11 WATER RESOURCES

11.1 INTRODUCTION

This chapter provides an assessment of potential impacts to water resources from construction and operation of the proposed southern coal seam methane (CSM) water supply pipeline (the proposed pipeline).

11.2 METHODOLOGY OF ASSESSMENT

11.2.1 RELEVANT LEGISLATION AND GUIDELINES

Legislation and guidelines relating to assessment of water resources along the pipeline route are discussed below.

Water Act 2000

The purpose of the *Water Act 2000* is to provide for the sustainable management of water and other resources. Under Section 266 of the *Water Act 2000*, a Riverine Protection Permit is required from the Department of Natural Resources and Water (NRW) to:

- destroy vegetation in a watercourse
- excavate in a watercourse
- place fill in a watercourse.

The proposed pipeline route traverses a number of watercourses and therefore approvals and/or permits will be required for pipeline crossings of these watercourses.

Additionally, where waters are to be taken from a watercourse, lake, spring or underground water, a Permit to Take Water may be required pursuant to section 237 of the *Water Act 2000*. Water for use during the construction phase of this proposal will preferentially be obtained from local on-site water sources, but the final source is yet to be confirmed. Further discussion is provided in Chapter 11 Water Supply and Management of Volume 1.

Environmental Protection (Water) Policy 1997

The Environmental Protection (Water) Policy 1997 (EPP Water) is subordinate legislation under the Qld *Environmental Protection Act 1994* (EP Act). It functions as an important tool for ensuring that broad environmental protection measures are better defined when it comes to the specific issues of protecting water.

The EPP Water identifies environmental values (EVs) for Queensland waters and provides a framework to define water quality guidelines and water quality objectives (WQOs) to enhance or protect the environmental values. EVs and WQOs have been established under Schedule 1 of the EPP Water for freshwater. However, none of the waters affected by the proposal are scheduled in Schedule 1 of the Policy through the corresponding Environmental Values and Water Quality Objectives report(s). The environmental values of the receiving waters are therefore deemed to be considered by addressing water quality guidelines.

In the policy, it is stated that the Australian and New Zealand Environment and Conservation Council (ANZECC) 2000 Guidelines are appropriate to be used to decide water quality trigger values for environmental value indicators for a water body.

Site based Environmental Values

EVs for the proposed pipeline area have not been identified. Dalby Regional Council is in the process of developing EVs for the area.

As site specific information is not available, the Australian and New Zealand Environment and Conservation Council (ANZECC) 2000 guidelines are to be *'used as a general tool for assessing water quality and are the key to determining water quality objectives that protect and support the designated environmental values of water resources, and against which performance can be measured'* (ANZECC 2000).

The ecosystem condition that is most appropriate to be applied to the default guideline value (ANZECC 2000) is a *'slightly to moderately disturbed system'.* The guideline values refer to the following levels of protection:

- physical and chemical stressors
- toxicants
- biological indicators.

For further information on the ANZECC (2000) trigger values for physical and chemical stressors, toxicants and biological indicators relating to the proposed pipeline, refer to the technical report TR 11-1-V2.5 entitled CSM water supply and gas supply pipelines Surface Water Quality impact assessment technical report. Note that figures/documents with numbering ending in V2.3, for example, refer to figures/documents contained in Volume 2, Book 3 of the EIS.

Fisheries Act 1994

The *Fisheries Act 1994* is an '*Act for the management, use, development and protection of fisheries resources and fish habitats and the management of aquaculture activities, and for related purposes'* (*Fisheries Act* 1994).

Under Division 8 of the *Fisheries Act 1994*, a waterway barrier works approval is needed to build any structure across a freshwater waterway. The purpose of this part of the Act is to provide a balance between the need to construct dams and weirs and the need to maintain fish movement. Impacts of the pipeline on fish passage are addressed in Chapter 17 and in technical report TR 17-1-V2.5: Wandoan Coal Project: Southern Coal Seam Methane Water Supply Pipeline, Aquatic Ecology impact assessment.

