8 PIPELINE OPERATIONS

8.1 OVERVIEW

This chapter, *Chapter 8*, describes the operating phase for the Pipeline Component of the Queensland Curtis LNG (QCLNG) Project. The pipeline network includes:

- a 380 km Export Pipeline from the area of the QGC Gas Field Component in the Surat Basin of southern Queensland to the LNG Facility in Gladstone, including crossing of The Narrows
- potentially a 150 km Lateral Pipeline which enables the connection of additional CSG fields to the Export Pipeline
- a 200 km Collection Header – a central pipeline located in an Upstream Infrastructure Corridor (UIC) to collect gas from centralised compressor facilities for delivery to the Export Pipeline.

Pipeline Component operational activities include general maintenance, gas metering, prevention of third-party damage, and maintenance of corrosion protection systems. QGC has developed a pipeline operating philosophy, based on these activities, which details key management responsibilities:

- organisational requirements and reporting structures with defined roles and responsibilities of key personnel
- personnel training requirements including competency testing
- Operations and Maintenance Plan
- Asset Integrity Assurance Plan
- Stakeholder Engagement Plan including implementation strategies
- Health, Safety, Security and Environmental (HSSE) Plan
- Emergency Response Plan
- Communications Plan.

8.2 PIPELINE PROTECTION SYSTEMS

The pipeline design incorporates an over-pressurisation system to ensure that operating pressure remains within the designated maximum allowable operating pressure (MAOP) as determined by national and international codes.

A mass-balance reconciliation process incorporated within the operating system of the pipeline detects any losses during transmission of the gas from inlet to outlet. In addition, remotely controlled emergency shutdown valves installed at strategic locations can be activated by both the pipeline operator and the LNG Facility in an emergency.

Pipes delivered to site are pre-coated in three-layer inert corrosion protection wrapping to ensure pipe material integrity. A cathodic protection system is also applied to the pipeline to supplement the coating protection. This combined

system guards against corrosion and any subsequent deterioration of pipe-wall thickness. The integrity of this system is monitored regularly as part of the pipeline's Operation and Maintenance Plan.

8.3 TELEMETRY SYSTEMS

Operation and maintenance of the pipeline will be managed from a centre based at the Gas Field. The centre includes a Control Room for transmitting and receiving data and controlling remotely-operated equipment. The data collection system is accessible by field staff and QGC headquarters in Brisbane. Dedicated personnel are assigned to 24 hour monitoring of the system.

A secondary communication system activates in the event of the primary communications system failing. Both systems are compatible with those currently in operation in the Gas Field and the proposed LNG Facility.

High-accuracy metering of all gas flows is continually checked against the volume of gas within the pipeline and any significant imbalance is immediately identified and investigated to confirm pipe integrity.

8.4 MAINTENANCE SYSTEMS

QGC's Operations and Maintenance Plan forms the basis of maintenance processes, procedures and plans. It also includes details relating to the requirement for general induction training, specific personnel training and competency assurance.

The maintenance system includes:

- ground and aerial patrols
- monitoring and repair of equipment
- cleaning of the pipelines, referred to as 'pigging'
- corrosion monitoring and remediation
- easement and lease area maintenance including access roads.

Regular inspections of the above-ground works include detection of erosion, monitoring of rehabilitation success and detection and control of weed species.

As the pipelines are buried, landholders may resume using surface land provided that activities do not include excavation activities beyond a depth of 300 mm. Landholders are required to advise the pipeline operator if excavating below 300 mm. In these circumstances, the pipeline operator locates the pipeline and, if required, supervises excavation works.

Deep-rooted vegetation directly across a pipeline easement (approximately 40 m in width) is discouraged due to the potential for damage to the pipeline. However, grasslands may be re-established with no long-term impacts to ecosystems affected by pipeline construction.

Prevention of damage to the pipeline from third-party activities is achieved through:

- continued communication with easement stakeholders
- appropriate depth of cover
- signposting the pipeline
- one-call 'Dial Before You Dig' education program
- regular inspection of the pipeline Right-of-Way (RoW) to identify any construction or earthmoving activities in the area
- third-party education about the potential dangers of carrying out activities in proximity to pipelines.

