12 PIPELINE CONSTRUCTION

Chapter 12 of the Queensland Curtis LNG (QCLNG) Project draft environmental impact statement (EIS) described the extent and nature of construction of the Pipeline Component of the Project. The chapter included the route selection process and description of the preferred routes for the various pipelines proposed.

At the time of the draft EIS, the Pipeline Component comprised the Export Pipeline, Lateral and Collection Header. Further refinements to the Project after the submission of the draft EIS have resulted in the Lateral Pipeline being abandoned and the Export Pipeline and Collection Header being further refined.

This chapter of the supplementary EIS therefore describes those changes that have occurred in relation to the Pipeline routes as well as clarifications as a result of submissions to the draft EIS.

12.1 SUBMISSIONS RECEIVED

A summary of the submissions received in relation to construction of the Pipeline Component of the Project and a response to those submissions is provided in *Table 2.12.1*.

Table 2.12.1 Responses to Submissions on the Draft EIS

Submission Received	Response	Submitter
Figure 2.12.4 appears to show the Export Pipeline crossing the Western Line (Dalby-Roma) rail corridor, however paragraph two of this section makes no reference to this crossing.	At the time of writing the draft EIS there was debate as to the location of kilometre point zero (KP0) of the Export Pipeline (south of the Warrego Highway as shown on the map or north of the Warrego Highway as described in the EIS). At this stage of the development, KP0 has now been moved further north to where the Export Pipeline meets the Woleebee Creek gas Collection Header (refer to *Section 12.2.1* of this Chapter). QGC is working to rationalise crossings of the Warrego Highway and the Western Railway. There will be a single gas pipeline and a single water pipeline crossing of these infrastructure elements. The crossings will be adjacent to each other to minimise impacts.	27
In describing the pipeline route through the Gladstone-Mt Larcom area, the EIS should include a description of the Moura Link Aldoga Yard rail project and the Wiggins Island Coal project.	Refer to *Section 12.2.1.2* of this chapter.	27

Submission Received	Response	Submitter
Between KP0 and KP20 the Upstream Infrastructure Corridor (UIC) crosses the Dalby to Glenmorgan rail corridor. This fact should be recognised in paragraph two.	The UIC did intersect this rail corridor at the time of the draft EIS. However, the shortening of the UIC at the southern end (refer to *Section 12.2.1* of this chapter) has eliminated the crossing of the Dalby to Glenmorgan rail corridor.	27
Row 10 of *Table 2.12.2* should specify AS4799 for pipeline crossings of railways. In this respect, the standard requires a depth of cover of 2 metres below the lowest drainage point of the rail corridor. In addition, this table should specify a requirement for tunnel boring or HDD, to ensure that rail operations are not interfered with.	Refer to *Section 12.2.8.1* and *Section 12.2.8.5* of this chapter.	27
Detailed Design (pg 26) In addition to watercourse crossings, this section should analyse detailed design requirements with respect to rail crossings, including the need for HDD.	Refer to *Sections 12.2.8.5* and *12.4.1.2* of this chapter.	27
This section and table appear to omit an analysis of proposed Project Construction Activities for locations where trenching is not appropriate e.g. for railways.	Refer to *Section 12.4.1.2* of this chapter.	27
The proposed corridor width of 40 m for the Export and Lateral Pipeline and 80 m for the UIC appears excessive especially when compared with other proposals.	Refer to *Section 12.2.8.4* of this chapter.	32
In general, the EIS does not provide detailed comment regarding the use of water efficiently as it is removed as a by-production of coal seam gas nor does the EIS provide details about the exact availability of water as a potable source for construction and operation of the development.	For a response on the availability of potable water for construction of the Pipeline refer to *Section 12.1.3* of this chapter.	28

12.1.1 Co-location Opportunities

As discussed in the draft EIS, QGC has been working with the Department of Infrastructure and Planning in relation to coordinating and co-locating Pipeline infrastructure through the Gladstone State Development Area (GSDA) and across to Curtis Island. This work has been extended to include consideration of a common infrastructure corridor from the Callide Range. The GSDA and the corridor from the Callide Range are referred to as the Callide Infrastructure Corridor State Development Area (CICSDA). A joint technical working group has been established involving all four LNG proponents with interests in constructing gas pipelines from the Surat Basin to Gladstone. The joint technical working group is working with the Government to identify opportunities for co-location.

The proposed Surat to Gladstone Pipeline route closely follows the original Option 1 route proposed by QGC. This route was abandoned by QGC as it presented a number of technical difficulties for a large diameter pipeline. The proposed Surat to Gladstone Pipeline is approximately half the diameter of the export pipeline proposed for the QCLNG Project. This smaller diameter provides more flexibility in route location than that available to QCLNG. However, as stated, QGC is a member of a working party that includes Arrow, as well as Origin and Santos. This working party is working to identify co-location opportunities where practicable.

12.1.2 Road Infrastructure Works

As stated in the draft EIS, all works related to controlled roads will be carried out in accordance with the *Main Roads – Road Planning & Design Manual* and in consultation with the relevant road authority.

12.1.3 Water and Sewage

QGC notes Council's concerns in relation to the availability of water and sewage treatment facilities within Banana Shire.

The temporary accommodation camps will require water both for potable purposes and for amenities. Logistics studies are under way for all of the facilities that will be required for the Project, including viable sources of water.

Sewage will be managed by an on-site package treatment plant. Effluent from this system will be released to land in such a way as not to cause long-term land contamination or soil erosion and so that it cannot directly enter any watercourse. DERM is reviewing the effluent characteristics for such plants with a view to creating standard conditions for such facilities on petroleum tenures. DERM will provide specific conditions for sewage effluent disposal within the environmental authorities for the pipelines.

12.2 CHANGES TO PROJECT DESCRIPTION

A change has been proposed in the route for the gas Collection Header (refer to *Section 12.2.1* above). This Section of the sEIS describes the change and the work that has been carried out in relation to those changes. The proposed changes have resulted in a variation in the length of the pipelines as set out in *Table 2.12.2* below.

Table 2.12.2 Pipeline Lengths

Pipeline	Draft EIS Length (km)	sEIS Length (km)
Export Pipeline	380	340
Gas Collection Header	200	195
Water Collection Header	200	100

These changes are discussed in the following sections. As the 40 km that has been reduced from the Export Pipeline has been incorporated into the gas Collection Header, all of the studies in *Volume 4* are referenced to the original 380 KP Export Pipeline length (refer *Figure 2.12.1*). This has enabled further studies to be linked directly to the information provided in the draft EIS. Information related to the new section of the gas Collection Header is addressed directly in various sections and referred to as the Woleebee Creek route of the gas Collection Header.

12.2.1 Route Selection Process

The selection methodology for pipeline route options has not changed, being based on sound safety, environmental, commercial and engineering principles set out in the *Australian Pipeline Industry Code of Environmental Practice* (APIA Code) and *Australian Standard 2885 Pipelines gas and liquid petroleum* (AS2885).

12.2.1.1 Gas Collection Header

Based on engineering requirements, further studies have been undertaken into the route of the gas Collection Header, which have resulted in a change to this route (refer to *Figure 2.12.2*). It is now proposed that the northern portion of the gas Collection Header will take a direct east-west route between the existing Woleebee Creek gas fields and the Export Pipeline; a distance of approximately 55 km (refer to *Figure 2.12.1*). This northern portion of the gas Collection Header will connect with the southern portion along what was previously the first 40 km of the Export Pipeline route.

Further refinement of the gas Collection Header southern portion is proposed (refer to *Figure 2.12.1* for the alternative location of the gas Collection Header). For the purposes of the sEIS, the southern portion of the gas Collection Header has remained within the Upstream Infrastructure Corridor

(UIC) approximately between Miles and the Ruby gas field area; a distance of approximately 100 km. This results in a gas Collection Header of approximately 195 km between the Ruby and Woleebee Creek gas fields.

In the southern section of the UIC, an alternative to locate the gas Collection Header to a new corridor predominantly to the north east of the UIC is under investigation. The UIC has multiple gas and water pipelines within it that will be constructed in differing timeframes. The construction program is therefore very complex. This complexity can be reduced by moving the gas Collection Header to a separate easement. Alternative route options under investigation are within the Project study corridor proposed in the draft EIS. Considerations for route selection will follow the process adopted for the Project, namely:

- Development of potential route options.
- Desktop studies of collected site data.
- Field reviews and landholder consultation.
- Selection of a preferred route for detailed study.
- Detailed field studies scheduled to refine the preferred route (ongoing).

The final route selection will be made using the following criteria:

- corridor length
- environmental approvals and land access complexity
- land use and ownership (including title and native title)
- community impacts
- constructability (principally terrain)
- proximity to QGC tenements and prospective CSG regions
- long-term pipeline protection, maintainability and operability
- future expansion potential.

Any proposed alternative route for the gas Collection Header will require assessment of the potential impacts on environmental and social values.

12.2.1.2 Export Pipeline

Due to the changes to the gas Collection Header, the Export Pipeline has been reduced in length by approximately 40 km (refer to *Figure 2.12.1*); the 40 km removed now forms part of the gas Collection Header.

The preferred route for the Export Pipeline is close to the Government's CICSDA (refer to *Figure 2.12.3*), and has been amended to conform to this corridor. QGC is a party to the joint technical working group, which is working to determine the actual location of the various proposed gas pipelines within this corridor.

12.2.1.3 Upstream Infrastructure Corridor (UIC)

The upstream infrastructure corridor (UIC) proposed in the draft EIS is an area in which linear infrastructure related to the Project will be co-located to reduce the overall impact on the area. The UIC will be used for sections of both the water and gas Collection Headers. These include clean water pipelines related to water management, trunklines linking the field compressor stations (FCSs) and central processing plants (CPPs) and gas and water gathering lines. The UIC route described in the draft EIS remains relatively unchanged, although it has been shortened at the south-eastern end. It is now anticipated that the UIC will only be required for approximately 100 km between Miles and the Ruby gas field.

As discussed in *Section 12.2.1.1*, an alternative route for the gas Collection Header is under investigation. This may result in the UIC narrowing in those sections which hold only power infrastructure and the water Collection Header. Where the UIC contains these and gas and water trunklines, the easement width will be marginally reduced.

12.2.2 Desktop Studies

The desktop methodology is also unchanged. This process was applied to the new section of the gas Collection Header from Woleebee Creek to the connection with the Export Pipeline.

12.2.3 Field Reviews

As for the other pipelines forming part of the Project, the field review of the Woleebee Creek section of the gas Collection Header was carried out by vehicle to understand the general terrain in relation to constructability constraints.

12.2.4 Selection of Preferred Route

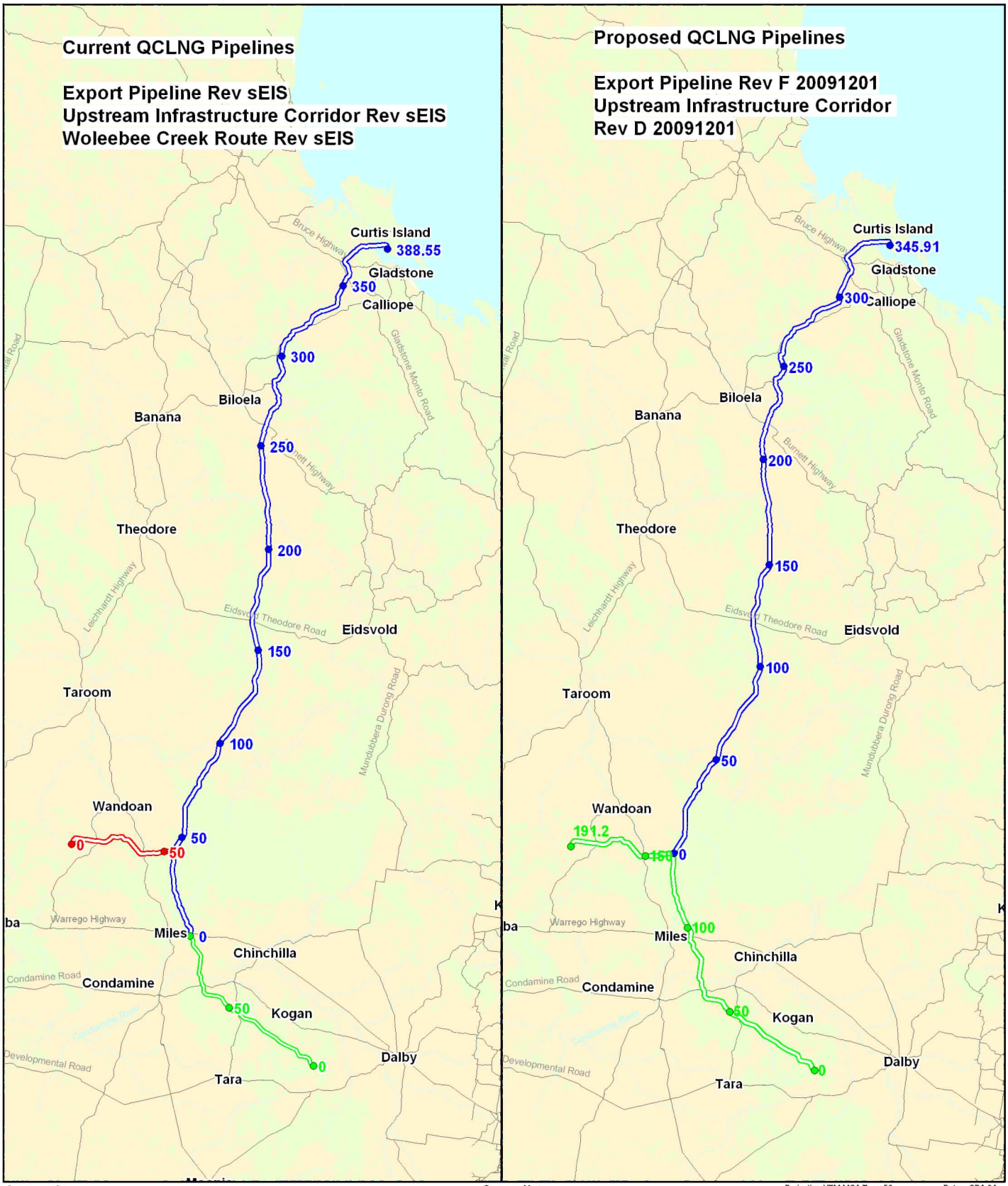
The methodology described in the draft EIS was applied to the Woleebee Creek section of the gas Collection Header.

