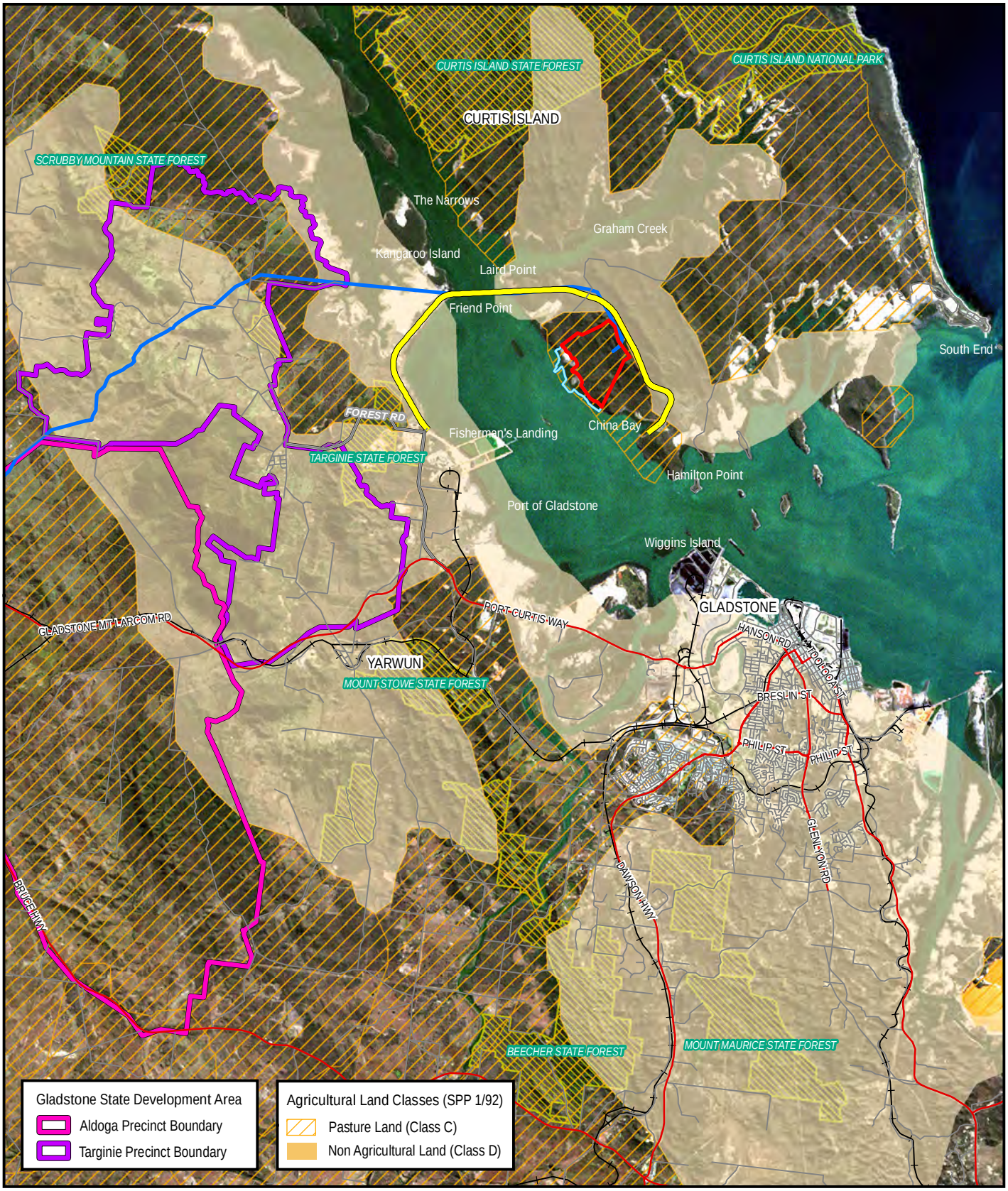
Recreational fishing and boating activities and values in proximity to the LNG Facility are also addressed in *Volume 8.*

5.2.7 *Good Quality Agricultural Land*

Figure 5.5.3 illustrates agricultural land classes in proximity to the LNG Facility

and mainland Project components.

State Planning Policy 1/92 – the Development and the Conservation of Agricultural Land protects Good Quality Agricultural Land (GQAL) from fragmentation into uneconomic units. It also serves to minimise the potential for incompatible land uses that will impact on existing and future productivity of agricultural land. GQAL is identified in the planning scheme mapping of the former shire councils which have been amalgamated to form the Gladstone Regional Council (GRC).



Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Proposed Export Pipeline
- Possible Curtis Island Road/ Bridge Corridor
- Main Highways
- Local Roads
- Railway
- Forestry Areas

Source Note:
StreetPro Australia - Pitney Bowes MapInfo
Curtis Island Road/Bridge - Connell Wagner

Projection: UTM MGA Zone 56
Datum: GDA 94

0 1 2 4 km

N

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title: Agricultural Land Classes

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	Volume 5	Figure 5.5.3
Approved	RS	File No:	0086165b_EIS_LUP_GIS004_F5.5.3
Date	16.07.09	Revision	4

Table 5.5.4 defines the different classes of GQAL land.

Table 5.5.4 Good Quality Agricultural Land Classes

GQAL Class	Definition
Class A Crop land	Land that is suitable for current and potential crops with limitations to production which range from none to moderate levels.
Class B Limited crop land	Land that is marginal for current and potential crops due to severe limitations; and suitable for pastures. Engineering and/or agronomic improvements may be required before the land is considered suitable for cropping.
Class C Pasture land	Land that is suitable only for improved or native pastures due to limitations which preclude continuous cultivation for crop production; but some areas may tolerate a short period of ground disturbance for pasture establishment. There are 3 sub-classes of pasture land: **C1** – Land suitable for sown pastures with moderate limitations **C2** – Land suitable for sown pastures with severe limitations **C3** – Land suitable for light grazing of native pastures in inaccessible areas. Of these, only C1 is considered to be GQAL.
Class D Non-agricultural land	Land not suitable for agricultural uses due to extreme limitations. This may be undisturbed land with significant habitat, conservation and/or catchment values or land that may be unsuitable because of very steep slopes, shallow soils, rock outcrop or poor drainage.