11.2.2 CATCHMENT HYDROLOGY

Catchments and watercourses potentially affected by the proposed southern CSM water supply pipeline have been identified through a review of topographic maps and aerial photographs. Hydrology within these watercourses was assessed through a review of NRW stream gauging stations and a review of NRW mapped spring vents and groundwater discharge locations. Rainfall within the catchment has been assessed through a review of historic rainfall records from both the Bureau of Meteorology (BOM) station at Miles Post Office and a privately owned weather station at Jondale.

11.2.3 WATER QUALITY

Existing water quality was assessed through a review of historical data available from NRW. Further details on the methodology for this assessment are given in TR 11-1-V2.5 CSM water supply and gas supply pipelines Surface Water Quality impact assessment technical report.

Water quality impacts have been assessed based on a detailed review of construction and operational phase activities and identification of potential pollutant sources and pollutant paths during these stages. Measures to mitigate impacts have also been identified.

11.3 EXISTING ENVIRONMENT

11.3.1 CATCHMENT DRAINAGE

The majority of the study area is located within the greater Condamine – Balonne Basin which includes the Balonne, Maranoa and Merivale River systems. The Condamine – Balonne River system is one of the major tributaries of the Murray-Darling River system.

The northern part of the study area is located within the greater Fitzroy River Basin which includes the Dawson, Nogoa, Mackenzie and Fitzroy River systems. The Fitzroy River drains generally to the east to meet the Pacific Ocean at Rockhampton.

The proposed pipeline route is located in the upper reaches of the Condamine River catchment and the upper reaches of the Dawson River catchment. Within the Dawson River catchment, the proposed route crosses Juandah Creek and a number of its smaller tributaries, including Sandy Flat Creek. Within the Condamine River catchment, the proposed route crosses Dogwood Creek, and a number of its smaller tributaries, including Eleven Mile Creek, Nine Mile Creek, Wallan Creek and L Tree Creek. Other smaller unnamed drainage lines will also be crossed by the proposed pipeline route.

The catchment drainage and stream base-flow is shown in Figure 11-1-V2-3. The watercourses affected by the proposed southern CSM water supply pipeline route are shown in Figure 11-2-V2-3.

11.3.2 STREAM HYDROLOGY

The study area is located in the upper reaches of the Condamine River and the Dawson River catchment. NRW operates stream gauges on both Juandah Creek (at Windamere, station 130344A) and Dogwood Creek (at Gilweir, station 422202B) in the vicinity of the proposed pipeline route.

The gauge on Juandah Creek is located just downstream of the Mining Lease Application (MLA) at Adopted Middle Thread Distance (AMTD) 62.8 km and has been in operation since late 1975. The catchment area to the gauge location is 1,678 km^2. Based on the NRW gauged streamflow data, the mean annual flow in Juandah Creek is 46524 ML/a, or 27.7 mm of runoff – i.e. a runoff to rainfall ratio of 4.3% (NRW, 2008).

Streamflow in Juandah Creek is highly variable as shown in Figure 11-3. Intermittent episodes of high flow are interspersed with long periods of no flow during which the bed is dry except for small isolated waterholes. Streamflow events tend to be of relatively short durations.