In some areas, such as road crossings, additional protection may be provided to reduce the risk of third-party interference. This may include deeper cover, the use of marker tape buried above the pipeline, physical barriers or a thicker wall pipe.

Regular pipeline monitoring and communication with easement stakeholders ensures that:

- there is no interference from third parties
- cathodic protection mechanisms are functioning correctly
- revegetation, erosion protection and weed management programs are successfully implemented.

Inspection of pipeline easements for erosion, weeds, subsidence, lack of revegetation or third-party activity occurs regularly (weekly to monthly depending on proximity of easement to other activities) by either ground or aerial patrols. QGC maintains regular contact with landholders of all properties traversed by pipelines to monitor any activities proposed within pipeline easements likely to affect the integrity of the pipeline.

8.5 MATERIAL REQUIREMENTS

Operation of the pipeline network requires very few materials. Some line pipe will be maintained in a stockpile at either end of the pipeline i.e. within the LNG Facility and at an appropriate location within the Gas Field. Other materials include welding rods, oils for vehicle service, grease for valve and plant maintenance, gloves and other safety materials.

8.6 STORAGE REQUIREMENTS

Storage requirements are minimal and mostly for line pipe as described under *Section 8.5*. All consumables will be stored in secure locations.

8.7 SITE ACCESS AND SECURITY

Existing local roads and tracks provide access to the pipeline RoW during

operations. It may be necessary to maintain additional tracks created during construction (refer to *Volume 2, Chapter 12*) and this will be negotiated with the relevant landholder. QGC aims to avoid creating new tracks that the general public may use to access Project sites. This is part of ensuring the ongoing security of the pipeline.

Security fencing, gates and locks around all major above-ground facilities (e.g. in-line compressor station, scraper stations and mainline valves (MLVs)) inhibits accidental or unauthorised tampering and provides for secure sites.

The remainder of the pipeline RoW is left available for existing land uses (e.g. grazing, agriculture, native vegetation).

8.8 ACCOMMODATION AND WORKFORCE

Operation of the Pipeline Component requires approximately 20 field personnel. Personnel will operate out of either the LNG Facility or the Gas Field and will be accommodated either in Gladstone or in the Miles/Chinchilla area. Operational staffing is insignificant compared to the requirements of the Gas Field and LNG Facility and is not expected to greatly impact on accommodation in either region.

8.9 TRANSPORT REQUIREMENTS AND INFRASTRUCTURE

Little impact is expected to the road network during pipeline operation. Inspection of the pipeline easement will be required but vehicle numbers will be minimal. It is expected that inspections will be undertaken by 4WD vehicles and by aerial inspection. Impacts to roads or traffic conditions will be negligible.

Helicopter routes will be established on an as-needs basis with aviation regulatory bodies. Landowners would be contacted prior to an aerial inspection.

8.10 ELECTRICITY/ENERGY

Electrical power is required at the in-field compressor station, MLVs, scraper stations and metering stations. QGC plans to use power for the compressor stations on-site using gas turbines or connecting to existing grid power, depending on an evaluation. A diesel standby generator with similar capacity will provide back-up power.

Solar energy is likely to provide power for the scraper stations, MLV sites and cathodic protection system. However, if mains power is available it will be considered as an alternative. Power for the transfer station at Gladstone will be less than 50 kW and mains power sourced.

8.11 TELECOMMUNICATIONS

A permanent radio network provides personnel communications for operations of the pipeline. It will be installed using existing towers and services wherever possible and connected to the existing Gas Field facilities.

The gas sales stations are likely to be connected to the existing communications network in Gladstone. Remote field personnel will utilise mobile and satellite telephones as required. Telecommunications will be installed for the monitoring of gas flow and the remote control of critical items of equipment such as emergency shutdown valves.

These systems may consist of:

- fibre optic cables (installed with each pipeline to connect major infrastructure)
- microwave towers
- satellite dishes
- Next-G telephone networks
- radio.