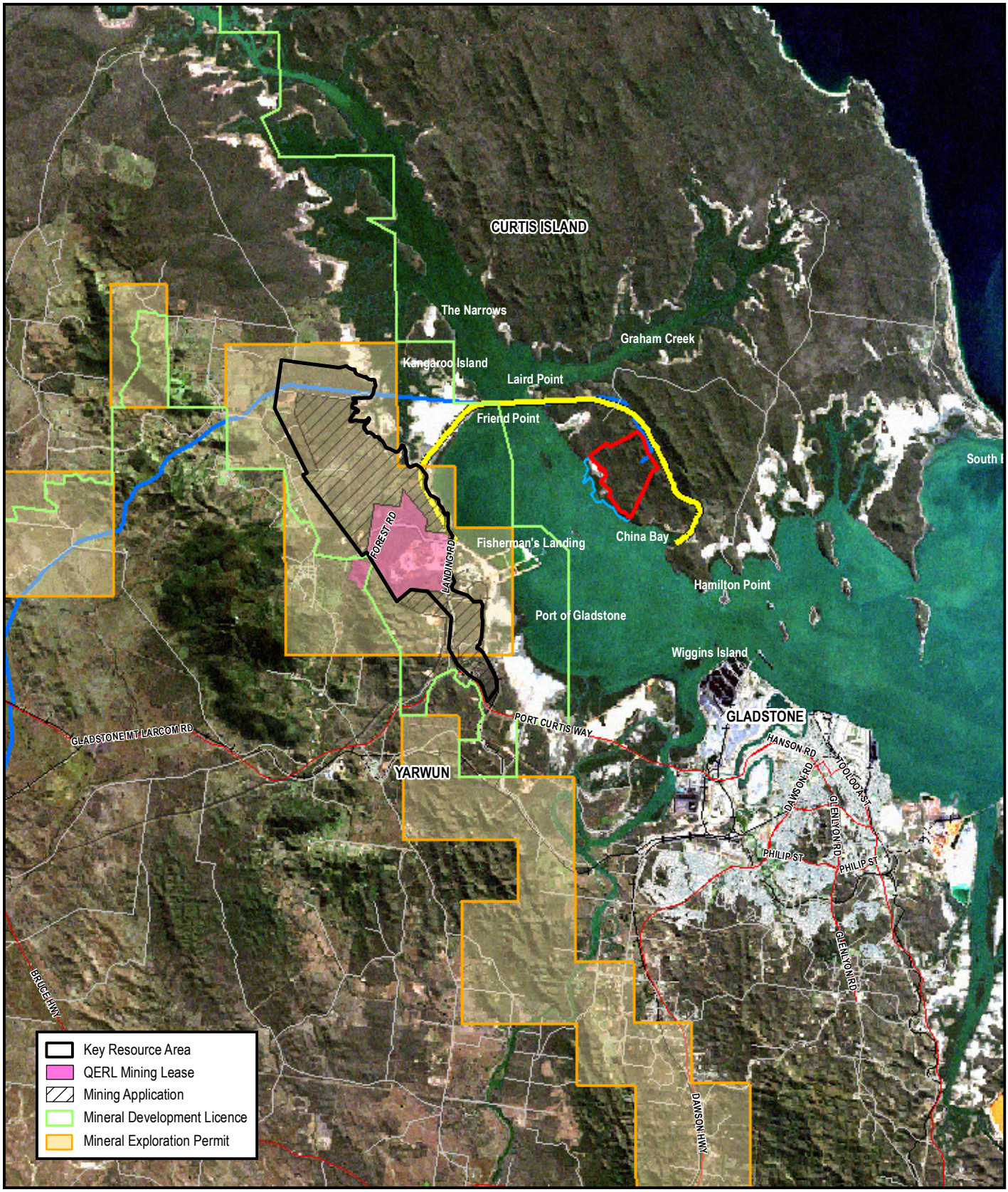
The LNG Facility site is identified as GQAL Class C in mapping information supplied by DERM. The Geology and Soils Assessment Report undertaken for the Project[9] has confirmed that land on the site of the LNG Facility is of sub class C3 and is, therefore, not GQAL. For further detail, refer to *Volume 5, Chapter 4.*

Within the Gladstone study area the route of the pipeline primarily traverses Class D non-agricultural land in the Aldoga GSDA Precinct, a small section of Class C Pasture land and Class D Non-agricultural land on the coastal margins.

5.2.8 Extractive Minerals and Resources

Figure 5.5.4 shows mining and petroleum tenements in relation to the LNG Facility and mainland Project components.

9 Environmental Resources Management Australia, 2009. *Queensland Curtis LNG Plant: Geology and Soils Report*.



Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Proposed Export Pipeline
- Possible Curtis Island Road/ Bridge Corridor
- Main Highways
- Local Roads
- Railway

Source Note:
StreetPro Australia - Pitney Bowes MapInfo
Curtis Island Road/Bridge - Connell Wagner
Mining and Petroleum Tenure - State of Queensland, Department of Mines and Energy

Projection: UTM MGA Zone 56 Datum: GDA 94

0 1 2 4 km

N

QUEENSLAND CURTIS LNG
A BG Group business

Project: Queensland Curtis LNG Project
Client: QGC - A BG Group business

Title: **Mining Tenements**

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	Volume 5	Figure 5.5.4
Approved	RS	File No: 0086165b_EIS_LUP_GIS003_F5.5.4	
Date	20.07.09	Revision 3	

Table 5.5.5[10] explains the difference between the different types of mining tenements.

Table 5.5.5 Mining Tenements

Mining Tenements	Status
Prospecting Permit (PP)	Allows the holder to enter the property (lands) shown on the permit to "mark out" the site intended for an application for a mining claim or lease. These also allow the permit holder to prospect for minerals and/or to hand mine for minerals other than coal.
Mining Claim (MC)	Allows for prospecting and hand mining for any mineral other than coal.
Exploration Permit (EP) There are two key types — an exploration permit for all minerals other than coal (EPM) and an exploration permit for coal (EPC).	An EP allows for exploration to determine the existence of, quality and amount of minerals. Examples of exploration activities include prospecting using appropriate instruments, equipment and techniques to determine the existence of any mineral, and extracting and removing samples, (mineral or other substances) to determine the mineral bearing capacity of the land.
Mineral Development Licence (MDL)	Commonly used as a "holding" tenure where a deposit of a mineral has been found within a specific area of an EP, but either requires further geological investigation, or is not currently commercially viable to develop. It allows the holder to undertake geoscientific programs (e.g. drilling, seismic surveys), mining feasibility studies, metallurgical testing and marketing, environmental, engineering and design studies to evaluate the development potential of the defined resource It can be granted to the holder of an exploration permit for a period of up to five years where there is a significant mineral occurrence of possible economic potential and can be renewed.
Mining Lease (ML)	Allows for the mining of minerals specified in the lease and any purposes necessary to, associated with, arising from, or promoting mining.

Commencing in 1999, Southern Pacific Petroleum operated a Stage 1 demonstration-scale processing plant at the Stuart Deposit, producing more than 1.5 million barrels of oil. The pilot project ceased production in 2004 due to concerns over emissions and the expansion of oil shale mining into "areas of state significance".[11] No oil has been extracted from the oil shale since this time. However, research is being undertaken to develop existing technologies and processes. [12]

QERL, which acquired the assets of the project in 2004, retains a mining lease

10 Queensland Government Department of Mines and Energy (2008) Mineral Development Licences (MDL): A guide for landowners and answers to the most asked questions.

11 Department of Infrastructure and Planning (2009) *Stuart Oil Shale Stage 2*

12 Queensland Energy Resources website www.qer.com.au

over the shale deposit, which is in the vicinity of the proposed route of the mainland access road. QERL also holds a mineral development licence over a larger area which extends east into the Port of Gladstone.

5.2.8.1 *Coal*

Coal is one of Queensland's most important economic resources and Central Queensland accounts for nearly 50 per cent of Queensland's coal production. The Bowen Basin dominates coal production in Central Queensland and is the main contributor to economic development in the Gladstone region.

There are no coal deposits identified in the Gladstone region itself but the port is a key conduit with the RG Tanna Coal Terminal exporting more than 40 million tonnes of coal per year[13] and the Barney Point Coal terminal exporting up to 5 million tonnes. The Project is not in the vicinity of coal deposits or located over infrastructure that carries coal to the port.

5.2.8.2 *Mineral Resources*

The Curtis region contains significant mineral deposits, notably limestone, silica sand and oil shale.

Cement Australia Qld Ltd (QCL) operates a plant at Fisherman's Landing and uses limestone from a mine at East End, 24 km from Gladstone near Mt Larcom. Silica sand is added to this limestone to manufacture cement. QCL has a mining lease to obtain this sand from a beach ridge barrier deposit at Iveragh (near Wattle Creek) which is located 30 minutes south-west of Gladstone. These mineral deposits are not in proximity to the LNG Facility or associated project components.