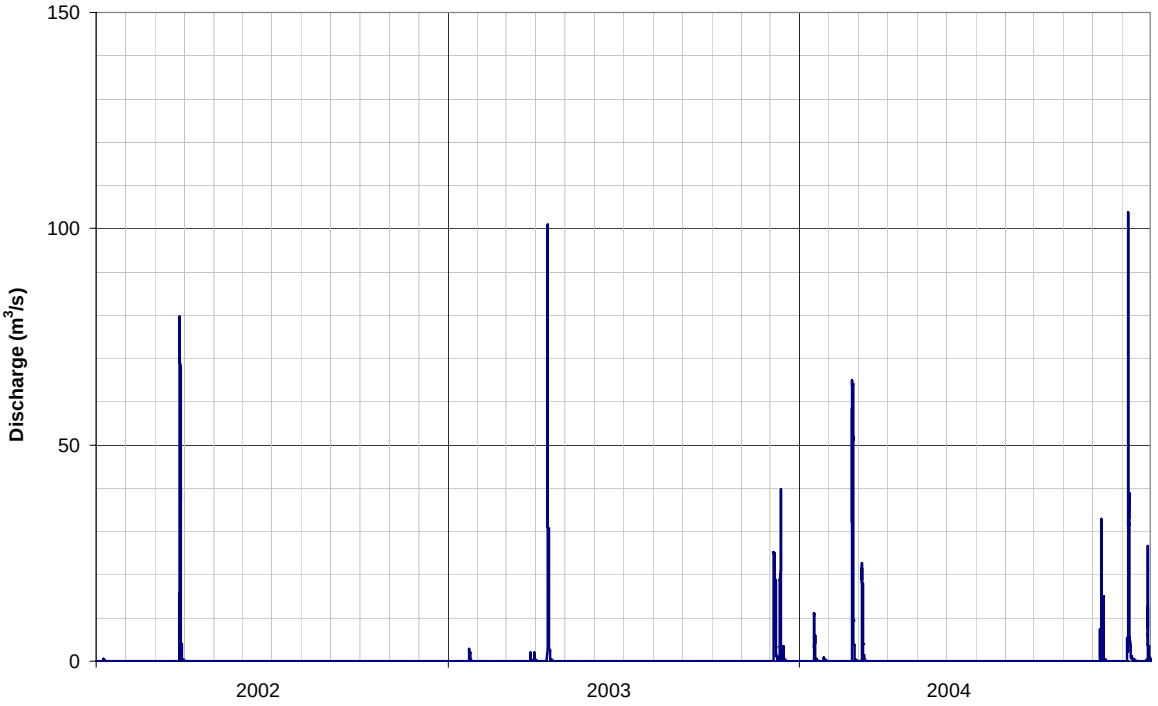

Figure 11-3: Example of Juandah Creek streamflow 2002 to 2004

Flow events occur all year round, but the largest contribution to annual runoff comes from events occurring in December, January and February, as shown in Figure 11-4.

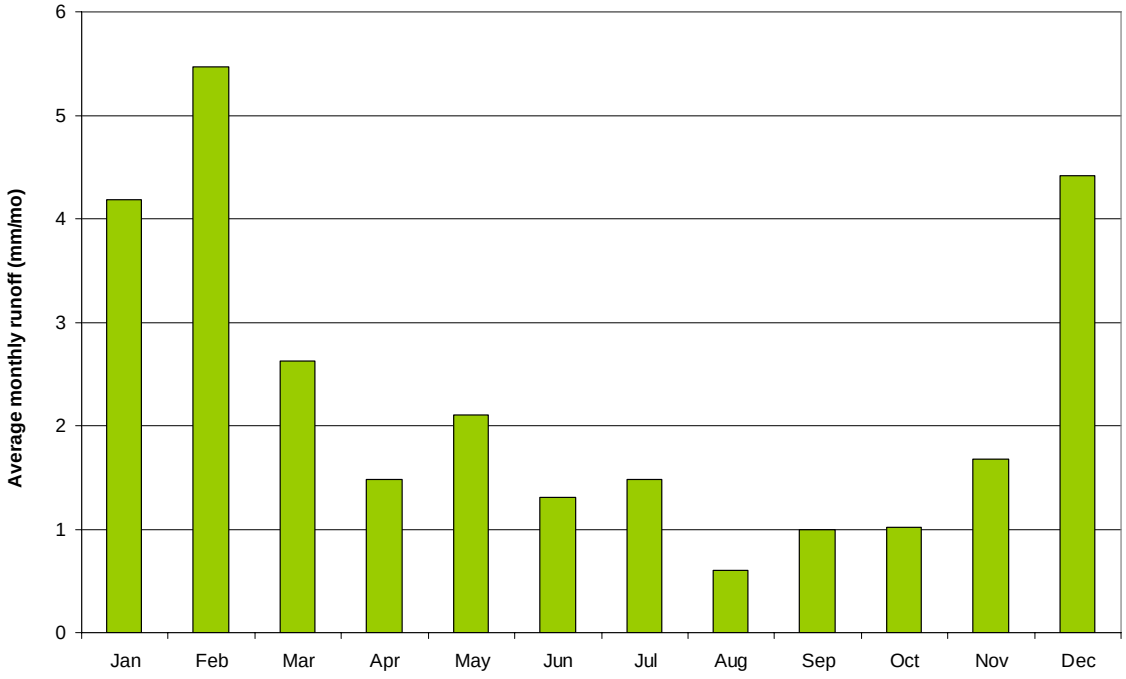

Figure 11-4: Seasonal variation in monthly runoff – Juandah Creek

The gauge on Dogwood Creek is located at Gilweir at AMTD 107.9 km and has been in operation since 1950. The catchment area to the gauge location is 3010 km^2. Based on the NRW gauged streamflow data, the mean annual flow in Dogwood Creek is 75593 ML/a, or 25.1 mm of runoff (NRW, 2008).