8.12 WATER SUPPLY AND MANAGEMENT

Ablutions at the in-line compressor station account for the majority of water used. This demand will be met from an on-site rainwater tank.

Bottled water supplies will provide potable water.

8.13 STORMWATER

QGC will install erosion control berms and sediment control fences at strategic locations along pipelines (e.g. on slopes, top and foot of the approaches to watercourses) during construction. During operation of the pipeline, these areas will be reviewed during routine patrols and after heavy rain to ensure that they are still required and operating correctly. Corrective action will be taken as required to ensure the ongoing effective management of stormwater along the RoW.

The aboveground facilities, except for the in-line compressors (refer *Volume 2, Chapter 12*) do not require any special stormwater management measures as natural run-off is maintained at these sites and there is no collection of rainwater.

8.14 SOLID AND LIQUID WASTE MANAGEMENT

Operation of the pipeline will generate very small quantities of waste, principally sludge from the cleaning (i.e. pigging) of the pipeline. This material is collected at scraper stations and transported to a licensed waste disposal facility.

The in-line compressor station generates small quantities of waste oil filters and packaging materials during maintenance works.

Typical waste disposal options for operation of the pipeline and facilities are provided in *Table 2.8.1*.

Table 2.8.1 Waste Disposal

Waste Type and Generation Point	Disposal
Filters (non-oily)	Landfill
Sludge (pigging)	Licensed landfill
Packaging (maintenance)	Recycle if practicable, e.g. timber pallets

Disposal of all wastes is in accordance with the requirements of the *Environmental Protection (Waste Management) Policy 2000* and the *Environmental Protection (Waste Management) Regulation 2000* which are both subordinate pieces of legislation under the *Environment Protection (EP) Act 1994* (Queensland). There are no environmentally relevant activities for waste in accordance with the *Environmental Protection Regulations 2008* associated with pipeline operations of the Project.

Waste management strategies are similar to those for construction waste management (refer to *Volume 4, Chapter 15*) and in accordance with the *EP Act* (Qld). QGC's aim is to 'reuse, recycle and recover'. Segregation and recycling of wastes is encouraged to minimise disposal to landfill.

8.15 NOISE EMISSIONS

The main noise event associated with the operation of gas pipelines is the venting of gas for maintenance or emergency shutdown. The venting of gas creates a very loud, high-pitched noise but these are uncommon and for limited durations (refer *Volume 4, Chapter 12*). Planned venting for maintenance takes into account the potential impact on residential areas. Potentially affected landholders are to be notified of any identified impact.

Low-level noise is emitted from above-ground pipeline installations but is not expected to require attenuation. However, noise surveys will be undertaken to confirm this and appropriate attenuation measures will be put in place where necessary.

The main ongoing noise emissions are associated with the in-line compressor station (refer to *Volume 4, Chapter 12*).

8.16 AIR EMISSIONS

Air emissions for an operational pipeline are minimal and limited to fugitive emissions that are not expected in a modern, new, gas transmission pipeline. Ongoing maintenance ensures that there are no fugitive emissions from above-ground facilities (e.g. MLVs, scraper stations) over time.

Air emissions will occur in relation to the in-line compressor and these are discussed in *Volume 4, Chapter 11*.

8.17 PROJECT ALTERNATIVES

8.17.1 Pipeline Route Options

Alternatives to the preferred Export Pipeline route are considered in two parts:

- Export Pipeline (Mainland) – all pipeline situated on the mainland to west of The Narrows. The Narrows includes all areas below the highest astronomical tide separating the mainland from Curtis Island
- Export Pipeline (The Narrows) – the pipeline crossing of The Narrows and Curtis Island.

As pipeline infrastructure is located within a pipeline route that is approximately 40 m wide, the Project and infrastructure locations are the same within the RoW.