Two oil shale deposits have been identified in the Curtis region comprising the Rundle and Stuart Oil Shale deposits. The Stuart deposit is located at the southern end of The Narrows and is continuous with the Rundle deposits in the north. The GSDA includes the Stuart Oil Shale Precinct — designated to reserve the area for possible future oil shale mining. The former Calliope Shire Council planning scheme identifies an existing mining lease, mining application and a KRA in the Extractive Minerals and Resources map of this area.[14]

5.2.8.3 *Extractive materials*

Other important economic resources found in the Gladstone region include extractive materials such as quarry rock, gravel and sand products. A disused rock quarry is located inland from Fisherman's Landing. Sand and gravel are

13 Gladstone Port Authority website www.gpcl.com.au

14 Calliope Shire Planning Scheme (2007) Extractive and Mineral Resources Series 05, Map 38

sourced primarily from the Boyne, Calliope and Fitzroy rivers and are important to the construction of infrastructure and civil works in the region. The Project is not in the vicinity of these resources.

5.2.9 *Infrastructure*

As part of investigations undertaken for the Project, an audit was undertaken of existing infrastructure provision in Gladstone City and surrounds[15] (refer *Appendix 5.3*). The audit describes the capacity of existing infrastructure to absorb potential impacts arising from the Project, including the additional workforce present in Gladstone, for the construction and operational phases of the LNG Facility. The audit was prepared on the basis of the original assumptions of 2,000 workers for the construction of the LNG Facility and 200 workers for the operational phase. Some assumptions have subsequently been refined but conclusions remain appropriate for the purposes of this impact assessment.

The audit focused on mainland Gladstone as the LNG Facility site on Curtis Island has no existing power, water, sewerage connections or gas supply.

Figure 5.5.5 illustrates existing infrastructure in the Gladstone in relation to the LNG Facility and mainland project components.

5.2.9.1 *Transport*

Existing road, rail and air transport infrastructure is discussed in *Volume 5, Chapter 14*, while *Volume 5, Chapter 15* details shipping transport.

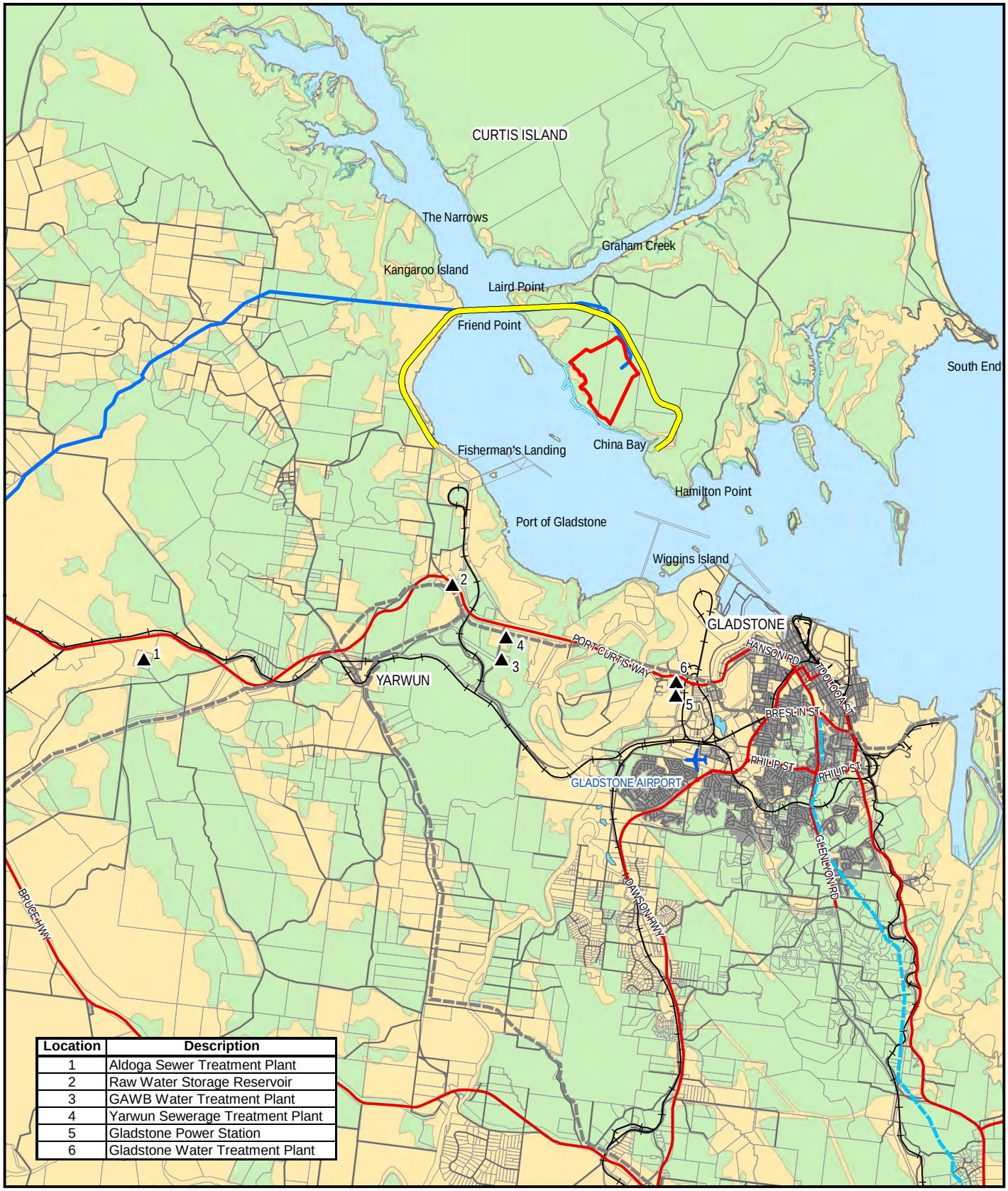
5.2.9.2 *Energy*

Power stations located in Stanwell, Callide and Gladstone are responsible for supplying the majority of Queensland's power. The Gladstone Power Station, Queensland's largest, is situated close to Central Queensland's coal reserves.[16] It has a generating capacity of 1,680 megawatts (MW). The station was sited near Auckland Inlet to take advantage of seawater for cooling.

The transmission of high voltage power in Queensland is the responsibility of Powerlink, who distribute power from 275 kilovolts (kV) lines to 110 kV and 132 kV for local transmission. Local transmission of electricity throughout Gladstone is the responsibility of Ergon Energy.