Streamflow in Dogwood Creek is highly variable. While there are long periods of little or no flow in Dogwood Creek there are also periods of months at a time when flows are higher than 1 m^3/s. As shown in Figure 11-5, it can be seen that during 1997 the creek was flowing most of the year. However, in other years the creek bed is dry except for small isolated waterholes during much of the year.

Flow events occur all year round, but the largest contribution to annual streamflow occurs during December, January and February, as shown in Figure 11-6.

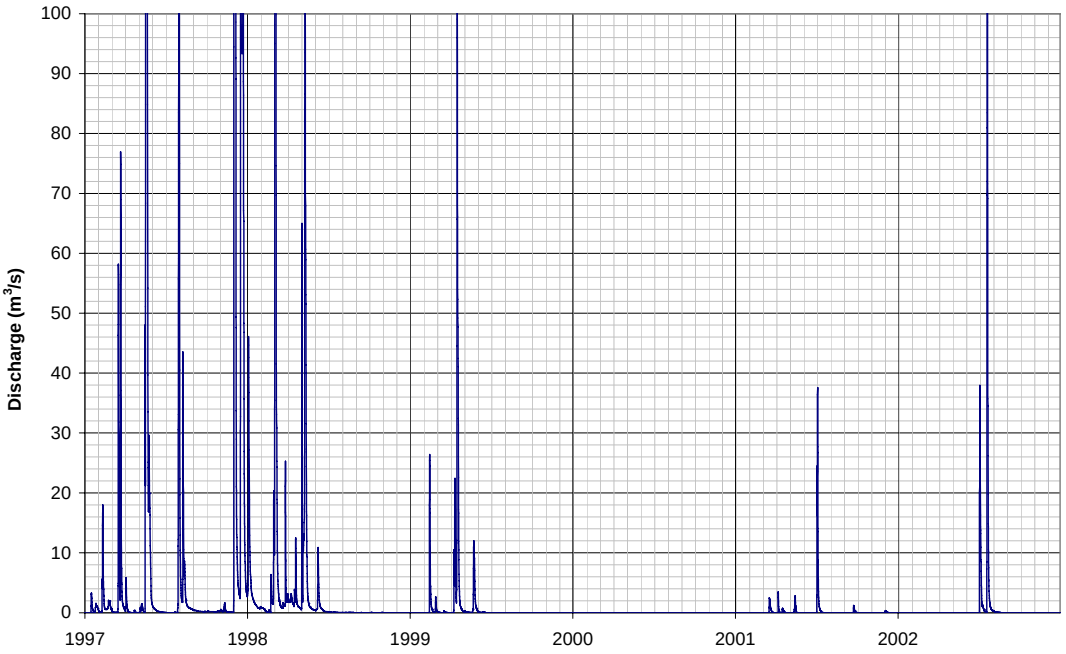

Figure 11-5: Example of Dogwood Creek streamflow 1997 to 2002

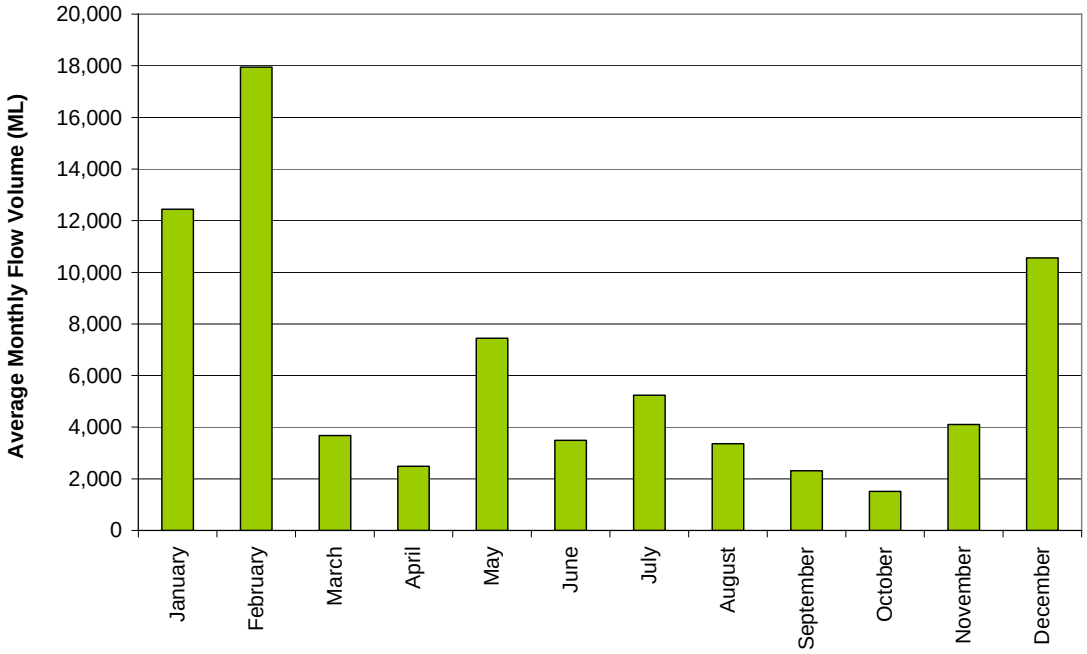

Figure 11-6: Seasonal variation in monthly streamflow – Dogwood Creek

Other watercourses and drainage lines crossed by the proposed pipeline form tributaries of either Dogwood Creek or Juandah Creek upstream of the NRW gauging stations. It is therefore likely that these other tributaries / drainage lines crossed will also have long periods during which the bed is dry with only waterholes persisting for months following flow events.

The proposed pipeline route overlies the Great Artesian Basin (GAB). Reaches of Dogwood Creek upstream of the proposed pipeline crossing, has been indicated by NRW to be supported by groundwater discharge from the GAB. Figure 11-1-V2.3 shows the location of potential groundwater discharges in this area.

11.3.3 WATERCOURSE GEOMORPHOLOGY

A detailed assessment of the geomorphic condition at each watercourse proposed to be crossed by the pipeline route has been conducted by frc environmental during preparation of the aquatic ecology impact assessment for this Environmental Impact Study (EIS). This assessment looked at:

