10 GROUNDWATER

10.1 INTRODUCTION

Chapter 10 identifies issues associated with groundwater impacts from the construction and operation of the Pipeline Component of the Queensland Curtis LNG (QCLNG) Project. Given that the operation of the pipelines which comprise the overall Pipeline Component will not impact on groundwater, the chapter focuses on the potential for impacts during construction.

10.2 PROJECT ENVIRONMENTAL OBJECTIVE

The Project's environmental objective for groundwater resources is to protect, as much as practicable, groundwater from contamination so as to preserve ecological health, public amenity and safety.

As set out in *Volume 4, Chapter 9* no area-specific environmental values or water quality objectives have been established under Schedule 1 of the Environmental Protection Policy (Water) (EPP Water) for the Pipeline study area.

A review of the existing water resource plans concluded that the Water Resource (Great Artesian Basin) Plan 2006 was the only plan with current relevance to groundwater for the Pipeline Component of the Project. The Plan identifies the need to protect the cultural and ecological values associated with the Great Artesian Basin (GAB) springs and GAB-derived baseflow connected watercourses.

Three subartesian areas, as defined in the Water Regulation 2002, have been identified in association with the Pipeline study area shown in *Figure 4.10.1.*

- Great Artesian Basin Subartesian Area
- Callide Subartesian Area
- Easter Downs Subartesian Area.

10.3 METHODOLOGY

The assessment of groundwater for the pipelines has been based purely on desktop studies as detailed in *Appendix 4.1*. This included a review of relevant legislation and Department of Environment and Resources Management (DERM) *Groundwater and Water Entitlements Registration Databases*. Based on this data, environmental values were determined and locations identified where groundwater is likely to occur within 2 m of the ground surface.

Once this review was completed, the EIS methodology for impact assessment,

as described in *Volume 1, Chapter 4* was applied.

10.4 EXISTING ENVIRONMENT

10.4.1 Groundwater Occurrence and Use

The DERM database search resulted in the identification of 5,508 registered bores within the Pipeline Component study area. The data relating to these bores was reviewed and any that related to depths greater than expected pipeline impacts (i.e. approximately 2.5 m in depth) were discounted. These included:

- surface water monitoring facilities
- bores with depth to water greater than 5 m
- bores with depth to water inlet greater than 30 m below the ground surface.

This resulted in a final dataset of 196 registered bores, as shown in *Figure 4.10.1*, demonstrating that there is a shortage of shallow bores with water level information within the Pipeline Component study area. QGC recognises that all bores are not registered with the DERM, however, its database is a good basis for determining the potential to impact on groundwater resources.