12.2.5 Detailed Studies

Results of detailed studies are described in *Volume 4* of this supplementary EIS.

12.2.6 Assessment of Pipeline Route Options

The assessment methodology described in the draft EIS was applied to the Woleebee Creek gas Collection Header route.



Legend:

- Export Pipeline & Kilometre Point
- Upstream Infrastructure Corridor & Kilometre Point
- Woleebee Creek Route & Kilometre Point

Source Note:
1:250,000 Topographic vector copyright Geoscience Australia

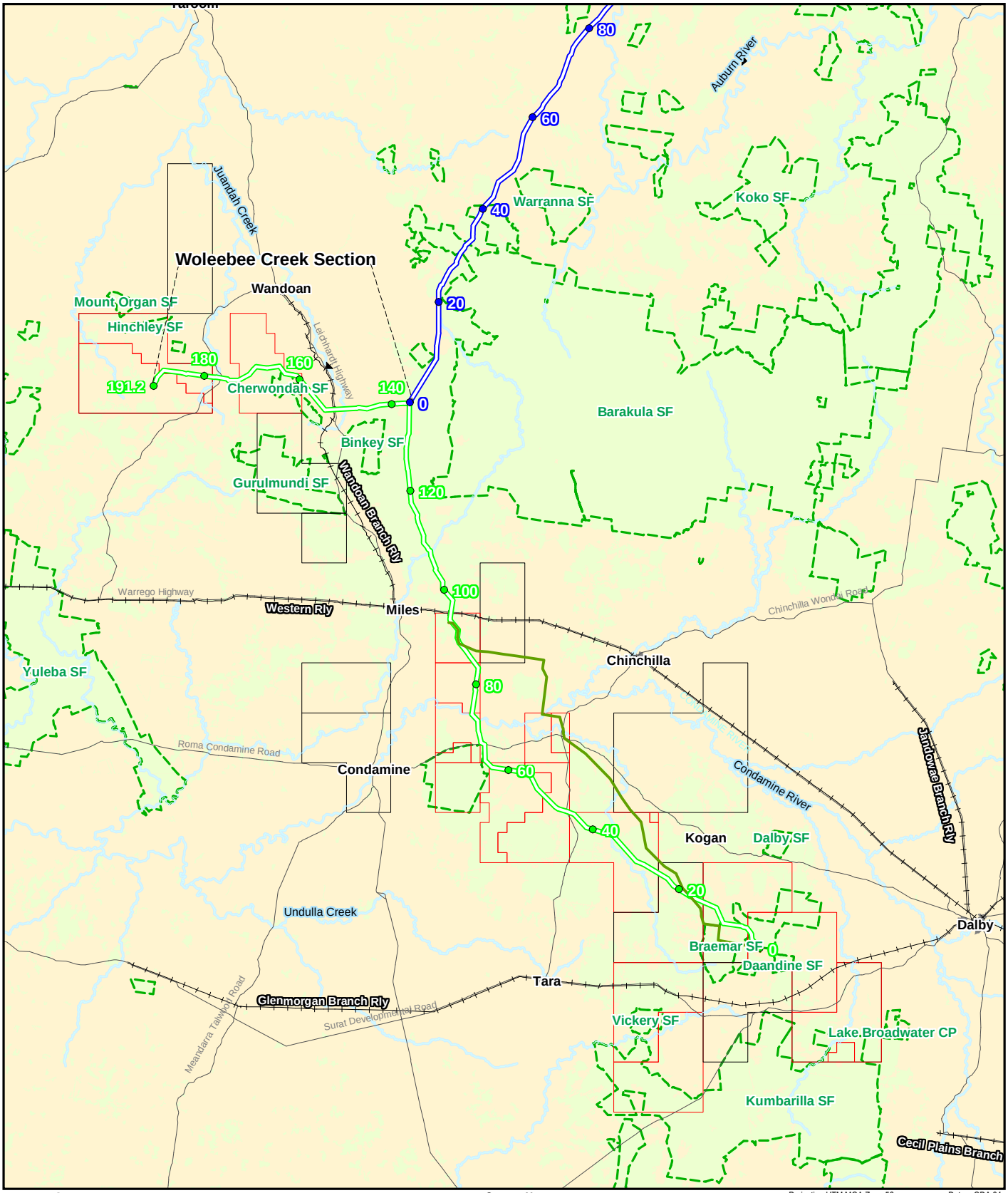
Projection UTM MGA Zone 56 Datum GDA 94

0 20 40 60 80

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: QCLNG Pipeline Revision Overview
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Unidel	sEIS Volume 2 Figure S2.12.1	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: CDP	File No: EO5-P-MA-96242	
	Date: 23.11.09	Revision: Supplementary	



Legend:

- Export Pipeline RevF 20091201
- Upstream Infrastructure Corridor RevD 20091201
- Alternate Gas Collection Header Route
- Gas Fields - PL & PLA
- Gas Fields - ATP
- State Forest

Source Note:

1:250,000 Topographic vector copyright Geoscience Australia
QLD Protected Areas sourced from DERM

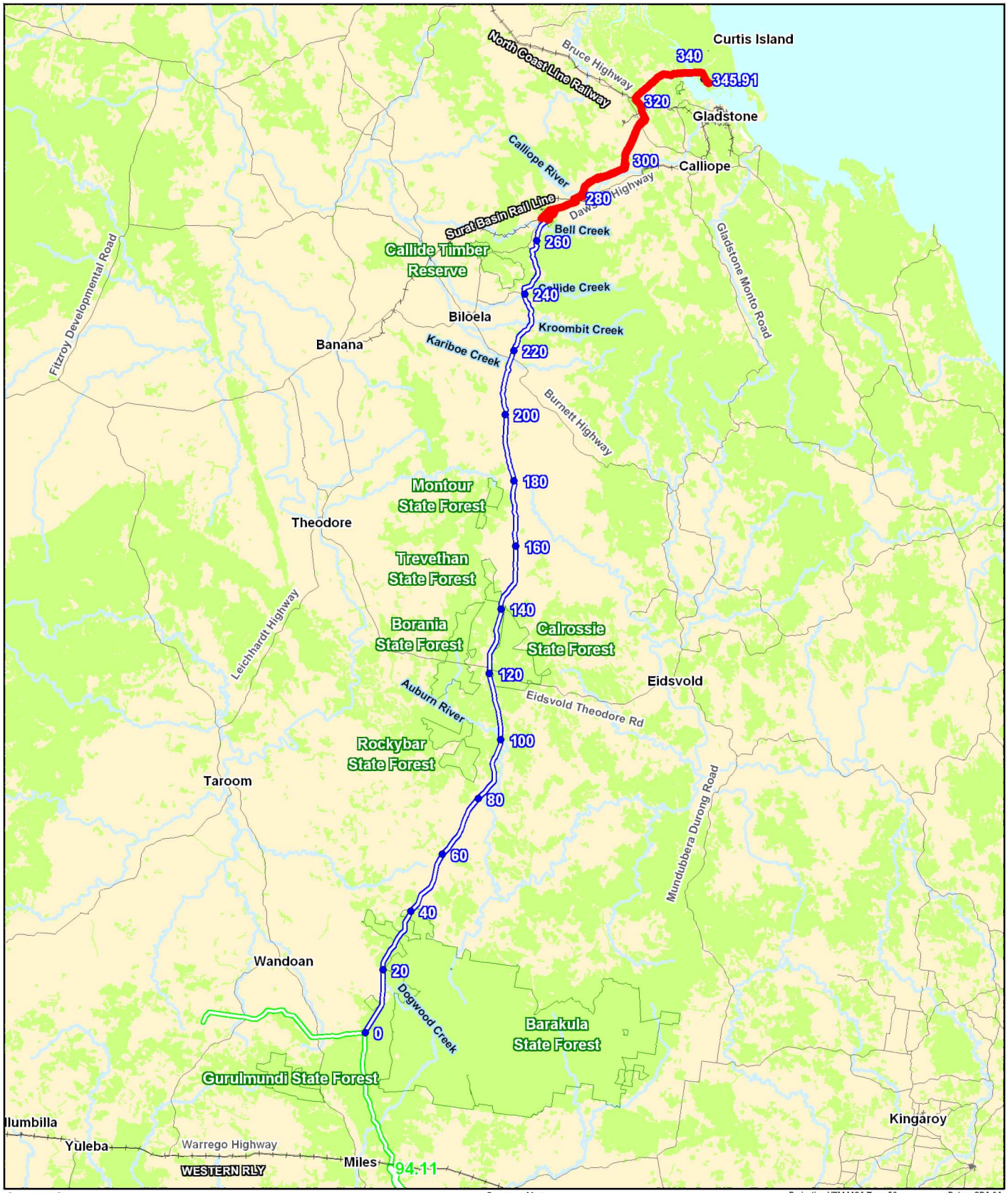
Projection UTM MGA Zone 56 Datum GDA 94

0 10 20 30 40

Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Gas Collection Header**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Unidel	sEIS Volume 2 Figure S2.12.2	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: CDP	File No: E05-P-MA-96239	
	Date: 21.01.10	Revision: Supplementary	



Legend:

- Export Pipeline RevEIS20092101 & Kilometre Point
- Callide Gladstone Corridor RevEIS20092101
- Upstream Infrastructure Corridor RevD 20091201

Source Note:
1:250,000 Topographic vector copyright Geoscience Australia

Note:
Width of Pipelines are not to scale

Projection UTM MGA Zone 56 Datum GDA 94

0 20 40 60
Kilometres

N

QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Export Pipeline Route**
	Client: QGC - A BG Group business		
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	Approved: CDP	File No: E05-P-MA-96240	
	Date: 18.12.09	Revision: Supplementary	

12.2.7 Preferred Route

12.2.7.1 Export Pipeline

The key changes proposed for this route are shortening of the pipeline route by 40 km in the southern end and relocations in the area of the Callide Ranges and the Gladstone State Development Area (GSDA) to conform to the government-mandated common infrastructure corridors.

As previously mentioned, the 40 km removed from the Export Pipeline route has been incorporated into the gas Collection Header route.

Pipeline Crossings of Rail Infrastructure

The preferred route does not intersect the rail works proposed for Wiggins Island; passing approximately 10 km to the west and 10 km to the north of the Wiggins Island project (refer *Figure 2.12.4*).

The Export Pipeline does not intersect the Warrego Highway or the Western Rail Line. The preferred Export Pipeline route will intersect the Moura Link Aldoga Yard rail project between KP355 and KP365 on the original Export Pipeline Route. The route proposed in the draft EIS would intersect the existing East End Branch Line and the Northern Rail Line in separate locations to the Moura Link line and the Aldoga Yard Bypass line. Relocation of the preferred Export Pipeline route within the Callide Gladstone Corridor should result in a rationalisation of these rail crossing points such that the pipeline would cross the existing rail lines at the points where they coincide with the proposed new rail lines (refer to *Figure 2.12.3* and *Figure 2.12.4*). The potential impacts of these works are addressed in *Volume 4, Chapter 5*.

12.2.7.2 Gas Collection Header

The first 20 km of the gas Collection Header has been deleted, eliminating the crossing of the Dalby to Glenmorgan rail corridor. The route now starts at Braemar State Forest. At this stage, construction within the State Forest cannot be avoided as this is related to the connection of Gas Field Component infrastructure.

The following description covers the new section of the gas Collection Header proposed from Woleebee Creek to the Export Pipeline, a distance of approximately 55 km. Kilometre point (KP) references are from Woleebee Creek to the Export Pipeline for ease of discussion within this supplementary EIS.

From KP0 the pipeline travels north-east for approximately 3 km across cleared grazing lands until it meets Gadsby's Road. It then follows this road eastward for a distance of some 9.5 km, also across cleared pasture lands, until it crosses Woleebee Creek at KP13.

From this point, the line continues west across the Jackson-Wandoan Road and follows an approximate alignment with the northern edge of Giligulgul Road as it traverses open pasture lands. The line then crosses Conloi Creek at KP20 and turns to the north-east to follow the northern edge of Hansen's Road for 2 km.

At this point (KP22), it turns to the east and crosses Hansen's Road, avoiding several small areas of remnant vegetation. It then follows an alignment through cleared grazing land, skirting the northern edge of Cherwondah State Forest for approximately 7 km until, at KP30, the line turns to the south-east and progresses across cleared land until it turns to the east at KP38.5 and crosses the Wandoan Branch Railway and the Leichhardt Highway in the vicinity of KP40. At KP42, the line crosses Juandah Creek. The regional ecosystem (RE) mapping at this point indicates the presence of RE11.3.2 (Biodiversity Status: of concern). However, satellite imagery indicates only very sparse vegetation at the point at which the pipeline crosses the creek.