- Bank stability – there is considerable bank erosion at most of the watercourses proposed to be crossed by the pipeline route. This is considered to be the result of water scouring during periods of high flow, although at locations on Eleven Mile Creek and its tributaries and on a tributary to Sandy Flat Creek bank disturbance is a result of cattle access. Bank stability is maintained at a large number of the crossing locations by bank vegetation and the root systems of larger trees
- Bed and bar stability – stream beds throughout the study area are moderately stable, with scour evident on outside meanders, downstream of obstructions and along roadside drainage channels

- Channel diversity – channel diversity is extremely low across the study area, with isolated pools forming the dominant habitat category. Bends and pools are likely to provide some diversity during flow periods. No riffle habitat was observed by frc environmental during the assessment
- Aquatic habitat – habitat at each watercourse is generally in the form of small woody debris, fallen logs and tree roots
- Riparian vegetation – throughout the study area, riparian zones are generally 10- 20 m wide. Grasses typically dominate the riparian zone of the creeks, although shrubs and trees are also present at most sites.

Further details of this assessment, including a photographic record of the current condition of each watercourse, are provided in TR 17-1-V2.5: Wandoan Coal Project: Southern Coal Seam Methane Water Supply Pipeline, Aquatic Ecology impact assessment.

11.3.4 FLOODING

Details of flooding in the vicinity of the Wandoan Coal Project Area are provided in TR 11-1-V1.5 Wandoan Coal Project: Water supply and surface water hydrology technical report. Further details of flooding along the extent of the pipeline route have not been assessed as the proposed pipeline will be constructed below ground and will not impact on flooding within either the Dawson River or the Condamine River catchments.