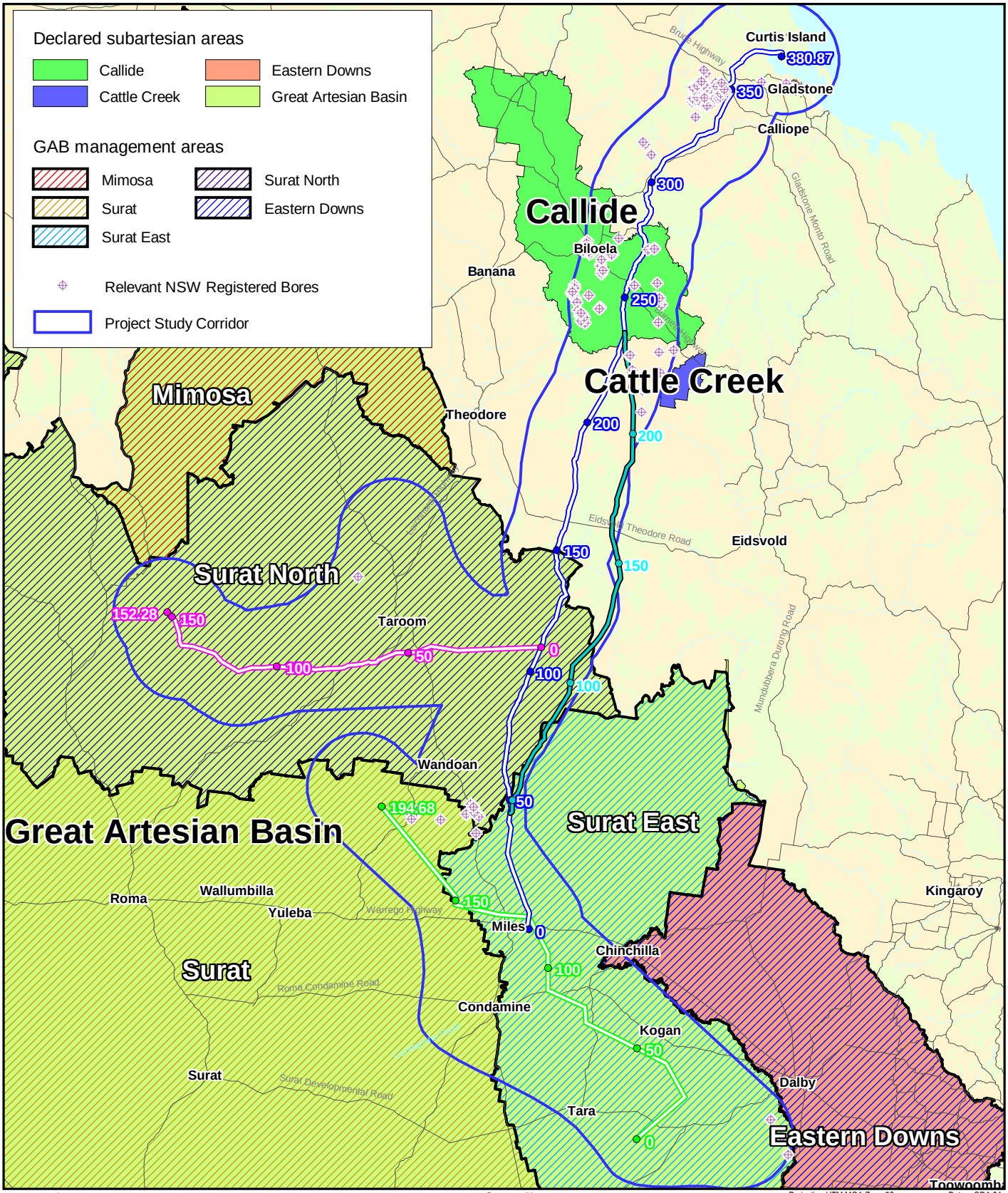
The analysis of bore data can be found in *Appendix 4.1* and has concluded that shallow groundwater along proposed Pipeline Component routes is expected to be predominantly alluvium associated with major watercourses. Seepage and artesian flow may be encountered in some watercourse beds where aquifers adjoin impermeable rock or in topographically low areas. These are likely to occur within the Collection Header between kilometre point (KP) 105 and KP 145 and along the route of the Lateral Pipeline between KP 46 and KP 50 and KP 75 and KP 95.

GAB springs of environmental and cultural significance occur within the study area, predominantly within the Collection Header. Of these springs, no spring vents exist within 800 m of the Pipeline routes. However, some watercourse springs may be intersected by the Pipeline routes within reaches of the:

- Dogwood Creek
- Moonie River
- Wambo Creek

Option 1 of the Export Pipeline route may intersect watercourse springs in Bungaban and Cockatoo Creeks.

Seepage and artesian flow may be encountered in some watercourse beds where aquifers adjoin impermeable rock or in topographically low areas. However the potential to adversely impact these waters is considered low.