At KP44.7, the route enters the northern edge of a large block of remnant vegetation consisting of eucalypt and *Callitris* woodlands on poorly developed soils (Biodiversity Status: not of concern). The line then continues east and emerges from remnant vegetation at approximately KP50 where it traverses open grazing lands and then again enters an area of remnant vegetation on private land at approximately KP54. This area consists of eucalypt woodlands with Lancewood (*Acacia shirleyi*) occurring on a low ridge at KP55 (Biodiversity Status for all REs in this area: not of concern).

12.2.8 Gas Transmission Pipeline Specifications

12.2.8.1 Design Parameters

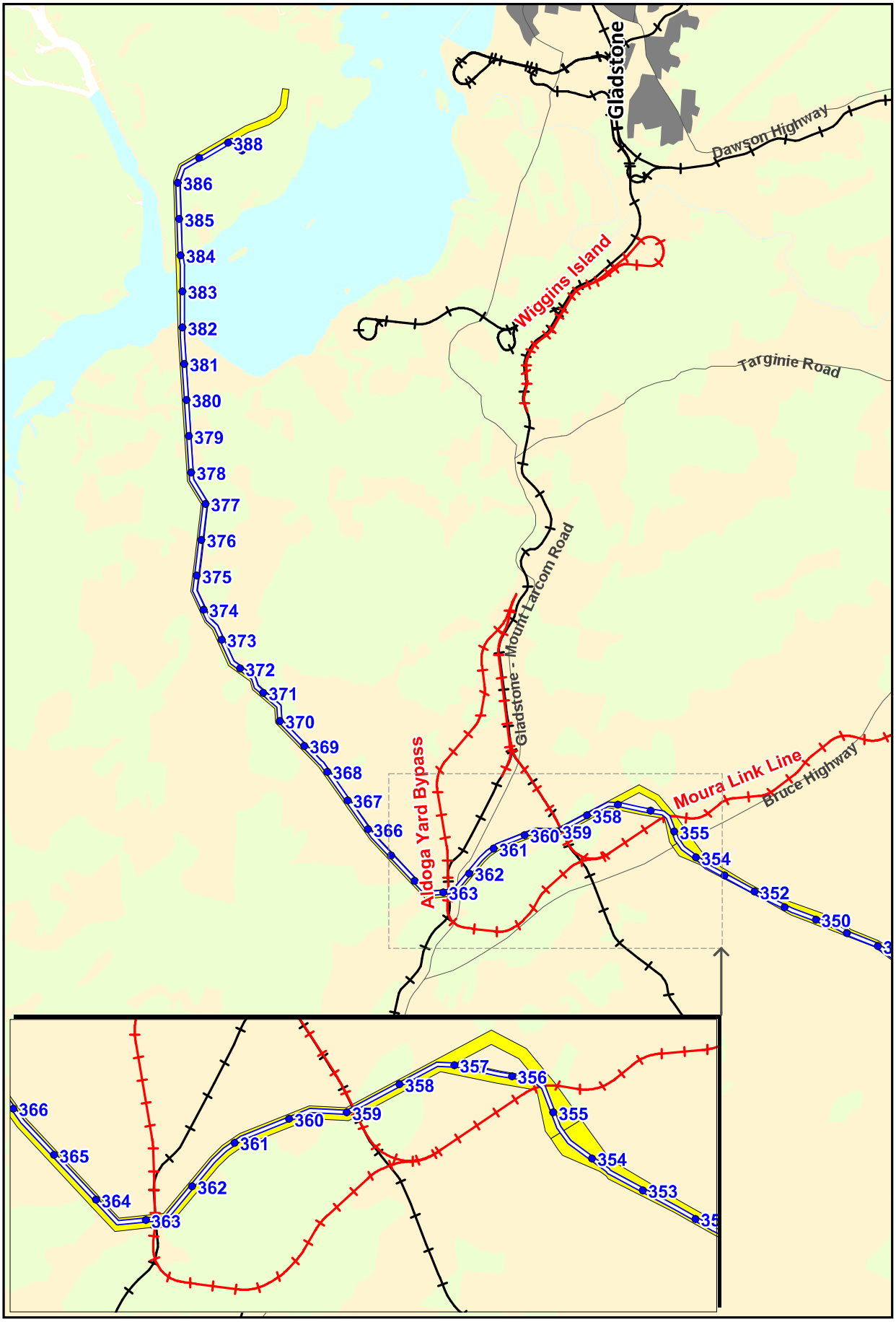
The design parameters (refer to *Table 2.12.3* below) for the various pipelines are largely unchanged. However, they are restated here as they apply to the revised pipeline routes. The depth of cover has been altered to (a) conform to AS2885 and (b) accommodate the requirements of the Department of Transport and Main Roads for road and rail crossings.

12.2.8.2 Cathodic Protection

Cathodic protection for the various pipelines will be as set out in the draft EIS.

12.2.8.3 Design Criteria for Temporary or Permanent Access Crossings

The design of temporary or permanent access crossings for the pipelines will be as set out in the draft EIS.



QUEENSLAND CURTIS LNG A BG Group business	Project: Queensland Curtis LNG Project		Title: **Export Pipeline Interaction with Proposed Rail Works**
	Client: QGC - A BG Group business		
ERM Environmental Resources Management Australia Pty Ltd	Drawn: Unidel	**sEIS Volume 2 Figure S2.12.4**	Disclaimer: Maps and Figures contained in this Report may be based on Third Party Data, may not be to scale and are intended as Guides only. ERM does not warrant the accuracy of any such Maps and Figures.
	Approved: CDP	File No: E05-P-MA-96217	
	Date: 07.12.2009	Revision: Supplementary	

Table 2.12.3 Pipeline Design Parameters

Pipeline Component	Design Parameters		
	Export Pipeline	Gas Collection Header	Water Collection Header
Number of pipelines	1 x gas	1 x gas	2 x water
Length (~ km)	340	195	100
Diameter (mm)	1050	1050	525
Wall thickness (mm) minimum maximum	 12.1 23.5	 12.1 23.5	 6 12
Material	API5L – X70 or X80	API5L – X70 or X80	API5L – X70 or X80
Coating External	Fusion-bonded epoxy	Fusion–bonded epoxy	Polyethylene (e.g. Sintakote) or bituminous paint
Internal	Two-pack epoxy	Two-pack epoxy	Cement or possibly epoxy lining[1].
Nominal Capacity	1,510 TJ/d	1,510 TJ/d	90 ML/d
Maximum Allowable Operating Pressure	10.2 MPa	10.2 MPa	Not applicable
Construction ROW (m) – average	40	40*	40*
Depth of cover (min)[2]	Generally:	75 cm	
	Deep cultivated areas	1.2 m	
	Road crossings[3]	1.2 / 2. m	Under road (minor road/major road)
		1.2 m	Below the lowest drainage point of the road easement
	Rail crossings[4]	20 cm	
		1.2 m	Below the lowest drainage point of the rail corridor
	Watercourse crossings	1.2/20 m	Under minor stream/major river crossing
Corrosion Protection	External coating and impressed current system		
Non-destructive testing	100% non-destructive inspection of welded joints		
Monitoring system	Supervisory control and Data Acquisition (SCADA) connected to the QGC control centre		

* Where these coincide an 80 m or more ROW will be required. Refer to Section 12.3.4.

1 Needs durability assessment to confirm lining requirement at detailed design stage.

2 Depth of HDD crossings will depend on geotechnical investigations, length and topography of the crossing, but will be greater than the depths listed in this table.

3 Crossings of state-controlled roads corridors to be trenchless.

4 Crossings of railway corridors to be trenchless and in accordance with AS4799 Installation of underground utility services and pipelines within railway boundaries.

12.2.8.4 Corridor Widths and Access

As stated in the draft EIS, clearing widths of 40 m will be required for each pipeline route (Export Pipeline, gas Collection Header, water Collection Header). The UIC will require 80 m as this corridor is designed to take both the gas and water Collection Headers and a number of the trunklines that connect the Field Compressor Stations (FCSs) to the Central Processing Plants (CPPs). It is also intended to use this corridor for any gas gathering lines where practical.

The requirement for a 40 m clearing width has been developed taking into account the volume of topsoil to be removed from the corridor, the volume of subsoil that will be removed from the trench, and safe working distances for the various pieces of equipment required for the construction of the pipeline. The standard engineering drawing for the right-of-way (ROW) clearing is provided (refer to *Annex A-1* {Drawing Number QCLNG-BG00-PLE-DWG-000076-Rev A}).

The base area for the soil stockpiles has been calculated using the following assumptions:

- mean topsoil depth along route of 15 cm (based on studies undertaken)
- mean subsoil depth of 1.85 m (typical trench depth of 2 m)
- predominance of duplex soils along the route
- typical stockpiled topsoil angle of repose of 30 degrees and bulking factor of 15 per cent (most topsoils are sands/sandy loam along route)
- typical stockpiled subsoil angle of repose of 45 degrees (usually 40 to 50 deg) and bulking factor of 30 per cent (most clays along route will be 'cloddy')
- stockpile heights of up to 2 m (or higher depending upon the site conditions) for short-term storage.

Plant and equipment for a 1,050 mm pipeline will need to be larger than conventional gas pipeline construction previously seen in Queensland. To provide for safe working areas and to ensure that all plant and equipment can work and pass within the cleared area (to avoid travelling off the ROW and on to potentially weed-infested areas and driving over topsoil stockpiles), QGC therefore believes that the 40 m area is justified. As this area allows for the stockpiling of cleared bush and timber, the cleared area could potentially be less in non-timbered areas.

The 80 m width requested for the UIC is based on the desire to co-locate pipelines to minimise the overall footprint of the Project and the impact on landholders. A typical drawing demonstrating how this is proposed is provided (refer to *Annex A-2* {*Drawing Number:* QCLNG-BG00-PLE-DWG-000075-Rev A}).

With the addition of grid-supplied power to the Project (refer to sEIS *Volume 2, Chapter 7)* there is now a requirement for a powerline easement between two

of the CPPs (Ruby and Jordan). This powerline easement would need to meet the provider's requirements of a 60 m easement with 50 m separation from a live gas pipeline. This would increase the UIC easement area to 125 m for a distance of 35 km in the southernmost portion. An engineering drawing showing the anticipated layout of the proposed water and gas Collection Headers, trunklines and powerline is given in *Annex A-3* {Drawing Number: QCLNG-BG00-PLE-DWG-000074-Rev A}.

12.2.8.5 Engineering Design

In addition to the information provided in the draft EIS, the following information is provided in response to submissions from DTMR:

At road and rail crossings, the depth of burial of the pipeline is dependent upon the requirements of the administering authorities and the relevant Australian Standards (e.g. AS4799 Installation of underground utility services and pipelines within railway boundaries).

Construction within road easements will be in accordance with *Main Roads – Road Planning & Design Manual.* Construction under state-controlled roads will be at right angles to the road corridor utilising trenchless techniques and depth of burial as set out in *Table 2.12.3*. Envelopers will be used for all water pipelines under state-controlled roads and for gas pipelines where required by DTMR. All works will be in accordance with ancillary works encroachment (AWE) permits.

Construction within rail corridors will be designed in accordance with AS4799 utilising trenchless crossing techniques and depth of burial as set out in 3. Design of the rail crossings will take into account minimum interruption to railway operations, and will be completed in consultation with QR Network Pty Ltd.

12.2.8.6 Temporary and Permanent Above-ground Facilities

Mainline Valves (MLVs)

The number of MLVs has undergone further engineering review and, with the abandonment of the Collection Lateral, the following MLVs are anticipated for the Project:

- Export Pipeline – four MLVs
- gas Collection Header, within the UIC – one MLV.

Scraper Stations

The number of scraper stations for the Export Pipeline and the gas Collection Header remain unchanged. The scraper stations for the Collection Lateral are no longer required.

Meter Stations

Meter stations will occur at entry to the Export Pipeline and at delivery to the LNG plant.

12.3 THE NARROWS CROSSING PIPELINE

The aim of this section of the sEIS is to provide further information on:

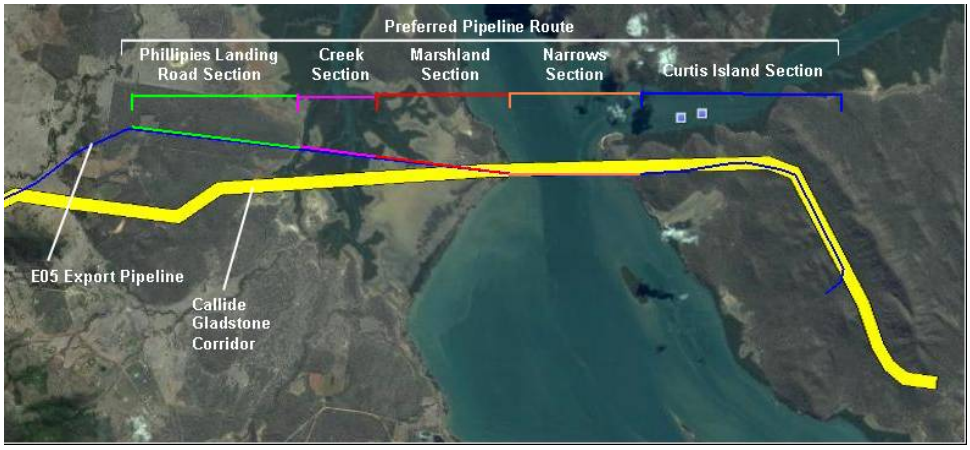
- route options and construction methods for The Narrows crossing pipeline
- additional temporary infrastructure that may be required.