11.3.5 RAINFALL PATTERNS

Historic rainfall data was obtained from the BOM weather station at Miles Post Station (located at the southern extent of the proposed pipeline) and the privately operated Jondale weather station (located just outside Wandoan, at the northern extent of the pipeline). Further details of data obtained from these stations are provided in Chapter 7 Climate.

The total annual rainfall throughout the study area is quite low, with historical data collected from the southern area reported an average rainfall of approximately 652 mm per year (based on rainfall data from 1885 to the present (BOM 2008)). The majority of these falls occur during the summer months (up to 40%), with January reporting the month of highest total rainfall. Winter and autumn have generally had the lowest total rainfalls across the study area. The northern locality of the pipeline showed similar seasonal rainfall trends to the BOM values.

However, a lower annual rainfall was measured due to the drought conditions that prevailed at the time the data was collected (April 2007 to March 2008). During the period April 2007 to March 2008, rainfall patterns were found to be generally consistent along the length of the pipeline route however rainfall depths varied slightly over the 93km pipeline distance, with some months (notably September and October 2007) experiencing higher rainfall at Miles Post Office, and others (January and February 2008) experiencing higher rainfall at Jondale.

11.3.6 WATER QUALITY

The NRW operates water quality monitoring sites on Juandah Creek (NRW gauging site 130344A) and Dogwood Creek (NRW gauging site 422202B), at the same location as the stream flow gauges. Data from these sites have been used to gain an understanding of water quality in the area. Further assessment of physical water quality parameters was conducted by frc environmental during preparation of the aquatic ecology impact assessment for this Environmental Impact Statement.

The NRW historic water quality data indicates historical nutrient pollution in the proposed pipeline area. This has been associated with diffuse runoff from agricultural activities within the catchment. Total Suspended Solids (TSS) and turbidity values have also been identified as being generally high. This has been associated with soil erosion within the catchment.

The water quality analysis also indicated elevated heavy metal levels. Most of the historical samples taken for heavy metals exceed the 95% protection trigger values (slightly to moderately disturbed systems, ANZECC 2000). Natural background concentrations of some chemicals, particularly metals, may exceed the stated guideline trigger values due to mineralisation from the catchment substrate, as distinct from anthropogenic sources (ANZECC, 2000).

Sampling conducted by frc environmental found that DO concentrations levels complied with the ANZECC 2000 guideline values, except at Dogwood and L Tree creeks. Low DO concentrations in L Tree and Dogwood Creeks were probably due to high biological oxygen demand and low mixing of the waters. Conductivity was below the ANZECC guidelines for all sites except Wallan and L Tree creeks. pH tended to be acidic (< 7) across most sites, but it ranged from 5.6 at Dogwood Creek to 7.8 at L Tree Creek. Eleven Mile Creek and a tributary to L Tree Creek were the only creeks with a pH value within the guideline range. Differences in pH between sites may be related to local geomorphology.

There is insufficient data available to discuss the existing water quality in terms of seasonal variations or variations with flow.

Further details on surface water quality is provided in TR 11-1-V2.5 5 Wandoan Coal Project: Water supply and surface water hydrology technical report and in TR 17-1-V2.5: Wandoan Coal Project: Southern Coal Seam Methane Water Supply Pipeline, Aquatic Ecology impact assessment.

11.3.7 EXISTING WATER USERS

A list of existing water users was compiled through a search of the NRW database on surface water extraction licences. The search revealed 4 surface water licences within 5km of the proposed pipeline route. Location and descriptions of use are provided in Table 11-1.

Table 11-1: Surface water extraction licences

Location (RP Number)	Purpose
11RP900616	Irrigation
11RP900616	Irrigation
27BWR781	Domestic supply, stock
130BWR785	Conserve water

11.4 DESCRIPTION OF PROPOSED DEVELOPMENT

This impact assessment examines the potential impacts on the catchment drainage, stream hydrology, water quality, and existing water users resulting from the construction and operation of the proposed pipeline. Details of the proposed development are provided in Chapter 5 Project Construction and Chapter 6 Project Operations.

11.5 POTENTIAL IMPACTS

11.5.1 CONSTRUCTION IMPACTS

Primary impacts to surface water resources during construction of the proposed pipeline will occur as a result of disturbance to land, watercourse banks and watercourse beds during trenching and pipe laying activities. Disturbance of these land surfaces will result in increased potential for sediment runoff and erosion.

