10 GROUNDWATER

10.1 INTRODUCTION

This chapter outlines the groundwater impact assessment undertaken for the proposed western coal seam methane (CSM) water supply pipeline (the proposed pipeline) from the Spring Gully CSM gas fields, to the proposed Wandoan mine as part of the Wandoan Coal Project (the Project).

10.2 METHODOLOGY OF ASSESSMENT

10.2.1 RELEVANT LEGISLATION

Water Act 2000

The *Water Act 2000* is the key piece of legislation that regulates the interference and extraction of groundwater within Queensland. The regulatory authority is the Department of Natural Resources and Water (NRW). Water management within Queensland is regulated through the development of Water Resource Plans and implementation of Resource Operations Plans. These plans provide a process to balance socio-economic and environmental needs, for managing unallocated water and defining the rules to protect dependent ecosystems and manage extraction. The Wandoan Coal Project (the Project) area is located within the Surat North Management Area (20) within the Great Artesian Basin (GAB) Water Resource Plan. This Plan manages artesian groundwater within the GAB and subartesian water that recharges the GAB sediments.

The Act authorises NRW to grant licences and permits for the extraction, use and interference to the flow of water, including groundwater. All bores that 'take' water (i.e. pumped) are required to have a development permit which gives the developer authority to construct a bore and defines any conditions of extraction (i.e. maximum depth). The development permit with a designated 'works number' replaces the need for bores to be registered (as required under superseded legislation). The licence grants a share of the resource i.e. entitlement. A water permit allows for the extraction of water and designates a use/purpose, volume for extraction and time period.

Environmental (Water) Protection Policy 1997

The Environmental Protection (Water) Policy 1997 (EPP (Water)) governs the discharge of wastewater to land, surface waters and groundwater. It provides a framework for defining the environmental value of water and guidelines for water quality.

10.2.2 GROUNDWATER ASSESSMENT METHODOLOGY

The groundwater technical study for the MLA areas was undertaken during the period December 2007 to July 2008. It built upon the work done in the prefeasibility study undertaken in 2007 (Parsons Brinckerhoff, 2007).

The groundwater technical study involved

- literature and data search
- hydrocensus

- drilling and bore construction
- pumping test
- hydrogeological assessment, including hydrochemistry
- groundwater impact assessment.

Details of the groundwater study for the MLA areas including the gas pipeline are provided in Chapter 10, Section 10.2.1 in Volume 1 of the EIS.

The study area for the groundwater assessment included the west of the MLA area, therefore, the hydrogeological information gathered for the original groundwater technical study is considered relevant for the proposed pipeline. Given the shallow depth of the proposed pipeline, a separate field study was not considered to be necessary for the proposed pipeline study area.

10.3 EXISTING ENVIRONMENT

The pipeline area is underlain by the Injune Creek Group composed of the rocks of the Walloon Coal Measures and sandstone formations. Quaternary alluvium associated with the major creek lines of Horse and Eurombah Creeks and their tributaries, unconformably overlie the rocks of the Walloon Coal Measures and are approximately 19 m deep.

10.3.1 GEOLOGY AND STRATIGRAPHY

The regional geology of the proposed pipeline area is presented in Figure 10-1-V3.3. Note that figures/documents with numbering ending in V3.3, for example, refer to figures/documents contained in Volume 3, Book 3 of the EIS. The geology and stratigraphy relevant to the study area are described in Chapter 9 (refer Section 9.3.2).

The proposed pipeline alignment is underlain by the Injune Creek Group, composed of the rocks of the Walloon Coal Measures, and sandstone formations of the Great Artesian Basin (GAB). Quaternary alluvial sediments associated with the major stream lines of the Eurombah Horse Creeks, and their tributaries, unconformably overlie the Injune Creek Group. These quaternary sediments are associated with the surface water courses and are likely to be relatively shallow.

10.3.2 HYDROGEOLOGY

QuaternaryAlluvium

The alluvium acts as an unconfined aquifer that is directly responsive to seasonal events such as rainfall and drought within the proposed pipeline area. Water levels are found between 1 m and 8 m below ground level in the alluvium associated with the Frank, Mud and Woleebee Creeks. The alluvium associated with the Horse and Eurombah creeks and their tributaries is likely to have similar water levels. The groundwater within the alluvium is likely to be primarily dependent on creeks for recharge. Discharge from the aquifer is likely to occur during dry periods and potentially supplies base-flow to the local creek systems and any dependent ecosystems. There is likely to be a strong groundwater/ surface water connection.