12.3.1 Overview

The Narrows crossing pipeline links the onshore section of the Export Pipeline with the proposed LNG Plant on Curtis Island. The Narrows crossing pipeline is approximately 12 km, and can be described in five sections from east to west (see *Figure 2.12.5*):

1. Phillipies Landing Road Section – approximately 2.5 km, from the Export Pipeline tie-in point to Humpy Creek, running parallel to Phillipies Landing Road
2. Creek Section – approximately 1.3 km east, across Humpy and Targinie creeks
3. Marshland Section – approximately 2.1 km from Targinie Creek, across the marshland section of Kangaroo Island and tidal mud flats to the shoreline at Friend Point
4. The Narrows Section – approximately 1.8 km across the tidal waterway of The Narrows between Friend Point on Kangaroo Island and Laird Point on Curtis Island
5. Curtis Island Section – approximately 4.5 km from the shore crossing at Laird Point to the proposed LNG Plant.

Figure 2.12.5 The Narrows Crossing Pipeline



12.3.2 Route Selection Process

A number of potential route options have been considered for The Narrows crossing pipeline, and these are presented in *Figure 5.8.15, Volume 5, Chapter 8* of the draft EIS. The selection process of the routes for the Export Pipeline across The Narrows has been described previously in *Volume 2* of the draft EIS (refer *Section 12.1*).

12.3.2.1 Route Options

A number of route variations for the preferred approach and crossing have been considered. These are influenced by a wide range of factors, including environmental considerations, and the two possible route options are outlined below.

Reference Case Route

A preferred engineering route for pipeline installation across The Narrows has been identified, and is the subject of ongoing engineering assessment and the impact assessment process. This route was chosen after a route selection assessment that aggregated weighted scores for a range of criteria, including technical risk, environmental impacts, cultural heritage and design requirements.

Callide Infrastructure Corridor State Development Area

In discussions with the Queensland Department of Infrastructure and Planning (DIP), the pipeline route across land to The Narrows crossing will lie within the CICSDA. QGC prefers that the marine crossing remains south of the Great Barrier Reef Coast Marine Park.

Final Route Selection

The final Narrows crossing pipeline route will depend on a number of factors, including technical engineering suitability, environmental and cultural aspects as well as state and local government requirements.

Environmental impacts due to the pipeline construction activities are expected to be similar for both route options identified above. *Volume 5, Chapter 7* and *8* of this supplementary EIS details the environmental impacts and associated management measures resulting from the pipeline installation activities in The Narrows crossing.

12.3.3 Pipeline Construction Methods

12.3.3.1 Construction Options

The Narrows crossing pipeline will be buried based on the requirement of the requisite design code AS 2885.1. Two construction techniques are presented in this document for the installation of the pipeline across The Narrows crossing: open-cut trenching and horizontal directional drilling (HDD).

The open-cut trench method is a conventional method for onshore pipelines, and can also be utilised for the Creek, Marshland and The Narrows sections.

HDD is under consideration for pipeline installation for Creek, Marshland and The Narrows Sections, subject to a comprehensive assessment to determine if the geotechnical conditions are suitable.

The Narrows crossing pipeline may be constructed using only open-cut trenching or a combination of both open-cut and HDD methods.

Open-Cut Methodology

Onshore Sections

The onshore sections of the pipeline at Phillipies Landing Road (Section 1) and Curtis Island (Section 5) will be constructed using a conventional open-cut pipeline layout. The right of way (ROW) will be cleared and graded. Cleared vegetation will be mulched and either taken off site or stored along the ROW. A trench will be excavated using conventional excavators, with excavated material being screened for suitable bedding and padding material and placed in the trench. The pipe will then lowered into the trench and the trench backfilled with the excavated material. The ROW is then reinstated.

Refer to *Volume 2, Chapter 12* of the draft EIS (*Section 12.8*) for further details on the open-cut installation methodology.

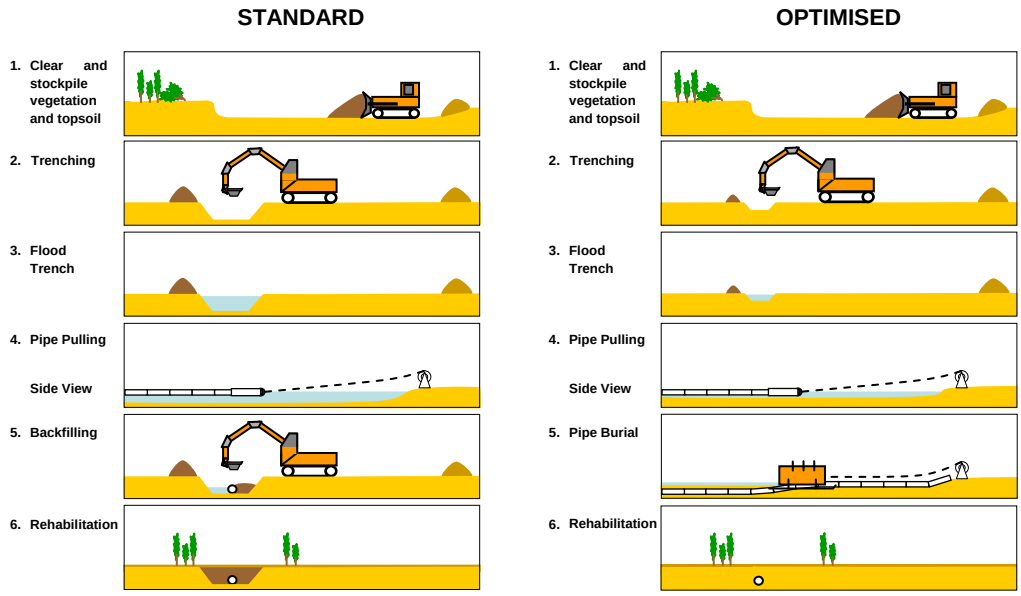
Creek, Marshlands and The Narrows Section

The proposed open-cut construction methodology for the Creek, Marshland, and The Narrows sections is pre and post-lay trenching, which includes:

- Stringing the pipe on Phillipies Landing Road ROW for Creek and Marshland sections and stringing the pipe on Curtis Island (subject to survey confirmation) for The Narrows Section.
- Clearing mangroves and creating a shallow trench (flotation channel) across the Creek and Marshland sections using barge-mounted and amphibious excavators. The flotation channel is used to aid pipeline installation.
- Pipe installation using a winch at Friend Point to pull the pipe strings through the flotation channel for the Creek and Marshland sections. The winch at Friend Point would also be used to pull the pipe string from Curtis Island to install the pipe in The Narrows.
- Post-lay trenching (pipeline burial) of the pipeline sections using a jet trencher or cutter trencher, subject to geotechnical survey findings.

The standard and optimised open-cut methods as they would be utilised for the Marshland Section are presented in *Figure 2.12.6* below.

Figure 2.12.6 Standard and Optimised Open-Cut Methods – Marshland



The above optimised open-cut trenching method minimises environmental impact as the width required for a flotation channel (approximately 3 to 5 m) will be much smaller than a trench required for a traditional open-cut installation (20 to 30 m). The flotation trench will be approximately 1 m deep, and is used as a means to transport and guide the pipe string from Phillipies Landing Road to the Creek and Marshland sections, and is not designed to achieve the required burial depth. All mangroves in the 3 to 5 m corridor will be cleared and a channel dredged within this section.

Coffer dams of 500 m and 230 m are likely to be piled at the mainland and Curtis Island shore crossings, respectively.

A jet trencher (see *Figure 2.12.7*), which sits over the pipeline, may be used for the optimised open-cut to bury the pipeline to the required depth. The jet-trenching method liquefies the soil around the pipeline using water jets, allowing the pipe to sink under its own weight into the fluidised soil. Depending on the soil strength, several passes of the jet trencher are likely to be required to achieve the required pipeline burial depth.

Figure 2.12.7 Typical Onshore/Marshland Jet Trencher

Figure 2.12.8 Typical Offshore Jet Trencher (Post-lay Trencher)

20” to 42” Pipeline Diameter bi-directional post trenching machine

30” to 60” Pipeline Diameter post trenching machine

Horizontal Directional Drilling

Horizontal directional drilling (HDD) is a pipeline installation method that involves drilling a hole of sufficient diameter through bedrock and then installing a pipeline through the hole. It is generally used for installing pipelines underneath features such as rivers, roads or railway crossings or for coastal shore crossings.

It is outside the technical capability of HDD equipment to drill a single 42 inch HDD beyond approximately 2 km. To cross the Creeks, Marshland and The Narrows sections of the pipeline route, a single HDD of 5.1 km would be required. Consequently, if geotechnical conditions are favourable, three individual drills are proposed for The Narrows crossing.

The key elements and stages of a conventional HDD operation include:

- A cleared and levelled drill entry site of approximately 70 x 70 m (see *Figure 2.12.9* for a typical HDD site layout).
- A cleared drill exit site of approximately 40 x 40 m.
- The drilling of a pilot hole following a pre-designated profile, remaining at least 10 m below ground until the exit.
- A series of reaming passes would be run to enlarge the hole to a final size of 125 per cent to 140 per cent of the pipe diameter. A final hole size of approximately 56 inch (1.5 m) will be required for a 42 inch pipeline.
- During the drilling and reaming process, a hydrocarbon-free drilling mud (typically bentonite) is used to provide lubrication for drilling, to support the hole and to flush drill cuttings from the HDD.
- The drilling mud, along with the cuttings, will be deposited into a contained drilling fluids pit (at the HDD entry site) where the mud is separated from the cuttings and reused in the drilling process. The cuttings are to be disposed of in accordance with an approved Environmental Management Plan (EMP).
- A cleared pipeline stringing right-of-way. The Creek and Marshland section pipelines will be strung along the Phillipies Landing Road ROW, and The Narrows Section pipeline will be strung along the Curtis Island ROW. The preferred option is to utilise the ROW constructed on Phillipies Landing Road and Curtis Island for the open-cut installation of these pipeline sections, resulting in no additional vegetation clearing and grading. The proposed ROW width at Phillipies Landing Road is 40 m, and 25 m on Curtis Island.

Refer to *Volume 2, Chapter 12 (Section 12.8.8.2)* of the draft EIS for additional information on the HDD construction method.

Figure 2.12.9 Typical Horizontal Directional Drilling Entry Site

12.3.3.2 Temporary Marine Infrastructure

There will be a need for temporary access to the pipeline construction sites on the Marshland and Curtis Island sections for transport of construction equipment and personnel. The temporary facilities are expected to be at Friend Point on Kangaroo Island and Laird Point on Curtis Island.

Temporary access will potentially be provided either with a rock groyne that extends into The Narrows, or a concrete landing ramp constructed at the shoreline.

Rock Groyne

A rock groyne is formed by rock and soil placement such that it forms a rigid structure perpendicular to the shoreline and extending into The Narrows.

Rock groynes are relatively easy to construct using excavators and cranes aboard a floating barge. Once completed, rock groynes require little maintenance. Upon completion of the pipeline construction, the rocks can be removed and reused for other purposes, such as for protection of exposed sections of the pipeline. The internal groyne fill can then be removed and the shoreline reinstated.

The provisional rock length of groynes at the western (Friend Point) and eastern (Laird Point) shore approach are 310 m and 250 m respectively.

Concrete Landing Ramp

A landing ramp is typically constructed to allow for a vessel or barge to approach the shore as close as possible within the limits of the water depth, to unload equipment and personnel directly to the shore. The design of the landing ramp is dependent on the seabed profile at the shore approach.

At the eastern landfall at Curtis Island where the shoreline descends steeply into the water, a simple concrete ramp can be constructed and used.

At Friend Point, the shore approach angle is gradual, so a longer landing ramp would need to be constructed.

Construction of landing ramps is usually performed from a barge, and involves placing fast-drying concrete into a pre-constructed cavity forming the profile of the ramp. The landing ramp provides temporary access to the construction site at the landfalls, and can be removed once pipeline installation has been completed.

12.4 CONSTRUCTION ACTIVITIES

Construction activities remain unchanged from those described in the draft EIS. Some changes have occurred to the construction program characteristics (refer to *Table 2.12.4*) with the potential for three spreads per pipeline rather than two. This is discussed in *Volume 2, Section 6.1.1.*

Table 2.12.4 Construction Program Characteristics

Construction Element	Details
Width of vegetation clearing	40 m for Export
	40 m for gas Collection Header
	40 m for water Collection Header
	80 m combined water and gas Collection Headers
	125 m for combined water and gas Collection Headers and power lines
Depth of trench to provide the minimum depth of cover set out in *Table 2.12.3*	Generally 2 m
	Deep Cultivated Areas 2.4 m
	Road Crossings 2.4/3.05 m
	Creeks/Rivers 2.4/3.2 m
Trenchless techniques	This can include boring, HDD or tunnelling as set out in *Section 12.4.1.2.* This technique is used, geotechnical constraints permitting, for rail line crossings, state-controlled road crossings and watercourses and other environmentally sensitive areas (such as wetland) where trenching techniques may cause unacceptable environmental disturbance.
Construction Workforce	Approx 500 for Export Pipeline
	Approx 500 for Collection Header

Construction Element	Details
Construction Spreads	Export Pipeline 3, plus special crossing team Collection Header 2, plus special crossing team
Standard construction hours	6 am – 6 pm seven days/week [5]
Construction duration (approximate)	18 – 24 months 36+ months for tunnelling activities, were this method to be used
Refuelling	Mobile fuel truck and construction depot
Normal time between clear and grade and restoration	Up to four months

The crossing of any roads or rail lines will be carried out by a specialist crew, enabling the activity to be completed within a minimum timeframe. At no time will a road be permanently impassable; traffic management measures will be implemented.