15 GHD (2009) Queensland Curtis LNG Project Draft Gladstone Infrastructure Audit CTR

16 NRG Gladstone Power Station website http://www.nrggos.com.au/page/About_Us/The_Process



Location	Description
1	Aldoga Sewer Treatment Plant
2	Raw Water Storage Reservoir
3	GAWB Water Treatment Plant
4	Yarwun Sewerage Treatment Plant
5	Gladstone Power Station
6	Gladstone Water Treatment Plant

Legend

- Proposed QCLNG Site Boundary
- Indicative Wet Lease Area
- Proposed Export Pipeline
- Possible Curtis Island Road/ Bridge Corridor
- Main Highways
- Railway
- Local Roads
- Native Vegetation
- Pipeline
  - Gas
  - Water

Source Note:

StreetPro Australia - Pitney Bowes MapInfo
Curtis Island Road/Bridge - Connell Wagner
Topography - GeoScience
Cadastral Currency, August 2008 - Department of Environmant & Resource Management

Projection: UTM MGA Zone 56 Datum: GDA 94

0 1 2 4 km

N

QUEENSLAND CURTIS LNG
A BG Group business

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business
Title	Existing Infrastructure

ERM
Environmental Resources Management Australia Pty Ltd

Drawn	JB	**Volume 5**	**Figure 5.5.5**
Approved	RS	File No:	0086165b_EIS_LUP_GIS006_F5.5.5
Date	10.06.09	Revision	3

Powerlink has commenced the process of acquiring easements to allow for the future reinforcement of the transmission network supplying the Gladstone area. The first phase of this development involves the future construction of a 275 kV line from the Calvale Substation near the Callide Power Station, to a new substation at Larcom Creek in the Gladstone State Development Area (GSDA).[17]

The longer-term second phase involves the future construction of a new 275 kV line from Gladstone Power Station to Larcom Creek Substation. These routes are not in proximity to the export pipeline route.

Table 5.5.6 provides a summary of the electricity grid capacity in the area.

Table 5.5.6 Summary of Gladstone, Boyne Island and Calliope Electricity Grid Capacity

Total Current Demand	**234.8 megavolt amperes (MVA)**
Total rated capacity	700.6 MVA
N1 capacity	397.6 MVA
Utilisation	34%
N1 utilisation	59%

1. All figures are in MVA unless noted otherwise.
2. Figures adapted from Ergon supplied information
3. Demand is based on measured figures extrapolated over time.
4. Rated capacity – is the full capacity of the substation.
5. N1 capacity – is the rated capacity of the substation with one sector debilitated.

5.2.9.3 Gas

Origin Energy supplies gas in Gladstone with liquid petroleum gas (LPG) available in and around the central business district and tempered liquid petroleum gas (TLP) supplied in some suburbs. There is no current plan to augment the existing network.

5.2.9.4 Water

The Gladstone Area Water Board (GAWB) and the GRC operate the majority of water infrastructure in the Gladstone area. The GAWB operate the water storage and bulk water infrastructure in the Gladstone area including raw water and treated water supplies. The GAWB also operate the potable water treatment plant and delivery pipelines service industrial areas north of the city with treated and raw water.

Approximately 80 per cent of water supplied by the GAWB is in a raw form for industrial consumers, with the balance sent to water treatment plants for commercial and domestic distribution of potable water.

17 Powerlink website http://www.powerlink.com.au/asp/index.asp?sid=5056&page=Projects/central&cid=5275&gid=408

Most of Gladstone's water supply is obtained from the Awoonga Dam on the Boyne River. Between 2000 and 2002, the dam was raised from 30 m to 40 m Australian Height Datum (AHD), to increase its storage capacity to 777,000 ML.

Under the Resource Operations Plan: Boyne River Basin, GAWB currently has a water allocation of 70,000 ML per year, which will increase to 78,000 ML per year when the dam first overtops. Current industrial and urban water consumption from Awoonga Dam is approximately 53,000 ML per year.

The pump station at Awoonga Dam has adequate capacity for increased water supply, as it currently only operates at night through the off-peak electricity supply period. Water supply could be increased 2.5 times but at higher cost due to increased power tariffs.[18]

As part of its drought mitigation strategy and planning for long-term water supply for the Gladstone Region, the GAWB has secured an allocation of a further 30,000 ML of water per year from Fitzroy River near Rockhampton. The GAWB is currently undertaking preparatory works to obtain and retain capability to construct a pipeline between Fitzroy River and the GSDA within a two-year period, if and when required due to drought or demand. When water supply drops below 90 per cent supply over 48 months, this would trigger the construction of alternative supplies. As at February 2009, bulk water storage was at 75 per cent of allocation, and pumps were running at 40 per cent capacity.

The GAWB is also responsible for the Gladstone Water Treatment Plant (GWTP) that currently produces approximately 35 ML of treated water per day, with an ultimate capacity of 61 ML per day. Water treated at GWTP is supplied to GRC (and domestic customers), to the Gladstone Ports Corporation and to the Gladstone Power Station.[19]

5.2.9.5 *Waste Water*

GRC operates a number of sewage treatment plants in Gladstone including:

- Calliope River
- South Trees
- Boyne Island
- Tannum Sands
- Calliope.

GRC also owns and operates the trunk network connecting local sewerage reticulation with the sewage treatment plants. *Table 5.5.7* shows the existing

18 HD, February (2009) Queensland Curtis LNG Project, Draft Gladstone Infrastructure Audit CTR, p.15

19 Gladstone Area Water Board (2001) Projected Demand for Water - 2000/01 to 2019/20, p.7

capacity of sewerage treatment plants within Gladstone. The figures indicate that the Calliope River treatment plant has capacity for 14,000 people and that the others are operating at 50 per cent capacity, on average.

Table 5.5.7 Sewerage Treatment Plant Capacities

Treatment plant	Current loading (EP)	Current capacity (EP)	Planned upgrade (EP)	Ultimate capacity (EP)
Calliope River	43,000	57,000	87,000	*
South Trees	2,500	5,000	10,000	*
Yarwun (industrial)	1,900	2,000	2,000	*
Yaroa (Aldoga)	0	2,000	2,000	2,000
Boyne Island	4,500	12,000	12,000	12,000
Tannum Sands	4,000	7,500	15,000	30,000
Calliope Town	1,900	2,500	#6,000	6,000

* Data unavailable

Currently under construction

EP- equivalent number of persons

5.2.9.6 *Communication*

Gladstone has high quality telecommunication infrastructure including established digital mobile phone services, internet access and data and video transmission capabilities. A number of telecommunication providers exist in the region and broadband services are increasingly becoming more widely available.

Gladstone is connected to the intrastate network by very high capacity dense wave division multiplexer (DWDM) optical fibre transmission systems. Telstra has advised that the extensive fibre infrastructure in Gladstone could be increased if demand required.

5.2.9.7 *Waste Disposal*

In Gladstone, most domestic, commercial and industrial waste is deposited at the GRC-operated Beranby landfill site. In 2008, an average 150 tonnes of waste was accepted per day.[20]

JJ Richards operates the domestic waste collection service in Gladstone. The service consists of two 140 litre wheelie bins, one for general waste and the other for recyclable material. The general waste stream is collected once a week while the recyclable material is collected once a fortnight. The collection fleet has some redundancy built in to allow for breakdowns. JJ Richards also

20 GHD p.15

maintains a reserve capacity of operators to accommodate fluctuations in demand holiday periods and employee movements.

The service is currently operating at approximately 90 per cent capacity. New residential growth has created an imbalance in the daily collection loading and collection routes have not changed to accommodate the changed spatial distribution of the population. A redistribution of collection areas to balance the load will allow kerb side collections to operate at approximately 80 per cent capacity. [21]

The recyclable waste stream is currently delivered to a Visy recycling facility in Brisbane by JR Stephens Pty Ltd, where it is processed. GRC has joined a Regional Association of Landfills and a regional Material Recovery Facility (MRF) is to be established for the Councils within 12 months to accept and process recyclable materials. The bailed recyclable material will then be shipped to Brisbane.

Commercial operations arrange waste disposal through licensed contractors who also dispose waste to the Benaraby landfill. In Gladstone, there are three operators servicing commercial customers; JJ Richards, Veolia and Transpacific.