Injune Creek Group Rocks

Groundwater occurs predominantly within fractures in the coal (primarily the cleats). Water strike in the Juandah Coal Measures is highly variable, varying from 18 to 123 m below ground and averaging around 95 m. The water bearing zones are up to 10 m thick. The inter-bedded sandstones, siltstones and shales act as semi-confining layers separating the water bearing zones within the coal seams. Regional groundwater flow is expected to be in a south-westerly direction (Habermehl and Lau, 1997).

The shallow water bearing zones are found in the Kogan coal seam and are generally of low transmissivity and water holding capacity. The shallow water bearing zones in the coal seams often provide little water.

On a regional scale, units such as the Walloon Coal Measures, within the Injune Creek Rocks, occupies the sequence between the major aquifers and are usually fine-grained sediments and form confining layers so that aquifers are not considered hydraulically connected to the deeper underlying Great Artesian Basin aquifers (PPK Environment and Infrastructure 2000, and Parsons Brinckerhoff and DNRM&E 2004).

Literature and data collection

The majority of previous studies have focused on the groundwater conditions of the deeper GAB, with little work available on the groundwater conditions of the Walloon Coal Measures or the alluvial sediments associated with the Horse and Eurombah Creeks and their tributaries.

There is limited information available from the NRW registered bores and WJV monitoring bores on water levels, yields or water quality within the proposed pipeline area.

Wandoan Joint Venture (WJV) exploration drill holes within the MLA areas are typically drilled to between 120 and 160 m total depth, targeting the Walloon (including Juandah) Coal Measures, although some holes extend up to 300 m in depth. Coal exploration drilling, particularly historic exploration generally did not consider the shallow groundwater conditions. However, recent bore logging has noted the presence of groundwater in drill holes and provided an estimate of flow.

Hydrocensus

The historic information on the bores within the proposed pipeline route is limited. There were 6 NRW bores and 5 WJV bores identified west of MLA 50229 with water strike and standing water level data available. The bores identified in the proposed pipeline area show that their location is in the eastern portion of the pipeline area (refer Figure 10-2-V3.3).

Water level information and monitoring

A previous groundwater monitoring drilling program (Parsons Brinckerhoff, 2008) included the installation of one production bore (R9095) and three monitoring bores (R9096, R9097, R9098). These have become additional bores in the monitoring network. The bores were drilled to target the coal seams of the Juandah Coal Measures, specifically the Kogan, Macalister and Wambo coal seams.

Historic water level and water quality monitoring at these sites has been intermittent. The WJV bores had water levels measured in 2008 and were similar to the water levels in the MLA areas (PB, 2008). The water levels in the bores located in the proposed pipeline area ranged from 15 to 41 m below ground level (refer Table 10-1).

Table 10-1: Summary of bores close to proposed western water supply pipeline area

Bore	Info source	Elevation (m)	Total Depth (m)	Top water strike (m)	Bottom water strike (m)	SWL (m)
34718	NRW	300	62	62	62	—
34929	NRW	300	57	51	57	—
44605	NRW	250	78	72	78	—
58079	NRW	250	58	52	58	—
44246	NRW	250	19	18	19	—
14632	NRW	250	—	—	—	—
R6126	WJV	287.77	129	123	129	39
R6127	WJV	285.81	123	120.1	123	19.5
R6128	WJV	274.59	123	121.8	123	27.5
R6151	WJV	263.54	123	123	123	20
R6226	WJV	326.73	63	45.7	45.8	15
R9095	WJV	265.3	91	46	84	22.8
R9096	WJV	264.4	88	27	84	40
R9097	WJV	286.4	77	70	73	41.1
R9098	WJV	271.6	62	38	58	22.5

10.3.3 WATER QUALITY

Alluvium

There is no water quality data available for groundwater within the Quaternary Alluvium. It would be expected that water quality within these sediments would be similar to the overlying creeks and is likely to be fresh. Further away from the creek lines it is expected that water quality would be influenced by the more saline groundwaters of the Injune Creek rocks.

Injune Creek group rocks

Water quality in the bores located in the proposed pipeline area was measured for field parameters (electrical conductivity (EC), pH and temperature) following bore construction. The data suggests that salinity is higher in the shallow coal seams of the Kogan (at EC values exceeding 20,000 µS/cm), with the deeper coal seams (Macalister and Wambo) showing slightly lower salinities (with EC values approximately 17,000 µS/cm). pH values suggest that Kogan coal seams are closer to neutral than the slightly alkaline deeper Macalister and Wambo coal seams (pH around 8).