All crossings of state-controlled roads and rail lines will be by trenchless techniques and there will be no interruption to rail traffic although some reduction in speed may be required. This will be negotiated with the relevant rail authority before the start of a specific crossing.

12.4.1.1 Watercourse Crossings

Further work has been done in relation to the potential construction method for crossing each of the various watercourses. A listing of the watercourses and their proposed method of crossing (minor crossing, major crossing or trenchless) is given in *Annex A-4*.

Engineering drawings showing the method of construction for minor and major watercourse crossings are provided (refer to *Annex A-4* Drawing Number: QCLNG-BG00-PLE-DET-000006-Rev C and QCLNG-BG00-PLE-DET-000007-Rev C).

The Export Pipeline watercourse crossings are classified as minor, intermediate and major. In all, there are 162 minor open-cut crossings, 108 major open-cut crossings and no proposed HDD or intermediate open-cut crossings. A complete list is in *Annex A-4*.

The Collection Header watercourse crossings are classified as minor, intermediate and major. In all, there are 38 minor open-cut crossings, 10 major open-cut crossings, two proposed HDD and 12 intermediate open-cut crossings. A complete list is in *Annex A-5*.

The Woleebee Creek gas Collection Header route has 23 minor open-cut crossings and two major open-cut crossings. A complete list is in *Annex A-6*.

12.4.1.2 Crossing Techniques

A new section has been created to group the construction techniques for crossing of watercourses and infrastructure so as to describe these methods for use in road and rail crossings as well as watercourse crossings.

Standard Open-Cut

The description of standard open-cut crossings remains unchanged from that provided in the draft EIS. This technique is suitable for the majority of watercourse crossings encountered along the various pipeline routes and for the crossing of unsealed local roads. It may also be applied to some low-traffic sealed roads where this will not create undue traffic interruptions.

Trenchless

This section has been renamed to group the trenchless piping techniques to describe the processes to be relevant to watercourse, road and rail crossings. Some minor rewording, shown in italics, of the following sections has been carried out to make them relevant to all three applications rather than the watercourse emphasis that existed in the draft EIS.

Horizontal Directional Drill (HDD)

This technique is used for trenchless crossings requiring long sections of pipe installation. It is suitable for road, rail and watercourse crossings but is predominantly used for watercourse crossings.

The feasibility of using HDD is limited by site conditions such as soil stability, slope, access, available workspace and nature of subsurface rock (such as gravel soils or cobble are not ideal for HDD*.* The length of the drill and the pipe diameter also influence the ability to use HDD as the risk of failure (unsuccessful construction) increases with pipe diameter and length of drill.

The installation of the pipeline by HDD involves drilling a hole at a shallow angle beneath the surface through which the pipe is threaded. Drilling is conducted by a specially designed drill rig, operated by a specialist contractor. A variety of associated equipment and infrastructure is required. Note that the work area (equipment layout) usually exceeds the ROW width, being typically about 50 m wide.

Although HDD *substantially* reduces the impacts in the immediate area of the crossing (such as to the bed and banks of watercourses), the technique can introduce additional environmental considerations. These include clearing of an area for the set-up of the equipment and pipe string, drill site sediment control, drill mud (water-based bentonite) management, potential for drill mud seepage through alluvial materials, and waste management. Access for

5 During trenchless operations that require drilling construction, work will be 24 hours per day. Open-cut work in Acid Sulfate Soil areas may also consider 24 hour operations to minimise the duration of exposure.

vehicles and equipment around the watercourse is also required, resulting in the additional use, or creation of, access tracks[6].

HDD also has the potential for the drill bit to intersect a fracture within the underlying geology. Should this occur, bentonite mud may be released to the surface (such as into the watercourse). This event is referred to as a 'frac out' and may present a safety hazard in road and rail corridors and an environmental hazard in watercourses. Bentonite is a natural clay-like substance formed from the deposition of volcanic ash. When it is released into a watercourse through a 'frac out', it will cause increased turbidity until the material is fully dispersed.

If partial losses are experienced due to a frac out then a Loss Circulation Material (LCM) is added to the drilling fluid initially. The LCM would be a combination of bridging agents, fibres and flakes and swelling additives. If returns are not regained by treating with LCM, the drilling borehole assembly will have to be removed and a cementing application tried. In a dry watercourse, it is often preferable to leave the spilt bentonite in situ where it will dry out and break down into the surrounding area. Where a large spill occurs, the material can be excavated and disposed of by burial. Where a spill occurs within a rail or road corridor, material would be removed to ensure the safe operation of the infrastructure.

To address these issues, site-specific management procedures will be prepared before drilling as an outcome of the detailed design phase of this Project.

Boring

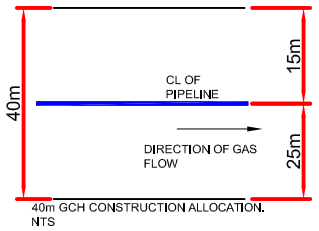
Boring is a low-impact technique involving drilling short distances from below ground within an enlarged trench area (bore pit) either side of the crossing location within the ROW This method may be used for road and rail crossings as well as for watercourses. For road and rail crossings, the bore pits are located outside the infrastructure corridor.

The feasibility of using a bore is limited by site conditions, including depth required, width of crossing, geology, landform, soil type and service/ infrastructure.

Tunnelling

Tunnelling is similar to boring but requires much larger bore pits, and micro-tunnelling equipment is used instead of a drill. This reduces the depth and distance required to achieve a HDD crossing with large-diameter pipe. The tunnel is lined with concrete sections through which the pipe is threaded. This method is not suitable for certain types of soil, such as gravels.

6 This would not apply at The Narrows Crossing.



PLAN VIEW

NOTES:

1. FOR COLLECTION HEADER PIPE TRENCH DETAILS REFER TO DRAWING No. QCLNG-BG00-PLE-DWG-0010
2. MINIMUM COVER SHALL BE AS SHOWN ON THE ALIGNMENT SHEET. OR PER AS-2885 IN HARD ROCK.
3. TRUCK TURNING BAYS TO BE PROVIDED AT REGULAR INTERVALS. REFER TO CONSTRUCTION FOOTPRINT DRAWINGS.
4. LOCATION OF PIPELINE IN EASEMENT MAY CHANGE DUE TO CULTURAL HERITAGE SITES, OTHER USERS OR OTHER CONSTRAINTS. LOCATION TO BE VERIFIED ON ALIGNMENT SHEETS.
5. TOPSOIL SHALL BE STRIPPED FROM RIGHT OF WAY AND STOCKPILED SEPARATELY FROM SUB SOIL.
6. ALL DIMENSIONS IN METRES UNO.

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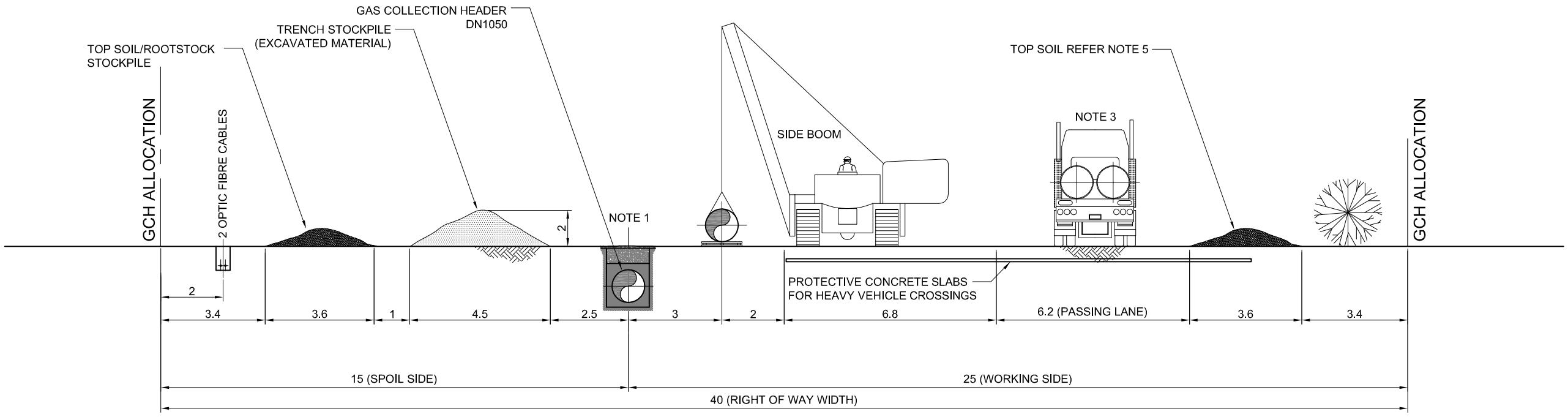

PIPELINE CONSTRUCTION ROW LEFT HAND SET UP - (NORMAL)

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UNIDEL PROJECT No.

UNIDEL DRAWING No.

UNIDEL ENERGY AND INFRASTRUCTURE

QGC A BG Group business

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CHECKED:	DATE:		
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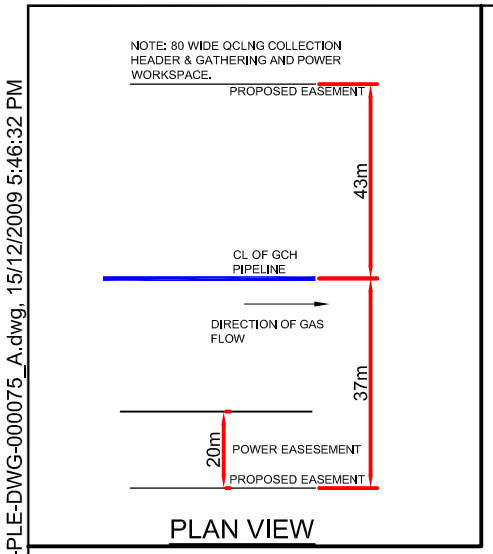


PLAN VIEW

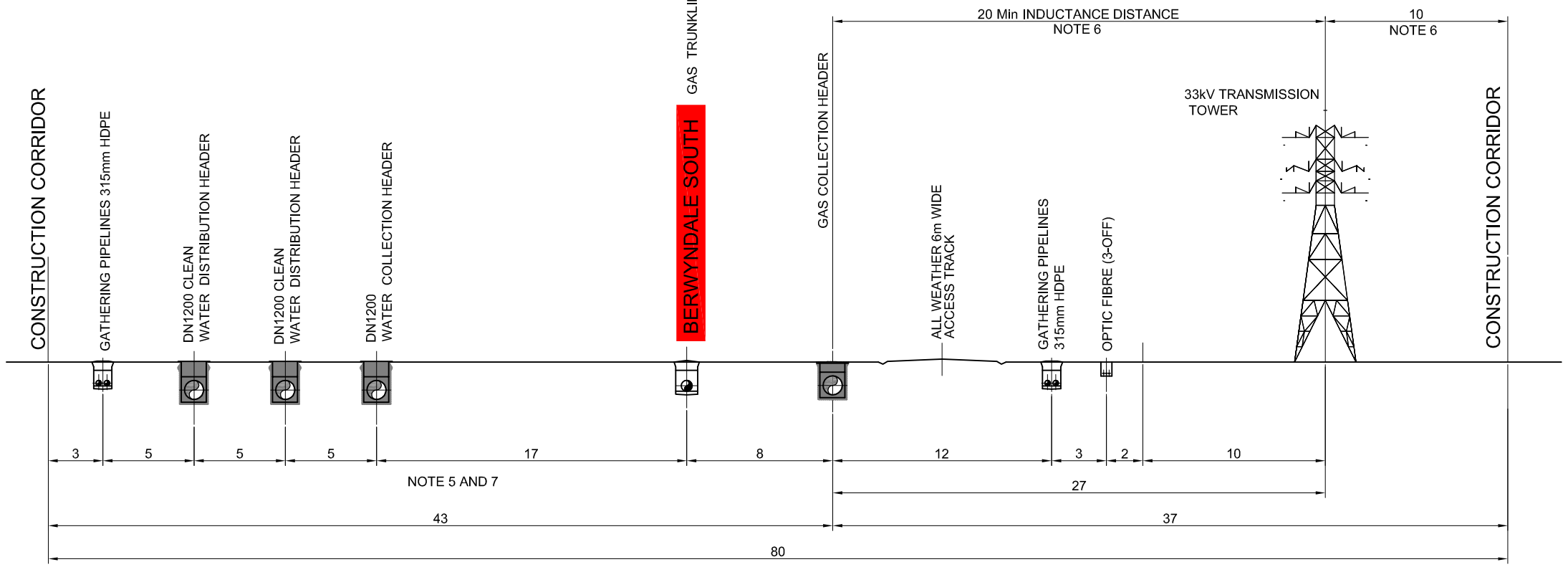
ISSUED FOR INFORMATION

NOTES:

1. FOR COLLECTION HEADER PIPE TRENCH DETAILS REFER TO DRAWING No. QCLNG-BG00-PLE-DWG-0010
2. MINIMUM COVER SHALL BE AS SHOWN ON THE ALIGNMENT SHEET. OR PER AS-2885 IN HARD ROCK.
3. TRUCK TURNING BAYS TO BE PROVIDED AT REGULAR INTERVALS. REFER TO CONSTRUCTION FOOTPRINT DRAWINGS.
4. LOCATION OF PIPELINE IN EASEMENT MAY CHANGE DUE TO CULTURAL HERITAGE SITES, OTHER USERS OR OTHER CONSTRAINTS. LOCATION TO BE VERIFIED ON ALIGNMENT SHEETS.
5. TOPSOIL SHALL BE STRIPPED FROM RIGHT OF WAY AND STOCKPILED SEPARATELY FROM SUB SOIL.
6. WHERE A FOREIGN UTILITY IS TO SHARE THE COMMON INFRASTRUCTURE. CORRIDOR EASEMENT WITH THE GAS COLLECTION HEADER PIPELINE THE MINIMUM LATERAL SEPARATION SHALL BE:

- POWER LINES (33kV)	- 30m (20 MIN. INDUCTANCE)
- OPTICAL FIBRE CABLES. (SUBJECT TO SPECIFIC REQUIREMENT OF THE CARRIER).	- 10m (TRUNK CABLE) - 5m (GENERAL PURPOSE CABLE).
- GATHERING TRUNKLINES (HDPE)	- 5m
- GATHERING TRUNKLINES (STEEL)	- 8m
- WATER GATHERING TRUNKLINES	- 5m

7. SPACE ALLOCATION FOR OTHER SERVICES AND GATHERING PIPELINES TO BE USED FOR GAS COLLECTION HEADER CONSTRUCTION ACTIVITIES.
8. ALL DIMENSIONS IN METRES UNO.