8.17.1.1 Route Selection (Mainland)

A detailed description of the route selection process is provided in *Volume 2, Chapter 12.* In summary, the development of the various pipeline routes employed a five-stage methodology involving:

- development of potential route options
- desktop studies
- field review
- selection of a preferred route for detailed study
- detailed studies to refine the preferred route.

Each of the corridor options was considered against the following assessment criteria:

- corridor length
- environmental impacts, approvals and land access complexity
- community impacts
- constructability (principally terrain)
- proximity to prospective CSG regions
- long-term pipeline protection and operability
- future expansion potential.

Assessment results are described in *Volume 2, Chapter 12.*

8.17.1.2 Route Selection (The Narrows Crossing)

Although *Figure 2.8.1* infers a preferred pipeline crossing alignment of The Narrows, there are six primary crossing options between the mainland and Curtis Island under consideration as shown in *Figure 2.8.1.*

- Option One is a west-east route between Phillipies Landing in the west, through Friend Point and across The Narrows to Laird Point on Curtis Island.

- Option Two is a route from Phillipies Landing south to just north of Fisherman's Wharves, then across Gladstone Harbour to Curtis Island, going south of North Passage Island.
- Option Three is a route from Phillipies Landing south to just circumnavigate the marsh land outside Phillipies Landing, thence east across Gladstone Harbour, going south of North Passage Island.
- Option Four is a route from Phillipies Landing south to just circumnavigate the marsh land outside Phillipies Landing, thence east across Gladstone Harbour, going north of North Passage Island.
- Option Five is a route from Phillipies Landing across to Kangaroo Island, across Kangaroo Island to Friend Point, thence across The Narrows to Laird Point on Curtis Island.
- Option Six is a route from Phillipies Landing into Humpy Creek and north around Kangaroo Island into The Narrows, then south to Laird Point.

Site visits and survey data gathering operations are planned across these route options to determine the various disadvantages and advantages associated with each. Based on this data, an assessment will be conducted and the route finalised. Community input will be sought so that a decision is made which takes account of community feedback and expectations. It is expected that a final route will be presented in a supplementary EIS.

As a final route has not been selected, pipeline length will be considered in the final assessment. All possible technical alternatives will be assessed, including trenchless crossing techniques (refer to *Volume 2, Chapter 12*). Only those options that are feasible will be considered for additional impact assessment.