5.3 *IMPACT ASSESSMENT*

Table 5.5.8 details the planning documents that were reviewed to identify the preferred pattern of land use within and surrounding the Project area. It is not intended to be a comprehensive list of all planning controls and policies that apply to the Project area. *Volume 1* outlines the relevant International, Commonwealth, state, regional and local planning processes, standards approvals and legislation applicable to the project and demonstrates how the proposal conforms to state, regional and local plans for the area.

21 ibid, p.33

Table 5.5.8 Planning Consistency

Planning document	Comments
Gladstone State Development Area (GSDA) Development Scheme	*Table 5.5.9* demonstrates the consistency of the LNG Facility and mainland project components with the GSDA Development Scheme.
Curtis Coast Regional Coastal Management Plan (CCRCMP)	The CCRCMP recognises the economic importance of the Port and industrial development within Gladstone and the GSDA. The CCRCMP identifies the potential for industrial development on Curtis Island and states that sensitive management is required to ensure significant coastal resources and their values are not degraded. It states that decision making in relation to Curtis Island should be based on a sound understanding of the island's resources/values and potential adverse impacts on these resources and values, which is presented in this EIS.
Gladstone Harbour - Protection and Enhancement Strategy 2003	The Gladstone Harbour Protection and Enhancement Strategy is a document to guide local actions by industry, government and community aimed at maintaining a healthy and functioning harbour. It identifies specific actions relating to stormwater run-off, monitoring, public access, the protection of cultural heritage and information sharing. The findings of this EIS demonstrate that the construction and operation of the proposed LNG Facility will be consistent with the goals and objectives of this strategy.
SPP 1/92 Development and conservation of agricultural land	The LNG Facility is not located on GQAL. Refer 5.2.7 and *Volume 5, Chapter 4*.
SPP 2/07: Protection of Extractive Resources	SPP 2/07 identifies areas of sand or rock resource of regional or State importance. These Key Resource Areas (KRA) are mapped in the local government planning schemes to protect them from incompatible land development. The proposed route of the pipeline and the mainland access road traverse the Oil Shale KRA identified in the former Calliope Shire Council planning scheme. Refer to *Section 5.2.8* for discussion.
Central Queensland Regional Growth Management Framework 2002 (CQRGMF) (Central Queensland – A New Millennium)	The CQRGMF recognises Gladstone as a major urban centre with its future prosperity generated by port infrastructure and major industry locating in the area. The following strategies within the CQRGMF have particular relevance to the proposed LNG Facility: • Central Queensland as a region should promote its capacity to meet high energy demand in an efficient and competitive manner to support economic growth and improvement in lifestyle (*theme 3.2.11.-Energy*) • The region's energy infrastructure (including existing electricity and gas reticulation infrastructure) should be maintained and improved to ensure the current and future needs of industry and community are met *(theme 3.3.8 Energy Infrastructure).* The LNG Facility and mainland Project components are consistent with the direction identified for Gladstone in the Framework and will provide infrastructure to support future industrial development in the area.
Gladstone Port Authority Land Use Plan 1995	The construction and operations ferry terminal and port related logistics are consistent with this plan. Refer to *Table 5.5.10*.
Gladstone Port Corporation 50-year Strategic Plan	The 50-year plan focuses on long-term industrial growth within the Port of Gladstone; and identifies infrastructure actions

Planning document	Comments
	necessary to improve existing capacity and encourage the establishment of future industry. The proposed LNG Facility is consistent with the strategic direction identified in the plan.

5.3.2 *Gladstone State Development Area*

Figure 5.5.2 illustrates the GSDA precincts in relation to the LNG Facility and mainland Project components. *Table 5.5.9* assesses the consistency of the proposed LNG Facility and project components with the land use designations set out in the GSDA development scheme.

Table 5.5.9 Consistency with GSDA Development Scheme

GSDA Precinct and Land use designation	Material change of use category under GSDA Development Scheme	Consistency with proposed land use
Curtis Island Industry Precinct To provide for the establishment of liquefied natural gas (LNG) facilities for processing operations (including liquefaction and storage) of national, state or regional significance that require access to export wharf facilities. To provide for establishment of infrastructure associated with LNG facilities including transport linkages to wharf facilities. To have regard to the physical characteristics of the land when considering the location of the industrial development. To prevent the establishment of uses that may be incompatible with, adversely affect, or constrain existing or future LNG processing operations within the Curtis Island Industry Precinct. To provide for the physical separation of significant industrial and infrastructure activities within the Curtis Island Industry Precinct from the adjoining Environmental Management Precinct.	High impact industry limited to natural gas (liquefaction and storage)	**LNG Facility** The LNG Facility and onshore facilities are consistent with the intent of the Development Scheme.
	Infrastructure facility	**Export pipeline** The gas pipeline is key infrastructure for supplying energy and is consistent with the intent of the Development Scheme.
	Infrastructure facility	**Curtis Island Bridge and access road** (Approval for which is not sought by this EIS) The access road and bridge are transport infrastructure intended to connect the different GSDA precincts and provide links to the surrounding road network. The bridge may provide impetus for further significant industrial development within the Curtis Island Industry Precinct.

GSDA Precinct and Land use designation	Material change of use category under GSDA Development Scheme	Consistency with proposed land use
	Local infrastructure	Infrastructure for the purposes of constructing the LNG Facility - water reticulation, sewerage disposal and construction camps are in this category. These uses are consistent with the intent of the Development Scheme.
Restricted Development Precinct To prevent the establishment of uses that may be incompatible with, adversely affect, or constrain industry establishing within the Curtis Island Industry or Targinie Precincts. To provide for the establishment of essential infrastructure facilities and materials transport infrastructure within the Gladstone State Development Area to connect with surrounding transport networks and the Port of Gladstone, in a manner which ensures areas of ecological significance are recognised and managed taking into account environmental values. To provide areas for open space where remnant vegetation, wetlands, waterways and areas of ecological significance can remain and where revegetation can occur.	Infrastructure	**Export pipeline** The gas pipeline is key infrastructure for supplying energy and is consistent with the intent of the Development Scheme.
	Infrastructure	**Curtis Island Bridge** (not included as part of this Project) If developed the Curtis Island Bridge would provide for materials transport primarily for the operations phase of the LNG Facility and establish a link between the CIIP, the Port and the surrounding transport networks.
Aldoga To encourage the establishment of industrial development that is of national, state or regional significance. In particular large scale, large plant footprint industrial development requiring undeveloped sites will be encouraged. To provide for infrastructure that may or may not be associated with activities within the Gladstone State Development Area. To manage and develop the area in an appropriate manner recognising that this precinct may include land uses other than industry. To have regard to strategic plans of development and physical characteristics of the land when considering the location of the industrial development.	Infrastructure facility	**Export pipeline** The proposed use is in the category that is considered to meet the purpose of the land use designation. The gas pipeline is key materials transport infrastructure for supplying energy and is consistent with the objectives of the Development Scheme. The alignment of the pipeline has been negotiated with government to ensure the potential for future large scale industrial development in the Aldoga precinct is not compromised.

GSDA Precinct and Land use designation	Material change of use category under GSDA Development Scheme	Consistency with proposed land use
Targinie Precinct To encourage the establishment of industrial development that is of national, state or regional significance that requires access to strategic port logistics and maritime facilities. To encourage the establishment of industrial development and other uses that support industrial activities in the Targinie Precinct and the Gladstone State Development Area. To provide for transport linkages to other areas of the Gladstone State Development Area and surrounding transport networks. To provide for infrastructure that may or may not be associated with activities within the Gladstone State Development Area. To manage and develop the area in an appropriate manner recognising that this precinct may include land uses other than industry. To have regard to strategic plans of development and physical characteristics of the land when considering the location of the industrial development.		