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QCLNG-BG00-PLE-DWG-000075	80M TYPICAL CONSTRUCTION RIGHT OF WAY									
QCLNG-BG00-PLE-DWG-000076	40M TYPICAL CONSTRUCTION RIGHT OF WAY	A	ISSUED FOR INFORMATION	15.12.09		JK	PJK			
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UNIDEL ENERGY AND INFRASTRUCTURE

UNIDEL PROJECT No.

UNIDEL DRAWING No.

QGC A BG Group business

DESIGNED: QGC	DATE:
DRAWN: J.K	DATE: 20.10.09
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APPROVED:	DATE:
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STATUS: INFORMATION	

DRAWING TITLE:

QUEENSLAND GAS COMPANY
GAS COLLECTION HEADER (GCH)
GATHERING - HEADER & TRUNKLINE ALLOCATION
TYPICAL 80M CONSTRUCTION RIGHT OF WAY

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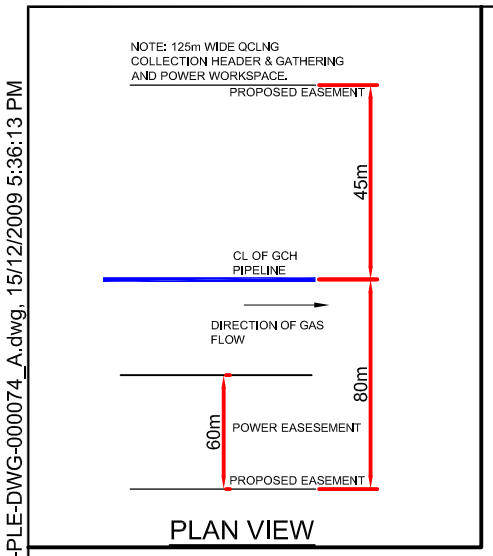


PLAN VIEW

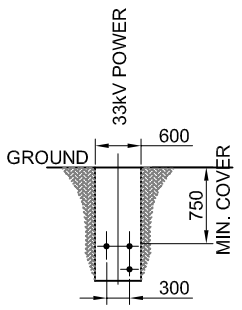
ISSUED FOR INFORMATION

NOTES:

1. FOR COLLECTION HEADER PIPE TRENCH DETAILS REFER TO DRAWING No. QCLNG-BG00-PLE-DWG-0010
2. MINIMUM COVER SHALL BE AS SHOWN ON THE ALIGNMENT SHEET. OR PER AS-2885 IN HARD ROCK.
3. TRUCK TURNING BAYS TO BE PROVIDED AT REGULAR INTERVALS. REFER TO CONSTRUCTION FOOTPRINT DRAWINGS.
4. LOCATION OF PIPELINE IN EASEMENT MAY CHANGE DUE TO CULTURAL HERITAGE SITES, OTHER USERS OR OTHER CONSTRAINTS. LOCATION TO BE VERIFIED ON ALIGNMENT SHEETS.
5. TOPSOIL SHALL BE STRIPPED FROM RIGHT OF WAY AND STOCKPILED SEPARATELY FROM SUB SOIL.
6. WHERE A FOREIGN UTILITY IS TO SHARE THE COMMON INFRASTRUCTURE. CORRIDOR EASEMENT WITH THE GAS COLLECTION HEADER PIPELINE THE MINIMUM LATERAL SEPARATION SHALL BE:

- HV POWER LINES (132kV) (SUBJECT TO A STUDY FOR COMPLIANCE WITH THE REQUIREMENTS OF AS 4853).	- 30m (50 MIN. INDUCTANCE)
- POWER LINES (33kV)	- 4.7m Min DISTANCE FROM STEEL PIPELINE
- OPTICAL FIBRE CABLES. (SUBJECT TO SPECIFIC REQUIREMENT OF THE CARRIER).	- 10m (TRUNK CABLE) - 5m (GENERAL PURPOSE CABLE).
- GATHERING TRUNKLINES (HDPE)	- 5m
- GATHERING TRUNKLINES (STEEL)	- 8m
- WATER GATHERING TRUNKLINES	- 5m

7. SPACE ALLOCATION FOR OTHER SERVICES AND GATHERING PIPELINES TO BE USED FOR GAS COLLECTION HEADER CONSTRUCTION ACTIVITIES.
8. ALL DIMENSIONS IN METRES UNO.



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QCLNG-BG00-PLE-DWG-000075	80M TYPICAL CONSTRUCTION RIGHT OF WAY								
QCLNG-BG00-PLE-DWG-000076	40M TYPICAL CONSTRUCTION RIGHT OF WAY	A	ISSUED FOR INFORMATION	15.12.09		JK	PJK		

UNIDEL ENERGY AND INFRASTRUCTURE

UNIDEL PROJECT No.

UNIDEL DRAWING No.

QGC A BG Group business

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DRAWING TITLE:

QUEENSLAND GAS COMPANY
GAS COLLECTION HEADER (GCH)
GATHERING - HEADER & TRUNKLINE ALLOCATION
TYPICAL 125M CONSTRUCTION RIGHT OF WAY

A-4 EXPORT PIPELINE CREEK CROSSING LOCATION AND METHOD

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
3.894	-	Minor-Open Cut
8.135	-	Minor-Open Cut
9.797	-	Minor-Open Cut
9.850	-	Minor-Open Cut
9.898	-	Minor-Open Cut
10.141	-	Minor-Open Cut
10.280	-	Minor-Open Cut
13.628	Dogwood Creek (60 m)	Major-Open Cut
17.292	-	Minor-Open Cut
18.716	-	Minor-Open Cut
19.116	-	Major-Open Cut
20.960	-	Major-Open Cut
25.025	-	Minor-Open Cut
26.336	-	Minor-Open Cut
29.837	Ltree Creek (56 m)	Major-Open Cut
31.661	Tin Hut Creek (28 m)	Minor-Open Cut
34.684	Bottle Tree Creek (8 m)	Minor-Open Cut
34.761	-	Minor-Open Cut
34.803	-	Minor-Open Cut
34.838	-	Minor-Open Cut
35.858	-	Minor-Open Cut
36.146	-	Minor-Open Cut
36.518	-	Major-Open Cut
36.573	-	Minor-Open Cut
37.408	-	Minor-Open Cut
39.336	-	Minor-Open Cut
39.976	-	Minor-Open Cut
40.708	-	Minor-Open Cut
45.201	-	Minor-Open Cut
52.360	-	Major-Open Cut
64.030	-	Minor-Open Cut
65.366	-	Minor-Open Cut
66.668	Roche Creek (10 m)	Minor-Open Cut
70.693	-	Minor-Open Cut
70.982	-	Minor-Open Cut
75.652	-	Minor-Open Cut
79.041	-	Minor-Open Cut
79.781	-	Minor-Open Cut
80.391	-	Major-Open Cut
81.546	-	Minor-Open Cut
83.414	-	Major-Open Cut
87.065	-	Major-Open Cut
92.451	-	Minor-Open Cut
93.163	-	Minor-Open Cut

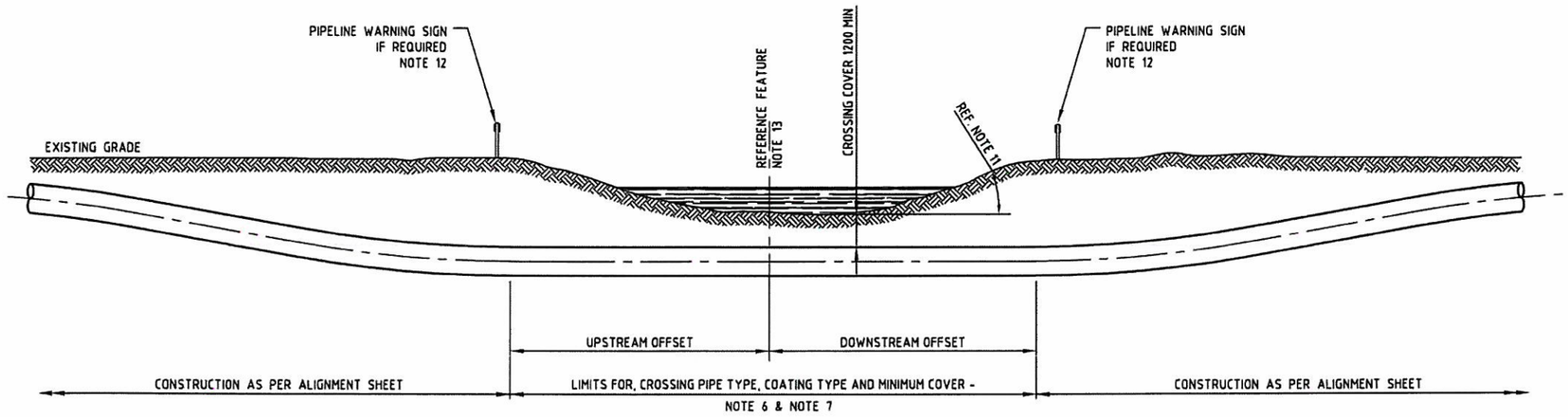
KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
93.333	-	Minor-Open Cut
94.300	-	Minor-Open Cut
97.425	-	Minor-Open Cut
97.628	-	Minor-Open Cut
97.870	-	Minor-Open Cut
102.570	-	Minor-Open Cut
103.297	-	Minor-Open Cut
105.289	-	Major-Open Cut
106.088	-	Major-Open Cut
108.162	Lydia Ck (38 m)	Major-Open Cut
108.814	-	Major-Open Cut
111.760	-	Minor-Open Cut
112.908	-	Minor-Open Cut
114.998	-	Minor-Open Cut
115.572	-	Minor-Open Cut
115.779	Fishy Creek (38 m)	Major-Open Cut
121.129	-	Major-Open Cut
122.639	-	Minor-Open Cut
123.378	-	Minor-Open Cut
124.647	-	Major-Open Cut
127.352	Pipeclay Creek (20 m)	Major-Open Cut
128.349	-	Major-Open Cut
130.351	-	Major-Open Cut
130.932	-	Minor-Open Cut
132.797	-	Minor-Open Cut
132.832	-	Minor-Open Cut
132.934	Paddy Creek (15 m)	Major-Open Cut
135.199	Dogherty Creek (40 m)	Major-Open Cut
139.309	-	Minor-Open Cut
140.110	-	Minor-Open Cut
141.728	Auburn River (25 m)	Major-Open Cut
156.711	Thistle Creek (50 m)	Major-Open Cut
157.166	Thistle Creek (50 m)	Major-Open Cut
158.051	-	Minor-Open Cut
169.238	-	Major-Open Cut
177.729	-	Minor-Open Cut
178.769	-	Minor-Open Cut
192.384	Skull Creek (100 m)	Major-Open Cut
193.300	Trevethen Creek (35 m)	Major-Open Cut
196.462	-	Minor-Open Cut
201.365	-	Major-Open Cut
202.553	-	Major-Open Cut
202.815	-	Major-Open Cut
203.734	-	Major-Open Cut
207.119	-	Minor-Open Cut
209.545	-	Major-Open Cut
210.323	-	Minor-Open Cut
211.962	-	Major-Open Cut

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
213.002	One Mile Creek (21m)	Major-Open Cut
213.080	-	Major-Open Cut
213.282	-	Major-Open Cut
214.395	-	Minor-Open Cut
214.571	-	Minor-Open Cut
214.735	-	Minor-Open Cut
215.319	-	Major-Open Cut
215.373	-	Major-Open Cut
216.320	-	Major-Open Cut
217.583	-	Major-Open Cut
217.843	-	Major-Open Cut
218.345	-	Major-Open Cut
218.750	-	Major-Open Cut
219.815	Ditz Creek (56 m)	Major-Open Cut
221.369	-	Minor-Open Cut
221.807	-	Minor-Open Cut
224.771	Amy Creek (14 m)	Major-Open Cut
225.112	-	Minor-Open Cut
226.653	-	Minor-Open Cut
227.647	-	Minor-Open Cut
227.708	-	Minor-Open Cut
227.966	-	Minor-Open Cut
228.316	-	Major-Open Cut
229.048	-	Minor-Open Cut
229.953	-	Major-Open Cut
230.511	Plain Creek (56 m)	Major-Open Cut
231.104	-	Minor-Open Cut
231.339	-	Minor-Open Cut
233.376	Brumby Creek (17 m)	Major-Open Cut
234.494	-	Minor-Open Cut
234.660	-	Major-Open Cut
234.828	-	Minor-Open Cut
235.528	-	Major-Open Cut
237.146	-	Major-Open Cut
237.824	-	Minor-Open Cut
239.322	-	Minor-Open Cut
239.809	-	Minor-Open Cut
240.816	-	Major-Open Cut
241.111	-	Major-Open Cut
245.056	-	Major-Open Cut
245.562	-	Minor-Open Cut
245.995	-	Minor-Open Cut
246.390	-	Major-Open Cut
247.112	-	Major-Open Cut
247.900	-	Major-Open Cut
249.232	-	Major-Open Cut
249.365	-	Major-Open Cut
251.698	-	Minor-Open Cut