8.17.1.3 Reason for Selection of Preferred Option

Social and Environmental

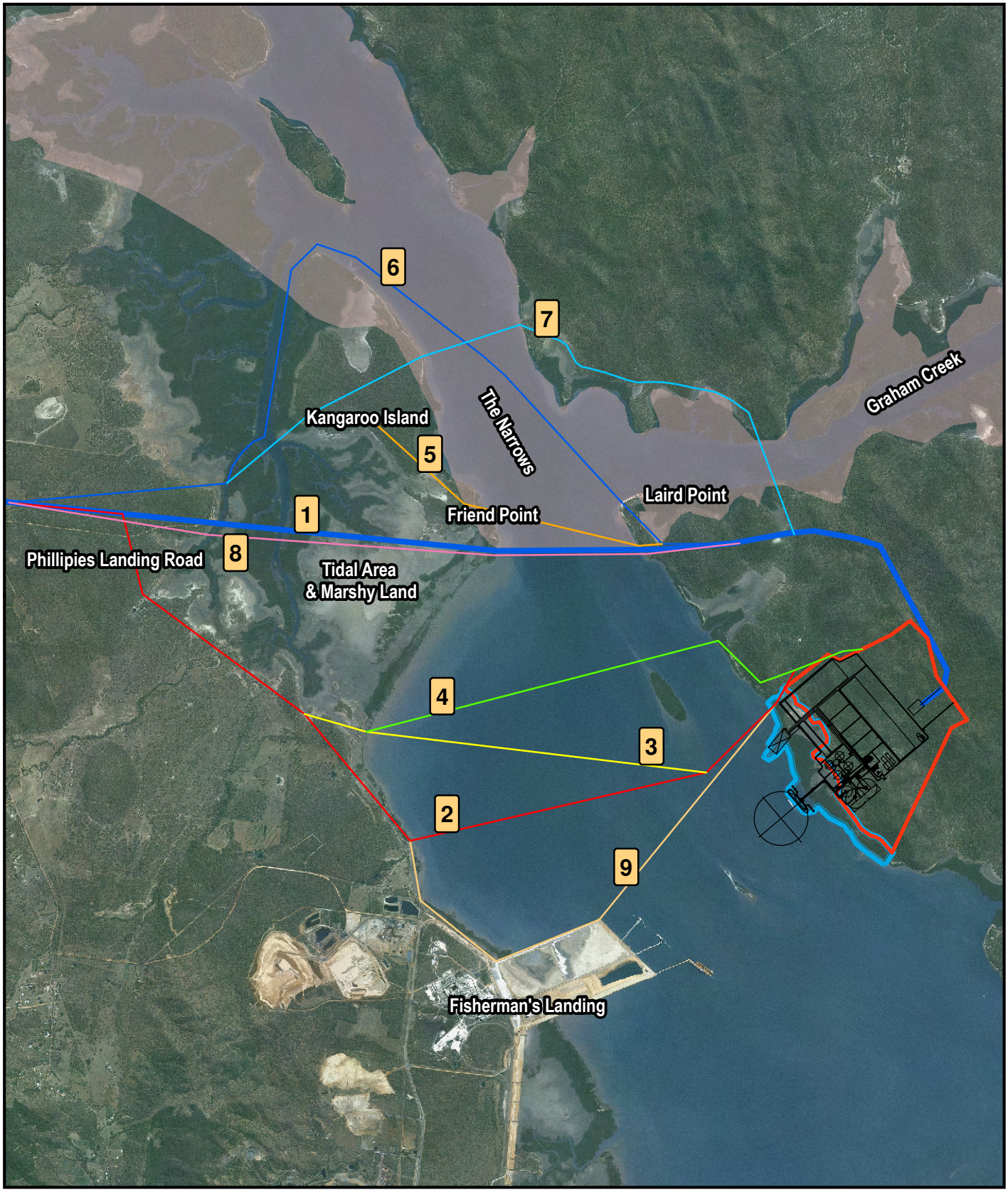
As described in this EIS, all measures will be taken to avoid and minimise impacts on communities and the environment from construction and operation of pipelines. The route option that has least impact on communities and the environment, and is commercially and technically feasible, will be selected.

Government Policy

The Queensland Government has facilitated both public and private pipeline connections between gas fields and consumers. Examples include Roma-Brisbane pipeline, the Carpentaria Gas pipeline, Moranbah to Townsville pipeline and Wallumbilla to Gladstone pipeline. The development of these pipelines has effectively formed a Queensland gas grid which was recently linked into the broader east coast gas pipeline network.

Since the advent of CSG, the Queensland Government has recognised the importance of additional gas pipeline development to link CSG fields to industrial consumers and electricity generators.

A number of projects include extensions to, and strategic infill development of, the Queensland gas pipeline grid. The Project will result in the gas pipeline network directly linking the Gas Field to export markets.



Legend

- Proposed QCLNG Site Boundary
- Wet Lease Area
- Proposed LNG Facility Plant Layout
- Great Barrier Reef Coast Marine Park
- 1 - 9 Indicative Potential Pipeline Crossing Options

Source Note:

Aerial Photo - SPOT 10m 2008 08 30
Curtis Island Road/Bridge Corridor - Connell Wagner
Indicative Pipeline Options - Xodus Group

Projection: UTM MGA Zone 56 Datum: GDA 94

0 0.5 1 2 km

N

QUEENSLAND CURTIS LNG
A BG Group business

Project: Queensland Curtis LNG Project

Client: QGC - A BG Group business

Title: **Proposed Narrows Crossing Options**

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Drawn	KP	Volume 2	Figure 2.8.1
Approved	DS	File No:	0086165b_EIS_GIS028_F2.8.1
Date	14.07.09	Revision	1

Land Use Factors

The Pipeline Component of the Project will temporarily affect approximately 1,260 ha of land classified as Good Quality Agricultural Land (i.e. Class A and B refer to *Volume 4, Chapter 4*). However, pipelines are not expected to have any long-term impacts on existing agricultural activities. Cropping activities would only be affected during construction and could resume once the land is reinstated. There should be limited impact on grazing activities from pipeline construction and operations. Some temporary relocation of cattle may be required during construction to prevent accidental injury from, for example, an open trench. This would be for a very limited period.