It is proposed that trenching techniques are used as the primary construction method of the proposed pipeline. The width of the trench will be in the order of 2 m, with the pipeline being positioned at typically between 0.6 m and 1 m depth, however greater depths may be used subject to site specific risk assessment and land uses. The width of vegetation clearing for construction purposes will be up to 20 m.

Trenching techniques may also be used for construction of the pipeline across watercourses and drainage lines, although where practical, a trenchless crossing method will be used if construction occurs in the wet season. Trenching techniques have the potential to cause damage to sensitive riparian vegetation, aquatic ecology and geomorphic features of the watercourse. Further assessment of the watercourses proposed to be crossed will be conducted during detailed design.

There is potential for water quality degradation to occur as a result of spills of fuels, oils, and general site waste generated during pipeline construction activities.

Construction of the pump station may also lead to increased sedimentation due to land surface disturbance. There is also potential for generation of waterway pollutants from site spills and construction waste generation during this activity.

Once constructed, hydrostatic testing of the pipeline will be undertaken. This will be conducted over a maximum length of 1km of pipeline at any one time. It is expected that a maximum of 30ML of water for the whole pipeline would be required to be used during each test. This water will be captured and, subject to water quality, recycled for further

tests or for use as construction water on the mine site. Any leaks will have the potential to cause scour of material and soil surrounding the pipeline.

11.5.2 OPERATIONAL IMPACTS

During operation of the pipeline there is potential for leakage or rupture of the pipeline as a result of accidental damage to the pipe. However, the risk of this occurring and uncontrolled emissions entering watercourses will be low as long as the proposed mitigation measures (refer Section 11.6) incorporated into the pipeline design and operation.

A detailed water quality specification will be prepared during detailed design stages of this proposal. Coal seam gas water is often rich in salts and other constituents indicating that water quality will be poor in comparison to the catchment water resources. Should leaks occur along the pipeline there is potential for water quality and aquatic ecology within the watercourses downstream of the leak to be negatively impacted. Leaks from the pipeline also have the potential to cause scour and soil erosion as the water leaves the pipe.

Scour outlets will be located at regular intervals along the pipeline route which will be decided during detailed design. There is a minor risk for spills to occur during the cleanout of the scour outlets along the pipeline route.

The proposed pipeline has an expected life of approximately 30 years. During this time natural geomorphic changes may alter the existing profile of any of the watercourses with some risk that the pipeline will become exposed.

11.6 MITIGATION MEASURES

11.6.1 CONSTRUCTION STAGE

Management of impacts to surface water resources during the construction phase will be closely linked to soil management. An Erosion and Sediment Control Plan will be prepared in accordance with Soil Erosion and Sediment Control; Engineering Guidelines for Queensland (Institution of Engineers, Australia, 1996) prior to the commencement of any construction activities. Measures that are likely to be incorporated in this plan include:

- installing erosion and sediment controls, such as sediment fences, in accordance with the Erosion and Sediment Control Plan
- diversion of clean surface runoff away from disturbed areas
- stockpiles of excavated materials will be located away from gullies and drainage lines
- clear identification of the areas required to be disturbed to ensure that land disturbance is minimised and as little vegetation is cleared as possible
- planning construction works to minimise the length of time that soils are disturbed and ensuring prompt rehabilitation and revegetation of areas as soon as works are complete.

Further discussion of erosion and sediment control is provided in Chapter 9 Geology, Mineral Resources, Overburden and Soils.

The following measures will be implemented to minimise impacts during construction of the proposed pipeline at waterway crossings:

- during detailed design of the pipeline, NRW will be consulted to ensure that the proposed construction methods are appropriate at each watercourse crossing and to obtain any approvals required under the *Water Act 2000.* Should significant or sensitive features be identified during detailed design phases, other construction techniques such as directional drilling will be considered for pipeline construction
- construction activities will be planned at waterway crossings to coincide with dry periods or low flow periods (autumn and winter months) where possible
- should it be necessary to construct the pipeline across a watercourse that is not dry, the water will be contained by a levee and the pipeline constructed in the minimal time possible to ensure minimal disturbance to the watercourse. Alternatively, if necessary other construction techniques, such as directional drilling will be adopted
- material excavated from within watercourses will be segregated so that, for example, material from the creek bed and topsoil from the banks are not mixed. This material will be reinstated in its natural position
- construction materials will not be stored within the channel of watercourses. Movement of construction vehicles, plant and personnel within the channel and banks of watercourses will be restricted.