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
253.491	Grevillia Creek (55 m)	Major-Open Cut
255.997	-	Minor-Open Cut
257.074	-	Minor-Open Cut
257.434	-	Minor-Open Cut
259.050	Kariboe Creek (260 m)	Major-Open Cut
264.418	-	Major-Open Cut
265.837	-	Major-Open Cut
266.428	-	Major-Open Cut
268.307	-	Minor-Open Cut
269.187	-	Minor-Open Cut
270.321	-	Major-Open Cut
272.540	Kroombit Creek (100 m)	Major-Open Cut
275.156	-	Minor-Open Cut
275.429	-	Major-Open Cut
275.512	-	Minor-Open Cut
275.567	-	Minor-Open Cut
275.693	-	Major-Open Cut
275.895	-	Major-Open Cut
276.371	-	Major-Open Cut
276.554	-	Major-Open Cut
276.791	-	Minor-Open Cut
276.956	-	Minor-Open Cut
277.015	-	Minor-Open Cut
277.166	-	Minor-Open Cut
277.415	-	Minor-Open Cut
277.552	-	Minor-Open Cut
278.702	-	Minor-Open Cut
279.124	-	Minor-Open Cut
280.906	-	Major-Open Cut
281.841	-	Major-Open Cut
281.935	-	Minor-Open Cut
282.299	-	Major-Open Cut
282.363	-	Major-Open Cut
282.553	-	Minor-Open Cut
282.789	-	Minor-Open Cut
283.859	Callide Creek (200 m)	Major-Open Cut
284.283	-	Major-Open Cut
284.636	-	Minor-Open Cut
285.350	-	Minor-Open Cut
285.722	Rainbow Creek (120 m)	Major-Open Cut
286.551	-	Major-Open Cut
287.345	Rainbow Creek (18 m)	Minor-Open Cut
288.074	Rainbow Creek (35 m)	Major-Open Cut
288.762	-	Major-Open Cut
289.130	-	Minor-Open Cut
290.551	-	Major-Open Cut
291.122	-	Major-Open Cut
291.594	-	Major-Open Cut

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
293.529	-	Major-Open Cut
293.971	-	Major-Open Cut
294.325	-	Minor-Open Cut
294.450	-	Minor-Open Cut
294.500	-	Minor-Open Cut
294.622	-	Minor-Open Cut
294.655	-	Minor-Open Cut
294.946	-	Minor-Open Cut
295.037	-	Minor-Open Cut
295.368	-	Minor-Open Cut
295.385	-	Minor-Open Cut
295.527	-	Minor-Open Cut
295.740	-	Major-Open Cut
295.818	-	Minor-Open Cut
295.828	-	Minor-Open Cut
298.497	-	Minor-Open Cut
300.612	-	Minor-Open Cut
301.460	-	Major-Open Cut
302.263	-	Major-Open Cut
302.488	-	Major-Open Cut
304.856	-	Major-Open Cut
305.379	-	Minor-Open Cut
305.990	-	Major-Open Cut
306.097	-	Minor-Open Cut
306.411	-	Minor-Open Cut
306.518	Bell Creek (32 m)	Major-Open Cut
308.800	-	Major-Open Cut
312.002	-	Minor-Open Cut
312.104	-	Major-Open Cut
312.535	-	Major-Open Cut
313.038	-	Minor-Open Cut
313.907	-	Minor-Open Cut
314.778	-	Minor-Open Cut
316.308	-	Minor-Open Cut
319.272	-	Minor-Open Cut
320.274	-	Minor-Open Cut
320.502	-	Minor-Open Cut
322.011	-	Minor-Open Cut
322.164	-	Minor-Open Cut
323.100	Calliope River	Major-Open Cut
323.560	-	Minor-Open Cut
324.236	-	Minor-Open Cut
325.158	-	Major-Open Cut
326.772	-	Minor-Open Cut
330.045	-	Minor-Open Cut
331.173	Harper Creek	Major-Open Cut
334.721	-	Minor-Open Cut
335.291	-	Minor-Open Cut

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
335.834	-	Major-Open Cut
336.969	-	Minor-Open Cut
337.330	-	Minor-Open Cut
339.204	-	Minor-Open Cut
339.584	-	Minor-Open Cut
339.769	-	Major-Open Cut
341.142	-	Minor-Open Cut
341.819	-	Minor-Open Cut
343.302	-	Minor-Open Cut
343.676	-	Minor-Open Cut
345.808	-	Minor-Open Cut
347.380	-	Major-Open Cut
348.571	-	Major-Open Cut
349.813	-	Major-Open Cut
351.688	-	Minor-Open Cut
353.232	-	Minor-Open Cut
354.346	-	Major-Open Cut
356.079	-	Major-Open Cut
357.233	-	Minor-Open Cut
360.340	-	Minor-Open Cut
363.200	-	Minor-Open Cut
364.276	-	Major-Open Cut
366.206	-	Minor-Open Cut
367.195	-	Minor-Open Cut
367.856	-	Minor-Open Cut
368.610	-	Minor-Open Cut
369.567	-	Minor-Open Cut
370.032	-	Minor-Open Cut
370.328	-	Minor-Open Cut
370.600	-	Minor-Open Cut
370.689	-	Minor-Open Cut
371.144	-	Minor-Open Cut
372.843	-	Minor-Open Cut
374.579	-	Minor-Open Cut



WATER COURSE CROSSING - MINOR
PROFILE

CONSTRUCTION NOTES.

1. WATER COURSE CROSSING SHALL BE OPEN CUT UNLESS SPECIFIED OTHERWISE BY THE COMPANY
2. CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE APPROVED ENVIRONMENTAL MANAGEMENT PLAN.
3. DELETED
4. NATURAL SURFACE OF CREEK CROSSING SHALL BE SURVEYED PRIOR TO CONSTRUCTION.
5. PIPE SHALL BE INSTALLED STRAIGHT AND HORIZONTAL FOR THE WIDTH OF THE CROSSING BETWEEN TOPS OF BANKS.
6. PIPE TYPE, COATING AND WALL THICKNESS SHALL BE AS SPECIFIED ON ALIGNMENT SHEETS AND SHALL APPLY BETWEEN THE UPSTREAM AND DOWNSTREAM OFFSET FROM THE REFERENCE FEATURE. THE OFFSET DISTANCES ARE NOMINATED ON THE ALIGNMENT SHEET. IF OFFSET FOR WALL THICKNESS, COATING AND MINIMUM DEPTH OF COVER VARIES, THE GREATER DISTANCE SHALL DEFINE THE EXTENT OF THE CROSSING.
7. MINIMUM COVER AS SPECIFIED ON THE ALIGNMENT SHEET SHALL BE MAINTAINED WITHIN THE CROSSING LIMITS.
8. WHEN CONTINUOUS BEDROCK IS ENCOUNTERED, DEPTH OF COVER TO TOP OF PIPE MAY BE REDUCED TO 900mm.
9. PIPE MAY BE LOWERED IN TRENCH ONLY IF THE TRENCH IS SMOOTH AND CLEAN AND DOES NOT CONTAIN STONES OR DEBRIS. IF WATER IS PRESENT IT SHALL BE PUMPED OUT PRIOR TO LOWER-IN OPERATION.
10. PIPELINE PROFILE AND DEPTH OF COVER SHALL BE SURVEYED AFTER LOWER IN. THE INSTALLATION SHALL BE APPROVED BY THE COMPANY REPRESENTATIVE PRIOR TO BACKFILL.
11. CREEK AND BANKS SHALL BE RESTORED AS SOON AS PRACTICABLE AFTER LAYING AND BACKFILLING. BED AND RESTORATION SHALL COMPLY WITH THE ENVIRONMENTAL MANAGEMENT PLAN.
12. PIPELINE WARNING SIGNS SHALL BE INSTALLED IF REQUIRED AT BOTH SIDES OF THE CROSSING. REFER DRAWING No. QCLNG-BG00-PLE-DET-000049.
13. THE REFERENCE FEATURE IS THE POINT ON THE ALIGNMENT SHEET TO IDENTIFY THE CROSSING AND IS NOT NECESSARILY AT THE CROSSING CENTRE. AMG COORDINATES FOR THE REFERENCE FEATURE ARE PROVIDED IN THE DATA TABLES.

GENERAL NOTES

1. A MINOR WATER COURSE IS DEFINED BY THE FOLLOWING CRITERIA.
   - WATER DEPTH AT HIGH LEVEL IS LESS THAN ONE METRE.
   - VERTICAL DISTANCE BETWEEN TOP OF BANK AND WATER COURSE INVERT IS LESS THAN FIVE METRES.
   - CROSSING WIDTH BETWEEN TOE OF BANKS IS LESS THAN TEN METRES.

2000 1000 0 2000 4000 6000 8000 10000
SCALE 1 : 100

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED

ZEKTIN DRAWING NUMBER WAS DET-M-015
ZEKTIN DRAWING NUMBER WAS DET-C-006

REV.	DESCRIPTION	DATE	DESIGNED	DRAWN	ENG_CK	DWG_CK	APP'D	CLIENT
C	ISSUED FOR TENDER	13.10.09	PF	PF	KK	JH	EL	
	DRAWING NUMBER WAS QCLNG-BG00-PLE-DWG-0006							
B	ISSUED FOR SAFETY MANAGEMENT STUDY	01.07.09	PF	PF	KK	JH		
	DRAWING NUMBER WAS D2K-C-DD-00005							
A	ISSUED FOR REVIEW	29.04.09	PF	PF	KK	TP		

REF. DRAWING No. | REFERENCE DRAWINGS

zektingroup
Zektin Engineering Pty Ltd
ABN 98 162 923 465
www.zektin.com.au
CONSULTANT PROJECT No. P09QGC02-000
CONSULTANT DRAWING No. DET-L-015

QGC A BG Group business

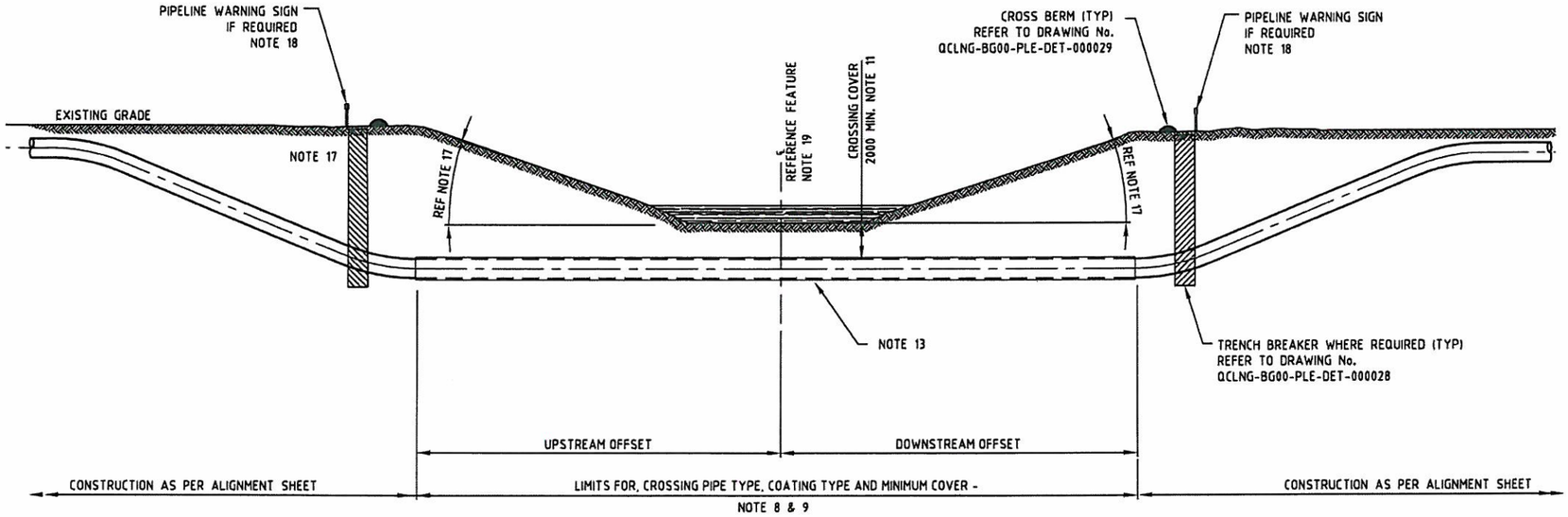
DESIGNED: PF DATE: 29.04.09
DRAWN: PF DATE: 29.04.09
CHECKED: DATE:
APPROVED: DATE:
SCALE: 1:100
STATUS: DEVELOPMENT

DRAWING TITLE:
QUEENSLAND GAS COMPANY
E05 EXPORT PIPELINE & GAS COLLECTION HEADER
WATER COURSE CROSSING - MINOR
TYPICAL DETAILS

SHEET SIZE A1 | DRAWING No. QCLNG-BG00-PLE-DET-000006 | REVISION C

QGC TEMPLATE NO. PRO-G-TPL-051_REV 2

13-10-09 09:24 PAULINE.FAIRHURST:\PROJECTS\P09QGC02\TECHNICAL (BLUE)\T15 PIPELINES\T15.7 DETAILS (DET)\000\P09QGC02-000-DET-L-015.DWG WATER CROSSING - MINOR



WATER COURSE CROSSING - MAJOR
PROFILE

GENERAL NOTES

1. A MAJOR WATER COURSE IS DEFINED BY THE FOLLOWING CRITERIA
   - WATER DEPTH AT HIGH LEVEL IS GREATER THAN ONE METRE.
   - VERTICAL DISTANCE BETWEEN TOP OF BANK AND WATER COURSE INVERT IS MORE THAN FIVE METRES.
   - CROSSING WIDTH BETWEEN TOE OF BANKS IS GREATER THAN TEN METRES.