Pipeline development will require clearing of approximately 1,460 ha of native vegetation. It is QGC's intention to either rehabilitate bushland during Project decommissioning or engage in biodiversity offset planting to match the vegetation clearing.

Once pipeline routes are established, restrictions would apply to the future use of easements as public transport corridors, as specific safety measures would need to be implemented. Registration of the pipeline easements ensures that any future development takes into account the presence of the pipeline.

Restrictions may also apply to the installation of other infrastructure (e.g. power transmission networks). Gas transmission pipelines and overhead, high voltage, power transmission lines are not always compatible uses for a single easement for safety reasons. Telecommunications (e.g. fibre optic cables) may be compatible infrastructure and would be considered by QGC. Again the registration of the pipeline easements will ensure that any future telecommunications or power transmission network installation takes into account the presence of the gas pipeline.

Commercial

The current preferred route is a length that is commercially viable and that provides good access to other CSG resources for future development of the Queensland's resources. The route has also been selected to minimise the potential for impacts on coal and minerals development.

8.17.2 Technology and Design Considerations

8.17.2.1 Pipe type and size

The pipeline sizing will be determined by the capacity required to deliver 680 million standard cubic feet (mmscf) of gas per train per day. Various large diameter pipes (42 inch up to 52 inch) are being considered for the Export Pipeline. The selection of the preferred diameter will be primarily based on feasibility and logistical reasons. The final size of the pipe would result in minimal variation to the environmental and social impact, as described in this EIS, of pipeline construction and operation.

8.17.2.2 The Narrows Crossing Technique

Crossing techniques under consideration for the marine routes involve:

- conventional offshore pipe lay whereby line pipe is welded together on a lay vessel and lowered to the seabed. With this technique the installed pipeline may either be left on the sea bottom or post-lay trenched. Risk assessments will assist with determining whether trenching is required. The pipeline may also be installed into a pre-cut trench, although this is technically more challenging than post-lay trenching
- open-cut pipeline installation whereby a trench is prepared across a section of land and a pre-strung section of pipeline pulled into the trench with flotation aids attached. Once in position the flotation aids are removed and the pipeline sinks to the bottom of the trench, which is then backfilled with either in-situ spoils or imported material. This type of construction is often employed in soft swampy ground conditions
- trenchless techniques (e.g. horizontally directional drilling or tunnelling) whereby an underground hole is pre-drilled and a pre-strung section of pipeline pulled or installed through once the hole has been reamed to correct size. This type of construction is often employed in under-river crossings, under-lake crossings and under sand dunes in onshore-to-offshore crossings. The technique has constraints in relation to the length of drill/tunnel that can be undertaken and the suitability of the underlying geology
- offshore or onshore pull-in pipeline installation whereby a section of pipeline, either pre-strung or welded together on a lay vessel, is pulled into final position using either a winch from onshore or a winch from an offshore platform. This type of installation is often employed in onshore-to-offshore crossings, and usually involves pulling into a pre-cut trench, which is then subsequently back-filled.

Application of any of the above construction techniques is subject to confirmation by a combination of risk assessments, environmental impact assessments, cost estimates, schedule estimates and detailed engineering based on a comprehensive site investigation and survey data gathering program.

The routes under consideration may also employ a combination of the above techniques to facilitate pipeline construction. The pipeline crossing will be decided during a detailed design phase which is ongoing.

Attachment of the pipeline to the possible Curtis Island bridge was also considered. However this option is not favoured by QGC on safety grounds associated with the presence of a gas pipeline suspended above a shipping channel.