10.4 DESCRIPTION OF PROPOSED DEVELOPMENT

The Project will include on-site coal handling and processing which will require a constant and reliable water supply. It is anticipated that operations raw water requirements for the Project will be up to 9,100 ML/a. A potential water resource to satisfy this demand has

been identified at the Origin and Santos CSM gas wells located at Spring Gully, approximately 100 km to the west of MLA 50229.

It is proposed to establish the proposed pipeline to beneficially re-use CSM gas waste water and secure a water supply for the Wandoan Coal Project. The water would be piped from the evaporation pond at the Spring Gully CSM gas fields to the raw water dam located at the mine infrastructure area (MIA). Treatment of the CSM gas water to a standard suitable for use in coal handling and processing will be undertaken prior to the water leaving the Spring Gully CSM gas field.

Initial design concepts indicate that the proposed pipeline will be between 90 km and 100 km in length and will require only a single lift pump station at the Spring Gully CSM gas field point of supply. The pump will operate for 20 hours per day. Pipe diameter size will be between 500 and 710 mm and will be located underground (approximately 1 m deep). It will be constructed using a section trench and backfill method.

The major streams and their tributaries potentially impacted by the proposed pipeline development include (but are not limited to) Eurombah Creek and Horse Creek, with eight potential crossings.

The proposed pipeline route is proposed to intersect with and be located, in part, within the Roma – Taroom Road, which is a state controlled road.

10.5 POTENTIAL IMPACTS

10.5.1 GROUNDWATER RESOURCES

The shallow depth of the proposed pipeline means that impacts to the deeper aquifers during construction are unlikely. Potential impacts to shallow groundwater within alluvial sediments along the main stream lines may be encountered during the installation of the proposed pipeline. However:

- the alluvium is not considered to be a significant groundwater resource and the potential for adverse impact is likely to be low
- the impacts are short term impacts to the alluvium during the pipeline installation
- water quality impacts will be very localised both horizontally and vertically.

10.5.2 ENVIRONMENT

Potential impacts to the environment as a consequence of the proposed pipeline are assessed as follows:

- no groundwater dependant ecosystems were identified and the impact is short term
- base-flow to streams and changes to drainage lines in the medium to long term are unlikely to be affected
- there is potential for some localised groundwater contamination if a significant contamination incident occurs onsite, particularly if occurring in the alluvial sediments. The groundwater within the alluvial sediments associated with the defined streams has the highest risk.

10.5.3 OPERATION OF PIPELINE

The potential impacts to groundwater if there is a leak in the pipe include:

- pipeline water leaking into the alluvium, or the weathered rock sediments of the Injune Creek Group. The electrical conductivity of the raw CSM aquifer water ranges from 11,700 to 23,100 μS/cm. The water is to be treated prior to being put in the pipeline and the treated water quality will be approximately 7,100 μS/cm (or 4,000 mg/l). The treated water quality would then not likely impact the water quality of the more saline groundwater of the Injune Creek rocks, however some degradation would likely occur in alluvial systems.

10.6 MITIGATION MEASURES

10.6.1 GROUNDWATER

The temporary disturbance to alluvial groundwater systems is unlikely to require mitigation measures during construction of the pipeline. If possible, construction should be undertaken during the dry season and best practices should be employed to contain any spills.

10.6.2 ENVIRONMENT

The risk of contamination to groundwater from a spill or incident on site is highest at locations that directly overlie the alluvium. It is proposed that machinery and potentially contaminating equipment be stored and operated on adjacent weathered rocks rather than directly over the alluvium where possible. Further mitigation measures will be to ensure that chemical spill kits are available on site in case of fuel spills and that there are appropriate waste disposal protocols in place.

10.6.3 OPERATION OF PIPELINE

Leakage from the pipeline into the adjacent agricultural land or alluvial sediments must be avoided as far as possible through appropriate design and maintenance. Measures to account for water inputs or output (water balancing) will be established.

10.7 RESIDUAL IMPACTS

There is likely to be a minimal amount of groundwater encountered during the installation of the proposed pipeline. Short term impacts occurring during the pipeline installation are likely to be minimal and further long term disturbance to the alluvium is unlikely. It is unlikely there will be any residual impacts to the pipeline area.

10.8 REFERENCES

Habermehl and J.E. Lau, 1997, Hydrogeology of the Great Artesian Basin, Australia. Australian Geological Survey Organisation, Canberra.

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