ZEKTIN DRAWING NUMBER WAS DET-M-016
ZEKTIN DRAWING NUMBER WAS DET-C-007

CONSTRUCTION NOTES.

1. WATER COURSE CROSSING SHALL BE OPEN CUT UNLESS SPECIFIED OTHERWISE BY THE COMPANY.
2. CONSTRUCTION METHODS SHALL BE IN ACCORDANCE WITH THE APPROVED ENVIRONMENTAL MANAGEMENT PLAN.
3. DELETED
4. WHERE CONTINUITY OF FLOW OR TURBIDITY CONTROL IS SPECIFIED IT SHALL BE PROVIDED IN ACCORDANCE WITH DRAWING No. QCLNG-BG00-PLE-DWG-0032 'FLUME CROSSING DRAWING ' OR DRAWING No..No.QCLNG-BG00-PLE-DWG-0031 DAM AND PUMP WATER CROSSING.
5. NATURAL SURFACE OF CREEK CROSSING SHALL BE SURVEYED PRIOR TO CONSTRUCTION.
6. PROPOSED CROSSING INSTALLATION SHALL BE DRAWN SHOWING LOCATION OF OVERBENDS, SAND BAGS, PROTECTIVE WEIGHT COATING AND FINISHED SURFACE PROFILE AFTER RESTORATION. DRAWING SHALL BE APPROVED BY THE COMPANY PRIOR TO CONSTRUCTION.
7. PIPE SHALL BE INSTALLED STRAIGHT AND HORIZONTAL BETWEEN TOPS OF BANKS.
8. PIPE TYPE, WALL THICKNESS AND COATING SHALL BE AS SPECIFIED ON ALIGNMENT SHEETS AND SHALL APPLY BETWEEN THE UPSTREAM AND DOWNSTREAM OFFSET FROM THE REFERENCE FEATURE. THE OFFSET DISTANCES ARE NOMINATED ON THE ALIGNMENT SHEET. IF OFFSET FOR WALL THICKNESS, COATING AND MINIMUM DEPTH OF COVER VARIES, THE GREATER DISTANCE SHALL DEFINE THE EXTENT OF THE CROSSING.
9. MINIMUM COVER AS SPECIFIED ON THE ALIGNMENT SHEETS AND SPECIFIC CROSSING DRAWING, SHALL BE MAINTAINED WITHIN THE CROSSING LIMITS.
10. DURING CONSTRUCTION, STABLE APPROACH SLOPES TO THE WATERCOURSE SHALL BE MAINTAINED AT ALL TIMES IN ORDER TO MINIMISE EROSION AND THEREFORE SILTATION OF THE WATERCOURSE. DURING RAINFALL.
    THE FOLLOWING SLOPE PROTECTION MEASURES SHALL BE IN PLACE FROM THE START OF CLEARING NEAR THE WATERCOURSE UNTIL RESTORATION AND CLEAN UP IS COMPLETE.
    A. SURFACE WATER DIVERSION BERMS ALONG THE TOP AND AT INTERMEDIATE POINTS DOWN THE SLOPES OF ANY SLOPE CONTAINING ERODIBLE MATERIAL. (DISCHARGE TO THE DOWNSTREAM OF THE TRENCH).
    B. SILT FENCES AT THE BASE OF SIGNIFICANT SLOPES.
    C. SETTLING PONDS AT THE BASE OF SLOPES TO COLLECT SURFACE RUN OFF WATER AND EROSION MATERIAL.
    D. DITCH PLUGS IN THE PIPELINE DITCH TO STOP THE SLOPE FLOW OF WATER AND ERODIBLE MATERIALS.
11. WHEN CONTINUOUS BEDROCK IS ENCOUNTERED, DEPTH OF COVER TO TOP OF PIPE MAY BE REDUCED TO 1200mm.
12. PIPE MAY BE LOWERED IN TRENCH ONLY IF THE TRENCH IS SMOOTH AND CLEAN AND DOES NOT CONTAIN STONES OR DEBRIS. IF WATER IS PRESENT IT SHALL BE PUMPED OUT PRIOR TO LOWER-IN OPERATION.
13. COATING PROTECTION SHALL BE PROVIDED OVER THE ENTIRE PIPE WITHIN CROSSING LIMITS.
    WHERE CONTINUOUS CONCRETE COATING IS SPECIFIED -
    A. JOINTS SHALL BE PROTECTED USING CONCRETE OR ROCK-SHIELD APPLIED TO THE THICKNESS OF THE CONCRETE COATING.
    B. BOLT ON WEIGHTS CAN BE USED AS AN ALTERNATIVE AND SUBJECT TO APPROVAL BY THE COMPANY. REFER TO DRAWING No QCLNG-BG00-PLE-DET-000024
14. CONSTRUCTION ACTIVITIES SHALL CEASE DURING PERIODS OF HEAVY RAINFALL IF IT APPEARS THAT MEASURES TO CONTROL SILTATION ARE LIKELY TO BE INEFFECTIVE.
15. THE DEPTH OF HORIZONTAL PIPE IS TO BE DETERMINED BY THE MINIMUM DEPTH OF COVER MEASURED FROM THE DEEPEST POINT OF THE CHANNEL TO THE TOP OF THE PIPE. IF BANK EROSION IS EVIDENT THE LIMIT OF STRAIGHT PIPE SHALL EXTEND BEYOND THE ZONE OF POTENTIAL EROSION AS DETERMINED BY THE COMPANY.

NOTES CONTINUED LEFT

NOTES CONTINUED.....

16. PIPELINE PROFILE AND DEPTH OF COVER SHALL BE SURVEYED AFTER LOWER IN. THE INSTALLATION SHALL BE APPROVED BY THE COMPANY REPRESENTATIVE PRIOR TO BACKFILL.
17. CREEK AND BANKS SHALL BE RESTORED AS SOON AS PRACTICABLE AFTER LAYING AND BACKFILLING. REFER TO DRAWING No. QCLNG-BG00-PLE-DWG-0026. BED AND BANK RESTORATION SHALL COMPLY WITH THE ENVIRONMENTAL MANAGEMENT PLAN.
18. PIPELINE WARNING SIGNS SHALL BE INSTALLED IF REQUIRED AT BOTH SIDES OF THE CROSSING. BOTH SIGNS SHALL BE CLEARLY VISIBLE FROM THE BANKS. REFER DRAWING No. QCLNG-BG00-PLE-DET-000049.
19. THE REFERENCE FEATURE IS THE POINT ON THE ALIGNMENT SHEET TO IDENTIFY THE CROSSING AND IS NOT NECESSARILY AT THE CROSSING CENTRE. AMG COORDINATES FOR THE REFERENCE FEATURE ARE PROVIDED IN THE DATA TABLES.

ALL DIMENSIONS IN MILLIMETRES UNLESS OTHERWISE STATED

REV.	DESCRIPTION	DATE	DESIGNED	DRAWN	ENG_CK	DWG_CK	APP'D	CLIENT
C	ISSUED FOR TENDER	13.10.09	PF	PF	KK	JH	CL	
	DRAWING NUMBER WAS QCLNG-BG00-PLE-DWG-0007							
B	ISSUED FOR SAFETY MANAGEMENT STUDY	01.07.09	PF	PF	KK	JH		
	DRAWING NUMBER WAS D2K-C-DD-00006							
A	ISSUED FOR REVIEW	29.04.09	PF	PF	KK	TP		

REF. DRAWING No. | REFERENCE DRAWINGS

zektingroup
Zektin Engineering Pty Ltd
ABN 98 162 923 465
www.zektin.com.au

CONSULTANT PROJECT No. P09QGC02-000
CONSULTANT DRAWING No. DET-L-016

QGC A BG Group business

DESIGNED PF 29.04.09 | DRAWN PF 29.04.09 | CHECKED | APPROVED | SCALE: 1:150 | STATUS: DEVELOPMENT

DRAWING TITLE:
QUEENSLAND GAS COMPANY
E05 EXPORT PIPELINE & GAS COLLECTION HEADER
WATER COURSE CROSSING - MAJOR
TYPICAL DETAILS

SHEET SIZE A1 | DRAWING No. QCLNG-BG00-PLE-DET-000007 | REVISION C

QGC TEMPLATE NO. PRO-G-TPL-051_REV 2

13-10-09 16:07 PAULINE.FAIRHURST:\PROJECTS\P09QGC02\TECHNICAL (BLUE)\T1S PIPELINES\T1S.7 DETAILS (DET)\000\P09QGC02-000-DET-L-016.DWG WATER CROSSING - MAJOR

A-5 COLLECTION HEADER CREEK CROSSING LOCATIONS AND METHOD

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
1.03		Minor-Open Cut
5.86	Bloodwood Creek	Minor-Open Cut
12.70	Kogan Creek	Major-Open Cut
15.17		Minor-Open Cut
16.24		Minor-Open Cut
18.74		Minor-Open Cut
35.89	Wambo Creek	Major-Open Cut
39.50		Minor-Open Cut
55.12	Nine Mile Creek	Minor-Open Cut
56.37	Wieambilla Creek	Major-Open Cut
59.44	Cobbareena Creek	Major-Open Cut
70.28	Sandy Creek	Minor-Open Cut
72.52	Condamine River	HDD
73.66	Bograbilla Creek	Minor-Open Cut
76.85		Minor-Open Cut
85.94	Columboola Creek	HDD
87.68		Minor-Open Cut
88.88		Minor-Open Cut
89.10		Minor-Open Cut
89.22		Minor-Open Cut
97.72		Minor-Open Cut
99.11	(3m)	Minor-Open Cut
105.47	(3m)	Minor-Open Cut
106.20	Dogwood Creek (70 m)	Major Open Cut
107.27	Eleven Mile Creek (30 m)	Major Open Cut
107.71	(15m)	Intermediate-Open Cut
112.41	(8m)	Minor-Open Cut
112.95	(7m)	Minor-Open Cut
116.59	(3m)	Minor-Open Cut
118.73	Camisla Creek (6m)	Minor-Open Cut
120.00	Wallen Creek (25m)	Major Open Cut
120.86	(8m)	Minor-Open Cut
122.35	(10m)	Minor-Open Cut
126.63	(13m)	Minor-Open Cut
130.33	(13m)	Minor-Open Cut
132.61	(3m)	Minor-Open Cut
132.85	(5m)	Minor-Open Cut
136.52	Wallan Creek (15m)	Intermediate-Open Cut
138.23	(10m)	Minor-Open Cut
141.75	Kangaroo Gully (15m)	Intermediate-Open Cut
143.41	Tchanning Creek (5m)	Minor-Open Cut

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
143.63	(15m)	Intermediate-Open Cut
151.20	(25m)	Minor-Open Cut
152.14	Ramyard Creek (3m)	Minor-Open Cut
152.37	(5m)	Minor-Open Cut
153.60	(10m)	Minor-Open Cut
154.23	(55m)	Intermediate-Open Cut
154.95	(4m)	Intermediate-Open Cut
156.66	(50m)	Major-Open Cut
157.06	(25m)	Intermediate-Open Cut
157.23	(18m)	Major-Open Cut
159.30	Eastern Channel (6m)	Intermediate-Open Cut
159.31	(23m)	Intermediate-Open Cut
159.31	Main Channel (12m)	Intermediate-Open Cut
159.68	(10m)	Minor-Open Cut
160.13	(25m)	Intermediate-Open Cut
160.85	(28m)	Intermediate-Open Cut
162.15	(50m)	Major Open Cut
163.84	Mayall Creek (5m)	Minor-Open Cut
164.08	(8m)	Minor-Open Cut
166.29	Mayall Creek (23m)	Minor-Open Cut
168.00	(9m)	Minor-Open Cut

A-6 WOLEEBEE CREEK COLLECTION HEADER CREEK CROSSING LOCATION AND METHOD

KP (km)	Watercourse Name (width) *if recorded*	Method of Crossing
2.69		Minor-Open Cut
5.18		Minor-Open Cut
7.07	Ogle Creek	Minor-Open Cut
9.16		Minor-Open Cut
13.27	Woleebee Creek	Major Open Cut
13.63		Minor-Open Cut
14.91		Minor-Open Cut
17.53		Minor-Open Cut
18.19	Conloi Creek	Minor-Open Cut
18.31	Conloi Creek	Minor-Open Cut
19.72	Conloi Creek	Minor-Open Cut
19.81	Conloi Creek	Minor-Open Cut
23.93		Minor-Open Cut
25.27		Minor-Open Cut
28.17	Sandy Flat Creek	Minor-Open Cut
30.59		Minor-Open Cut
32.27		Minor-Open Cut
33.24		Minor-Open Cut
34.53		Minor-Open Cut
36.39		Minor-Open Cut
37.24		Minor-Open Cut
42.18	Juandah Creek	Major Open Cut
53.93		Minor-Open Cut