Legend:

- Export Pipeline & Kilometre Point
- Export Pipeline Option 2 & Kilometre Point
- Lateral Pipeline & Kilometre Point
- Upstream Infrastructure Corridor & Kilometre Point

Source Note:

1:250,000 Topographic Vector copyright Geoscience Australia Declared subartesian areas (2009), GAB management areas (2008), Registered bores (2008) data copyright The State of Queensland (Department of Natural Resources and water)

Projection UTM MGA Zone 56 Datum GDA 94

0 20 40 60 80

Kilometres

N

QUEENSLAND CURTIS LNG
A BG Group business

ERM
Environmental Resources Management Australia Pty Ltd

Project	Queensland Curtis LNG Project			Title	Relevant Groundwater Bores
Client	QGC - A BG Group business				
Drawn	Mipela	Volume 4	Figure 4.10.1	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-96105		
Date	17.06.09	Revision	A		

A total of 12 bores were identified as being used for town/public/urban supply in the region and 405 bores are used for stock and domestic purposes. The town/public/urban bores would be expected to be used for supply of drinking water whereas the domestic use on the other bores has been identified as primarily for uses other than drinking water (refer *Appendix 4.1*). Farmers and graziers within the Pipeline Component study area make limited use of near-surface groundwater. The primary use in the Callide and Condamine areas is irrigation while in the GAB and other areas it is stock watering.

10.4.2 Groundwater Quality

The investigation identified that the groundwater level in most areas is unlikely to be within 2.5 m of the ground surface and is therefore unlikely to be affected by the pipeline construction and operations. Limited investigation of groundwater was therefore carried out.

Of the 196 bores identified, some laboratory data is available for 139. A brief analysis of the electrical conductivity data for the shallow bores within the study area indicated that the groundwater is fresh-to-moderately brackish and suitable for watering most livestock and irrigating a range of crops.

10.5 POTENTIAL IMPACTS

The primary activities associated with the pipelines with the potential to impact on groundwater, if the appropriate control measures are not applied, are:

- construction of the pipeline trench in locations where shallow aquifers exist
- boring or tunnelling where shallow aquifers exist
- dewatering of the pipeline trench, where groundwater infiltrates.

Shallow aquifers are of concern as they may be at a level that could be intersected by the construction works, resulting in impacts to water quality.

Potential impacts to groundwater associated with the pipelines include:

- changes to surface hydrological conditions
- water quality/contamination.

10.5.1 Hydrological Conditions

Pipeline construction will generally require trenching to depths of between 2 m and 2.4 m. It is anticipated that the groundwater level in most areas is unlikely to be within 2.5 m of the ground surface and therefore it is unlikely that construction of the proposed pipelines will impact on groundwater.

Groundwater levels may be subject to seasonal variation in response to rainfall and this will determine the hydrological conditions that need to be considered at the time of pipeline construction.

The ground surface in low-lying areas may intersect the water table and become inundated after significant rainfall. Where the pipeline trench intersects, or comes into close proximity with these areas or what is called the saturated zone, the groundwater is more vulnerable to impacts from contamination associated with construction works.

Shallower water tables may be intersected by the trench, and there may be a requirement for dewatering of the trench during construction. The intersection of the groundwater by the trench has the potential to create localised impacts to the groundwater flow patterns. This impact will be temporary due to the short duration of the open trench (approximately three weeks in any one area) and depth of the intrusion.

The compacted trench can also potentially impact on local hydrology. If the back-filled trench is significantly less compact than the surrounding land, the trench potentially acts as a horizontal conduit for water. A filled trench that is more compacted than the surrounding land has the potential to interrupt the lateral flow of groundwater and may result in an accumulation of groundwater at the compacted surface.

Extraction of water from local bores for construction activities (e.g. dust management) may result in localised groundwater draw-down if not correctly managed.

Due to the shortage of existing information relating to near-surface groundwater in the study area, and the low potential for construction to intercept groundwater, the hydrogeological properties, groundwater flow patterns and seasonal variations have not been assessed. However, as discussed in the groundwater study report *(*refer to *Appendix 4.1)* groundwater flow patterns of near-surface aquifers can generally be assumed to mimic topography (i.e. surface drainage patterns).