Other general mitigation measures which will be required during construction include:

- ensuring that chemicals and fuels are appropriately stored and bunded
- training of construction employees to implement spill response procedures and implement, maintain and be aware of sediment and erosion control measures and requirements.

Mitigation measures required during hydrostatic testing include:

- a maximum length of pipeline of 1km will be tested at a time
- should leaks be detected, testing will cease immediately
- water from each test will be captured for dust suppression for the pipeline construction, reuse in further tests or for construction water at the mine site.

11.6.2 OPERATION

Measures to mitigate impacts during operation of the pipeline will be incorporated into the pipeline design and maintenance and monitoring schedule.

The pipeline will be designed and constructed such that it is located at adequate depth from the bottom of all watercourses crossed to ensure that there is minimal potential for scour and resulting changes to channel morphology. This will ensure that operation of the proposed pipeline will not affect the existing stream profile at any of the crossings. As there is unlikely to be any change to the cross section profile at crossing locations, there will also be no change to the conveyance of any of the waterways and no impact to the flow or flooding regime.

The NRW will be consulted during pre-construction activities to ensure that design factors such as depth of cover will be suitable minimise potential impacts and to obtain any approvals required under the *Water Act 2000.*

Following periods of heavy rainfall, watercourse crossings will be inspected to check for signs of scour and erosion. If necessary, rehabilitation works will be carried out to prevent erosion along the pipeline route.

Scour outlets will be equipped with a cam-loc coupling to allow the pipe to be dewatered into a water truck. Water collected will be trucked to the mine site for release into the water storage dam (if of a suitable water quality), or disposed of to the tailings dam. Spill containment will be incorporated at each of the scour outlet locations to ensure that any spills during pump out of water are contained and not released to the surrounding environment. The small amounts of water that may spill during scour outlet pump out will be left to evaporate from the containment structure. The WJV will monitor the impacts of any spills and develop appropriate responses as required within the Project Environmental Management Plan.

Regular maintenance and monitoring of the pipeline will be conducted to minimise the potential for pipeline leaks or ruptures to occur. This will include continuous monitoring of flows and regular inspection of the pipeline condition. Pipeline maintenance will be carried out when inspection notes this being required to minimise potential for leaks to occur. The pipeline will incorporate appropriate mechanisms for use in the event that failure of the pipeline occurs. This will ensure that large volumes of CSM water will not leak from the pipeline.

11.6.3 DECOMMISSIONING AND REHABILITATION

Pipeline decommissioning is most likely to involve either abandonment or beneficial reuse (see Chapter 25 Rehabilitation and Decommissioning for further details).

These options are not likely to result in any significant impacts to surface water resources. Any beneficial reuse will need to ensure that the condition of the pipeline at that time is suitable for the proposed use.

11.7 RESIDUAL IMPACTS

Provided the mitigation measures discussed in Section 11.6 are implemented, construction and operation of the proposed water supply pipeline should not have residual impacts on surface waters.

11.8 REFERENCES

Australian and New Zealand Environment and Conservation Council, and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC), 2000, *National Water Quality Management Strategy.*

Bureau of Meteorology (BOM) 2008a, *Climate statistics for Australian locations – Miles Post Office*, viewed 12 September 2008,
http://www.bom.gov.au/climate/averages/tables/cw_042023_All.
shtml

Department of Natural Resources and Water (2008) Historic Stream Gauging data for Juandah Creek at Windamere (130344A) and for Dogwood Creek at Gilweir (422202B), viewed 12 September 2008.

http://www.nrw.qld.gov.au/water/monitoring/current_data/site_details.php?site_id=130344A and
http://www.nrw.qld.gov.au/water/monitoring/current_data/site_details.php?site_id=422202B

Institution of Engineers (Queensland Division) and the Queensland Branch of the Australian Institute of Agriculture Scientists, 1996, *Soil Erosion and Sediment Control, Engineering Guidelines for Queensland.*