Table 5.5.10 describes the consistency between the proposed Project components and the Gladstone Port Authority Land Use Plan.

5.3.3 Land Use

5.3.3.1 Curtis Island

The establishment of the LNG Facility represents a permanent change in historical land use on Curtis Island, from previous grazing and pastoral uses to industry. However, QGC's decision to site the LNG Facility in the proposed location is consistent with the land's designation within the CIIC of the GSDA, and with strategic planning direction in the Gladstone area. The amount of land in the CIIC precinct is 1,563 ha compared to the 4,593 ha set aside within

the GSDA to provide an environmental buffer between the LNG precinct, Curtis Island National Park and the community of South End.

Table 5.5.10 Consistency with Gladstone Port Authority Land Use Plan 1995

Project component	Plan outcome	Consistency with proposed land use
Construction ferry terminal, fabrication area and laydown area, Auckland Point	While there are the established operations at the Auckland Point Wharves, there is significant vacant land north of the railway in the Port Central area that provides future opportunities for expansion of the Port's activities including container handling. This area will also play an important role as an inter-modal transfer and storage area particularly for the resources coming to/from the GSDA. A future rail line branching from the main marshalling area through this vacant portion may proceed when Aldoga proceeds. The proximity of this land and port infrastructure makes it an important area for the long term.[22]	The proposed use of the site for the construction ferry terminal, logistics and lay-down areas are consistent with the Port's land use plans for the area. The temporary nature of the proposed use (approximately four years) also provides for this land area to be used without constraining future land uses.
Operations ferry terminal-RG Tanna Wharf	Continuing reclamation by quarrying and dredging spoil methods will provide some further commercial development opportunities and cater for the ongoing expansion of the coal terminal. Potential future reclamation may occur to accommodate a proposed alternate tug harbour and further areas for light industrial activity.	The use of this land for the operational ferry terminal is consistent with the planned outcomes for this area.

The site is currently vacant so the establishment of the LNG Facility will have negligible direct impact on existing uses on the site.

The GSDA land use designations identify LNG industry as the preferred use for the precinct. Future development within the CIIP adjacent to the site is

22 Gladstone Ports Corporation, Statement of Proposals, Land Use Plan Review for the Port of Gladstone and Port Alma

likely to accommodate similar projects which may provide the QCLNG Project LNG Facility with infrastructure synergies.

As construction and operation access to the LNG Facility will be primarily marine based, no vehicular access between the LNG Facility and South End is anticipated. This will preserve the relative isolation and holiday settlement atmosphere of this community.

The design life of the Project is 20 years per LNG train, although the operational life of the Project may be longer than this. At the end of its operational life, the LNG Facility will be decommissioned with post decommissioning land use to be negotiated with appropriate regulators nearer to the time.

5.3.3.2 Kangaroo Island (Curtis Island Bridge)

The Curtis Island Bridge, were it to be constructed, would be consistent with the area's designation within the GSDA.

5.3.3.3 Gladstone Area

Pipeline

Direct impacts on land use arising from the pipeline will be minor and short term relating primarily to the disturbance of land during construction activities. Only a small amount of land in the route of the pipeline is identified as GQAL Class C (refer *Figure 5.5.3*). This short-term disturbance will have only minor local impacts on the productive use of land for agriculture and grazing activities. Following pipeline establishment and rehabilitation, the original productive value of the land would be restored.

The pipeline is primarily located within the Aldoga and Targinie precincts of the GSDA. The alignment of the route has been selected so that future major industrial development in these precincts will not be compromised.

Mainland Access Road

Land use in the route of the mainland access road would undergo a permanent change from grazing to roadway. The impacts of this are considered minor as most of the land is intertidal mudflats with a minimal portion suitable for grazing uses. Existing informal public access to the harbour foreshore may be limited during construction and potentially permanently restricted by the operation of the road. The impact on public access is considered minor as the area is not of high recreational value.

Potential impacts of the mainland access road on extractive minerals and resources are addressed in *Section 5.3.8.*

Ferry terminals

The proposed logistics ferry terminal at Auckland Point and operational ferry terminal at the RG Tanna Wharf are both located on Strategic Port Land. The proposed uses are consistent with the Gladstone Port Authority Land Use Plan 1995. Impacts will be negligible and at Auckland Point it will be limited to the duration of construction which is approximately four years for the first two trains (processing units) and an additional three-and-a-half years for construction of a third train should it be deemed economically feasible.

5.3.4 Native Title

Although native title has been extinguished for the LNG Facility site, QGC intends to undertake a combination of Right to Negotiate agreements and Indigenous Land Use Agreements (ILUAs) with the Traditional Owners for the site including the intertidal area associated with the LNG Marine Facilities.

QGC's approach to cultural heritage and native title is founded on the following key principles:

- inclusive, open and fair negotiations
- minimisation of negative impacts on cultural heritage and community
- respect and recognition of Aboriginal Culture and Aboriginal Peoples' traditional connection to land upon which the Project will operate
- building long-term partnerships with aboriginal communities reflective of the company's desire to operate sustainably and harmoniously in the region for years to come.

The potential effects of the Project on land and Traditional Owners are addressed by the Project's Native Title and Cultural Heritage Strategy in *Volume 8.*

5.3.5 Indigenous Cultural Heritage

Cultural Heritage Management Plans (CHMPs) are currently being negotiated between QGC and the relevant Aboriginal parties. These plans will detail the protection, management and mitigation measures to be applied in relation to items of cultural heritage. This is further discussed in *Volume 8*.

5.3.6 Non-indigenous Cultural Heritage

Non-indigenous cultural heritage is addressed in *Volume 8.*

5.3.7 Commercial and Recreational Boating and Fishing Activities and Values

Details of the potential impacts arising from Project shipping activities and

dredging are contained in *Volume 5, Chapter 15.*

Further discussion of potential impacts on recreational fishing is also addressed in *Volume 8.*

5.3.8 Extractive Minerals and Resources

Minor impacts on extractive minerals and resources may arise from the routing of the Pipeline or the proposed mainland access road.

The pipeline routes crosses land subject to mineral development licences and the KRA. The proposed mainland access road traverses the QERL mining lease application area and the area covered by the QERL mineral development licence. The mainland access road is also within the KRA. To minimise potential sterilisation of land associated with possible future mining activities, the road has been aligned as close to the high water mark as possible.

5.3.9 Millable Timber

The LNG Facility site will need to be cleared of vegetation prior to construction commencing. The site has some timber suitable for milling, although a detailed survey has yet to be undertaken to assess quantities. Options for management are described in *Volume 2, Chapter 13*.

5.4 IMPACTS ON INFRASTRUCTURE

5.4.1.1 Curtis Island

The LNG Facility will be self sufficient for electricity, water supply and sewerage services during the construction and operation phases.

This infrastructure is described in *Volume 2, Chapter 13* and *Volume 2, Chapter 9*. A summary of proposed infrastructure is discussed in this section.

Volume 5, Chapter 17 describes the management of waste from infrastructure after the decommissioning of the LNG Facility.