10.5.2 Water Quality Contamination

Activities with the potential to create contamination of groundwater include:

- trench dewatering
- discharging hydrotest water
- disturbance of acid sulfate soils (ASS)
- waste management, including effluent discharge at construction camps
- refuelling and maintenance of plant and equipment
- storage and management of fuels, oils and chemicals
- leaking of Associated Water from the Water Collection Header.

Mitigation measures to ensure that these activities do not adversely impact groundwater quality are set out in *Section 10.6*.

10.6 MANAGEMENT AND MITIGATION MEASURES

It is unlikely that groundwater quality will be affected by the proposed development given that sound management measures are implemented for trench dewatering, hydro-test and effluent discharge and management of fuels and chemicals.

Should dewatering of the trench be required, specific mitigation strategies will minimise the impact on the water table. These will include discharge of the water in proximity to and downhill of the trench. Discharge will be through a filter fabric and flow control mechanism to protect the area from erosion and sedimentation. Any potential impacts are expected to be localised and short term.

During construction, backfilling will be managed such that the returned trench spoil is adequately compacted to a level consistent with the pre-existing condition. Trench breakers may also be used to prevent any horizontal flow of water. Post-construction monitoring of the disturbed area will identity any potential areas of groundwater accumulation and appropriate corrective actions will be implemented.

The management of hydro-test water is addressed in *Volume 2, Chapter 12* and *Volume 4, Chapter 15*. It is expected that hydro-test water will be reused in some sections of the Pipeline minimising the number of discharge points. The use of additives will depend upon the source of the hydro-test water however it is expected that the water will be able to be discharged directly to ground. This will be done away from any watercourse. Discharge of the hydro-test water will be carried out so as to ensure that no environmental harm occurs. If additives are used then a specific discharge plan will be prepared to ensure that the quality of the water is suitable for the receiving environment.

There is the potential to intercept ASS on the Export Pipeline route in the Gladstone region. The management of ASS has been discussed in *Volume 5, Chapter 4*. Geotechnical studies will be carried out along that portion of the Export Pipeline route and the presence of ASS will be confirmed during these studies (refer *Volume 4, Chapter 4*). An ASS Management Plan will be developed (refer *Volume 5, Chapter 4*).

A waste management plan will be implemented that ensures there is no burial of wastes at site (refer to *Volume 4, Chapter 15*). All wastes will be removed from the Right-of-Way (RoW) to the camp locations from where they will be disposed of through the services of a licensed waste contractor. Effluent from camp sewage treatment facilities will be discharged to land at locations away from surface and groundwater locations and in accordance with DERM requirements.

Refuelling will not be carried out in proximity to watercourses, where practicable, as spills have a higher potential to enter the groundwater table in these locations. Handling measures, including the use of drip trays, will be in used for refuelling in the field. If refuelling is required in proximity to a watercourse (e.g. for equipment used in trenchless techniques) this would be carried out within a lined and bunded area.

Environmental management planning will include provision for responsible transport, storage, and use of materials (e.g. fuels, oils, greases and cleaning products) which have the potential to impact on groundwater quality if infiltrated to the various aquifers.

The water Collection Header, which will be used for transferring Associated Water to treatment/management locations within the Gas Field Component, will be monitored on a regular basis to minimise the potential for leakage to groundwater resources.

10.7 CONCLUSION

A desktop analysis of groundwater resources within the study area of the Pipeline Component for the QCLNG Project has been undertaken. Existing registered bores have been identified and the potential to impact on groundwater resources has been assessed as negligible. Appropriate management strategies to ensure that other groundwater users are not disadvantaged have been proposed.

A summary of the impacts outlined in this chapter is provided in *Table 4.10.1*.

Table 4.10.1 Summary of Impacts for Groundwater

Impact assessment criteria	Assessment outcome
Impact assessment	Negative
Impact type	Direct
Impact duration	Short term (limited to construction)
Impact extent	Local
Impact likelihood	Unlikely

Overall assessment of impact significance: negligible, due to the shallow depth of construction in relation to groundwater resources, and provided that mitigation measures are implemented for the storage and handling of fuel, chemicals and acid sulfate soils (ASS).