5.4.1.2 *Energy*

Electricity

Data from both Ergon Energy and Powerlink suggests that the electricity network in Gladstone is capable of handling any temporary population increase associated with the construction workforce with substations on average operating at 34 per cent to 59 per cent capacity. Assuming the construction workforce is dispersed across the Gladstone region, it is expected that the existing trunk network would cope with additional demand and impacts would be negligible.[23]

Power requirements on the Curtis Islands site during LNG Facility construction will be met through use of on-site diesel powered generators. While power requirements (and consequently diesel consumption) will vary subject to the construction phase, it is estimated that peak construction power requirements will be in the order of 15 megavolt amperes (MVA) for approximately 18 months.

Once operating, six refrigeration compressor drivers (aero-derivative LM2500+G4s with dry, low nitrogen oxide ($NO_{x)}$ emission systems) will be used for each LNG train. In addition to the refrigeration compressor driver, electric power for general LNG Facility operations will be generated by two gas turbine generators with another installed as a spare.

No use of mains power is proposed for the works on Curtis Island and no transmission/distribution lines are proposed outside the site boundary.

5.4.1.3 *Water*

The impacts on the potable water supply system of up to 2,000 workers dispersed across Gladstone are considered negligible. The water treatment plant has 50 per cent spare capacity and the bulk water system has been operating at 20 per cent of full capacity.

Estimated volumes of water for LNG Facility construction are outlined in *Volume 2, Chapter 13*. During early construction stages, potable water for drinking will be purchased and bottled and supplied to the site as necessary.

A temporary RO plant is to be established on a floating barge moored near the shoreline of the LNG Facility. The RO plants will be moved from barge mounted operation to on-shore operation when most of the bulk earthworks on site are complete.

23 GHD(2009) Draft Gladstone Infrastructure Audit CTR, p. 31.

Retention ponds will be constructed on site during Stage 1 of construction, and integrated into the temporary site drainage system. For the operations phase of the LNG Facility, rainfall runoff into these retention ponds will be the primary source of both non-treated and potable water. RO will provide a source of make-up water for periods where rainfall does not provide sufficient water supply.

5.4.1.4 *Waste Water*

The majority of Gladstone City utilises the Calliope River sewage treatment plant which has spare capacity of 14,000 Equivalent Persons (EP). The majority of other residential treatment plants are operating at approximately 50 per cent capacity. There will be adequate capacity in the existing treatments plants to absorb the loadings associated with the Project workforce and impacts on the system are considered negligible. [24]

The construction camp and the operational LNG Facility on Curtis Island will have their own on-site sewage treatment plants and will not impact on the current capacity of the existing treatment plants on the Gladstone mainland.

Sewage will be treated in an extended aeration-activated sludge sewage treatment plant. Treated wastewater will be further processed in tertiary filters and stored before being pumped to the irrigation system or discharged through sediment ponds to the Port of Gladstone. Refer *Volume 5, Chapter 17* for further details.

5.4.1.5 *Communication*

The existing optical fibre transmission system in Gladstone has sufficient capacity to accommodate the communication and data transmission demands of the Project workforce located in the Gladstone area.

Consultation with the telecommunications provider indicates that the capacity of the mobile tower at Targinie (3 mbits/sec download), is planned to be expanded to 21 mbit/sec. This upgrade will be more than sufficient to provide for the LNG Facility requirements as well as growth in demand in Gladstone.

The site on Curtis Island has good existing mobile phone and data coverage and this will be the primary telecommunications method during the construction phase of the LNG Facility. A fibre-optic connection will potentially be established for the operations phase.

24 GHD (2009) Queensland Curtis LNG Project, Draft Gladstone Infrastructure Audit, p.22.

5.4.1.6 *Waste Disposal*

The GRC landfill site at Benaraby has adequate capacity at current predicted levels to accept material up to the year 2050. On average 150 tonnes of waste per day was accepted in 2008, with the current cell having a remaining life of four years.[25] Approvals through the DERM are required for the next cell to be created on the northern side of the site. It is expected that the landfill will continue to satisfy the relevant regulations. *Volume 5, Chapter 17* describes the volumes of waste to be disposed during the construction and operation of the LNG Facility.

Waste collection for a mainland construction camp would need to be arranged with a commercial operator within Gladstone. The three operators in Gladstone are national operations with a network of resources to call on as required. It is not envisaged that there would be any difficulty engaging contractors to carry out this work. [26]

It is expected that existing domestic kerbside collection services will accommodate demands from the operational workforce, which will most likely live in the Gladstone area. The impact of this population increase will be negligible.

5.4.2 *Co-location of other Infrastructure*

The location and alignment of the proposed Curtis Island Bridge/Road allows for the provision of the following infrastructure within the Curtis Island Infrastructure Corridor, if required in future: (Note that approval for this infrastructure is not sought by this EIS.)

- three gas supply pipeline corridors of 40 m width each located north of the road bridge on the assumption that three LNG projects may in future be developed on Curtis Island
- a rail bridge(s) located south of the road bridge
- water reticulation pipeline and 66 kV power supply within the road corridor, which may be attached/supported by the bridge/road superstructure
- potential for other industry materials transport pipelines to the north of the bridge/road to be developed.

5.4.3 *Electrical Interference*

Volume 4, Chapter 5 discusses electrical interference issues relating to the route of the Export Pipeline.

There are no electrical interference issues relating to the LNG Facility as there

25 ibid

26 GHD (2009) Queensland Curtis LNG Project, Draft Gladstone Infrastructure Audit, p.33

is no power supply to Curtis Island. The mainland Project components are not located within electrical transmission corridors.

5.5 SUMMARY OF IMPACTS

Table 5.5.11 and Table 5.5.12 summarises the impacts on land use and infrastructure identified in the impact assessment. They detail the phase (construction, operations, or decommissioning) at which the impact is likely to occur. Where a phase is not included in the table, it is because it is not relevant to that component.

Table 5.5.11 Summary of Impacts - Land Use

Project Component	Impact	Phase	Expected impact
LNG Facility	Change from existing land use	Construction Operation Decommissioning	Negligible Negligible Negligible
	Loss of public access to land	Construction Operation Decommissioning	Negligible Negligible Negligible
	Impacts to adjacent land uses (South End community)	Construction Operation Decommissioning	Minor Minor Negligible
	Impacts to immediately adjacent land uses (future industrial)	Construction Operation Decommissioning	Nil Negligible Negligible
	Land contamination	Construction Operation Decommissioning	Negligible Minor Minor
Proposed road and export pipeline route	Change from existing land use	Construction Operation Decommissioning	Negligible Negligible Negligible
	Potential beneficial impacts through provision of infrastructure for future industrial development	Construction Operations Decommissioning	Negligible Moderate (positive) Minor (negative if pipeline removed)
Curtis Island Bridge (not part of this project)	Change from existing land use	Construction Operations Decommissioning	Negligible Minor n/a (bridge unlikely to be removed if it is constructed)
	Beneficial impacts through provision of infrastructure for future industrial development	Construction Operation Decommissioning	Negligible Minor (positive) n/a (bridge is unlikely to be removed if it is constructed)
Mainland			
Export Pipeline route	Loss of access to grazing land	Construction Operation Decommissioning	Minor Negligible Negligible
	Sterilisation of mining resources due to	Construction Operation	Minor Minor

Project Component	Impact	Phase	Expected impact
	resource removal or alteration.	Decommissioning	n/a (export pipeline is unlikely to be removed)
	Beneficial impacts through provision of gas for future industrial development	Construction Operations Decommissioning	Negligible Moderate (positive) Moderate
Access road (not part of this Project)	Loss of access to grazing land	Construction Operation Decommissioning	Negligible Negligible Negligible
	Loss of public access to foreshore	Construction Operation Decommissioning	Minor Negligible n/a (road is unlikely to be removed if it is constructed)
	Sterilisation of mining resources due to resource removal or alteration.	Construction Operation Decommissioning	Minor Minor n/a (road is unlikely to be removed if it is constructed)
Construction ferry terminal	Change from existing land use	Construction	Negligible
Operations ferry terminal	Change from existing land use	Operations	Negligible

Table 5.5.12 Summary of Impacts - Infrastructure

Infrastructure	Project impact	Phase	Expected impact
Electricity supply	Upgrading of local reticulation networks to service the electricity requirements of construction camps	Construction	Minor
Gas	Gas not required therefore nil Project impact	n/a	n/a
Water	Water supply to mainland construction camps		
	Bulk water supply to LNG Facility	Construction	Minor
Waste water	Nil Project impact.	n/a	n/a
	Increased demand from operational workforce in Gladstone	Operations	Negligible
Communication	Existing communications network sufficient	n/a	n/a
Waste disposal	Commercial waste disposal from mainland construction camps	Construction	Negligible
	Waste disposal from construction, operation and decommissioning of LNG	Construction Operations Decommissioning	Refer *Volume 5, Chapter 17*

Infrastructure	Project impact	Phase	Expected impact
	Facility		

5.6 CUMULATIVE IMPACTS

Consideration has been given to the cumulative impacts on land use and infrastructure arising from the LNG Facility in combination with other proposed projects in Gladstone.

As the LNG Facility will be self sufficient for electricity, water supply and sewerage services during construction and operational phases, it will not contribute to any cumulative impacts on mainland infrastructure.

The LNG Facility and proposed projects in Gladstone will have cumulative impacts on the capacity of existing landfill sites to deal with waste generated from all projects. As these wastes will be treated, transported and disposed of in accordance with legislation, with landfill disposal being used as last resort, it is anticipated that impacts will be minor. The Beranby landfill within Gladstone received an average 150 tonnes of waste per day in 2008.[27] At current predicted levels the site has adequate capacity to accept material up to the year 2050. Funding for the creation of new cells in the landfill is collected through a charge per tonne and expansion is undertaken on a needs basis in accordance with DERM requirements.

5.7 MANAGEMENT AND MITIGATION MEASURES

Mitigation measures for each of the impacts identified in the impact assessment are described below. Where the impact and mitigations measures are described elsewhere in this EIS, the relevant chapter is referenced.

5.7.1 Environmentally Sensitive Areas

Measures to mitigate impacts on environmentally sensitive areas are discussed in various chapters of the EIS. *Table 5.5.13* identifies the chapter of the EIS in which the mitigation measure is described or describes the mitigation measure.

27 GHD (2009) Queensland Curtis LNG Project, Draft Gladstone Infrastructure Audit, p.37

Table 5.5.13 Mitigation Measures for Environmentally Sensitive Areas

Environmentally Sensitive Area	Environmental Values
World Heritage Areas	*Volume 5, Chapter 16*
National Heritage Places	*Volume 8*
Marine Parks	*Volume 5, Chapter 8*
National Parks	*Volume 5, Chapter 7*
Wilderness Areas	Not applicable.
State Forests	The mainland access road will be aligned in consideration of its proximity to the Targinie State Forest. Impacts are not anticipated to the Curtis Island State Forest.
Wetlands of International Importance - Ramsar Sites	Not applicable
Wetlands	*Volume 5, Chapter 9*
International migratory bird agreements (i.e. JAMBA, CAMBA and ROKAMBA).	*Volume 5, Chapter 7*
Wildflower Areas	Not applicable.
Rivers and Lakes	The Construction Camp will not impact the Calliope River.
Endangered Regional Ecosystems	*Volume 5, Chapter 7*
Scientific Reserves	Not applicable.
Dugong Protection Areas (DPA)	*Volume 5, Chapter 7, 8*
Migratory and Shorebird Habitat Areas	*Volume 5, Chapter 7, 8*
Declared Fish Habitat Areas (FHA)	The LNG Facility is approximately 40 km distant from the Colloseum Inlet FHA and 60 km from the Curtis Channel FHA. These are not anticipated to be impacted by the Project.
Areas of State Significance	*Volume 5, Chapter 11*
Cultural Heritage Areas	*Volume 8.*
Groundwater Vulnerability Areas	*Volume 5, Chapter 10*
Bushfire Hazard Zones	*Volume 5, Chapter 18*

5.7.1.1 *Impacts to Adjacent Land Uses (South End community)*

South End will not be used as an access point for construction or operations of the LNG Facility. Community consultation will be conducted throughout the construction, operations and decommissioning process so that residents are informed of progress.

5.7.1.2 *Impacts Arising from Pipeline Construction*

The following general mitigation methods are to be implemented in relation to the pipeline construction:

- ensuring appropriate buffers are maintained between the pipeline and existing and planned development, or where this is not practicable, ensuring pipeline design meets the safety requirements for developed areas
- ensuring appropriate discussions with landholders and occupants in relation to the provision of access for pipeline construction and ongoing maintenance during operation
- liaison with mining permit, claim or lease holders to determine the most appropriate alignment, based on current and future needs and ensuring that existing legislation has been considered
- ensuring appropriate notification and management of noisy and dusty activities.

5.7.1.3 *Extractive Mineral and Resources*

Land overlain by mining permits, claims and leases is subject to the provisions of the *Minerals Resources Act 1989*. QGC has considered the relevant provisions of this Act in determining the current proposed road and pipeline alignment and will consult with mining and exploration companies to determine the preferred strategy to meet current and future needs.

5.8 CONCLUSION

The establishment of an LNG Facility on Curtis Island represents a change in historical and existing land use on Curtis Island. However, the construction and operation of the LNG Facility fulfils the intent of strategic planning direction in the Gladstone region. The expansion of the Gladstone State Development Area to include the Curtis Island Industry Precinct sets a clear framework for future industrial land use and investment on Curtis Island and the proposed LNG Facility is one of several LNG projects that intend to locate within the precinct. The GSDA's Environmental Management Precinct will provide a significant buffer between the new industrial precinct and the remainder of the island.

The establishment of the LNG precinct on Curtis Island will provide continued economic activity in the region and capitalise on existing port infrastructure and capabilities within the region.

Impacts arising from the Project components in Gladstone will primarily be temporary during the construction period. Detailed design of the Export Pipeline route and the access road will be undertaken to minimise impacts on extractive minerals and resources. Existing infrastructure in Gladstone has sufficient capacity to accommodate increases in population from the construction and operations workforce.

The LNG Facility will be self-sufficient for power, water and wastewater disposal. Therefore its requirements for these services will not impact Gladstone infrastructure. A summary of the impacts outlined in this Chapter is provided in *Table 5.5.14*.

Table 5.5.14 Summary of Land Use and Infrastructure Impacts

Impact assessment criteria	Assessment outcome
Impact assessment	Positive for LNG Component, Curtis Island Road/Bridge and potential disposal of dredge spoil adjacent to Fishermans Landing. Negligible for impacts on infrastructure
Impact type	Direct
Impact duration	Long-term
Impact extent	Local
Impact likelihood	High

Overall assessment of impact significance (land use): Negligible positive as establishment of the LNG Facility on Curtis Island and the Curtis Island Road/Bridge is consistent with the objectives of the GSDA.

The potential reclamation of land north of Fisherman's Landing using dredge material will create additional port land which will be a positive impact of major significance from a land use perspective.

Overall assessment of impact significance (infrastructure): Negligible as existing capacity can accommodate requirements of the LNG Facility and Ancillary Infrastructure.