5 PROJECT CONSTRUCTION

5.1 INTRODUCTION

This section provides an overview of the likely methods and procedures that will be used by contractors in constructing the respective components of the proposed western coal seam methane (CSM) water pipeline (the proposed pipeline). The proposed pipeline will be generally located underground, constructed using a section trench and backfill method.

As outlined within Chapter 1 Introduction, the proposed pipeline will transport water from the Spring Gully/Fairview CSM fields, approximately 91 km to the west of Wandoan. The proposed pipeline route is shown in Figure 1-1-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.

It is proposed that the pipeline construction will be undertaken by a major pipeline contractor with the specialist equipment and expertise required to handle and weld large diameter pipe. Pipeline construction is expected to commence early in the second year of the Wandoan Coal Project (the Project) construction and proceed in an easterly direction towards the Project area.

The width of the proposed construction corridor will be approximately 20 metres. All construction activities will be undertaken within the proposed construction corridor.

5.2 CONSTRUCTION PROGRAM

As the commencement date for construction is dependent upon the timing of the Project approvals process, the Environmental Impact Statement (EIS) will not quote specific years for early works, construction and operation. The phasing of the Project is discussed in terms of early works commencing in Year -3, with the first year of construction being Year -2, second year of construction Year -1, followed by first year of operation as Year 1, then following operational years to Year 30. A description and indicative Project timing is provided in Table 5-1.

Table 5-1: Indicative Project timing

Year	Explanation	Indicative dates
Year -3	Pre–construction works	Aug-Dec 2009
Year -2	1st Year of construction	2010
Year -1	2nd Year of construction	2011
Year 1	Commencement of operations	2012

Work for the proposed pipeline (as outlined in the schedule below) is expected to commence during Year -2. Site preparation and construction is expected to commence in early Year -1. The pipeline construction schedule will require the following activities to be undertaken consecutively:

Early works (Year -2)	detailed survey and identification of sensitive areas validation of potential archaeological areas construction approvals fencing where required
Site preparation/Construction (Year -2 and Year -1)	progressive clearing and grading of the construction corridor trenching for majority of route and micro-tunnelling or thrust boring (across major infrastructure corridors, such as Roma – Taroom Road) pipe stringing and bending pipe welding and inspection joint coating pipe placement and backfilling
Post-construction	pressure testing rehabilitation and sign posting

The pipeline construction rate will vary depending on location and access to each section of the route. Preliminary indications suggest that the pipeline construction period will be approximately 9 months, based on an average construction rate of up to 300 metres per day. Further time will be required for pipeline commissioning.

5.3 SITE PREPARATION AND PRELIMINARY WORKS

5.3.1 SURVEY OF PIPELINE CORRIDOR

Detailed survey and fencing of sensitive areas

At the start of the site preparation phase, surveyors will mark the pipeline centreline (for trenching purposes), the width of the approved construction corridor and areas of particular significance that need to be avoided or protected during construction, including environmentally sensitive areas.

It is proposed that a qualified ecologist will accompany the surveyors to ensure that the ecological constraints and mitigation measures stipulated in Chapter 17 Ecology are correctly mapped and implemented.

Areas that have been identified as environmentally sensitive or that require protection from potential damage will be fenced for the duration of the construction period.

Validation of potential archaeological deposit sites

The Aboriginal register searches undertaken as part of this EIS identified a number of potential archaeological deposits (PADs), within or in close proximity to the proposed construction corridor. The existence of PADs does not necessarily mean that archaeological deposits occur in these locations, but requires that certain management measures be implemented before major earthmoving activities commence. Chapter 20A Indigenous Cultural Heritage provides further details.

As detailed in Chapter 20A, if the WJV chooses the western CSM water supply pipeline as its preferred option, and it is the entity that will own and construct the pipeline, the WJV will develop an "approved" Cultural Heritage Management Plan (CHMP), as required for the proposed pipeline area. The CHMP that is negotiated with the relevant Aboriginal Party will provide for comprehensive surveys to be undertaken over the proposed pipeline area to identify and protect cultural heritage prior to any activities taking place on the area. The team undertaking the surveys will include representatives of the relevant Aboriginal Party.

Once the inspection has confirmed the absence of artefacts, normal construction activities will proceed.

The construction contractor will implement the heritage management procedures that will be outlined in the CHMP to ensure that all works are stopped if a potential archaeological deposit site is encountered during construction. Relevant extracts are provided within Chapter 20A.

5.3.2 DEMOLITION OF EXISTING STRUCTURES

The proposed pipeline alignment has been situated in order to ensure that the existing residences are not impacted by the proposed development. Hence, no existing structures are expected to require removal or relocation for the construction of the proposed pipeline.

5.3.3 CONSTRUCTION ACCESS

Access to the proposed pipeline easement will generally be unrestricted along the entire route, except where it crosses private lands.

An access track will also be established parallel to the proposed pipeline to allow access for security patrols and maintenance vehicles. A number of walking tracks will also be established to provide access to the test points associated with the pipeline corrosion protection system. It is envisaged that up to four test points will be required. The test points will be located inside a small above ground lockable cabinet and access to these points will be restricted to appropriately qualified maintenance staff.

5.3.4 CONSTRUCTION COMPOUNDS

Although the majority of the construction activities will occur along the proposed construction corridor, the establishment of temporary construction compounds and facilities will be required during the construction period. These compounds will be used for the temporary storage of construction equipment and materials, and contain temporary construction management and project administration offices and crew amenities.

Based on the length of pipeline to be constructed, it is expected that potentially three construction compounds may be required. One compound will be located at the site of the proposed pump at the Spring Gully reverse osmosis plant and the second compound established within the Project area, possibly near the site of the proposed raw water dam in the mine infrastructure area (MIA). The location of the third compound along the corridor alignment will be decided after consultation with the Dalby and Roma Regional Councils (whichever is applicable) and adjacent property owners.

Each compound will be provided with the relevant site services and will be subject to strict environmental management controls and procedures, as per the Construction EMP for the pipeline.

5.3.5 ACCOMMODATION

The WJV estimates that a workforce of up to 50 may be required to construct the proposed pipeline. During the site preparation and construction phases, the workforce will potentially stay in local caravan parks, motels, or the Project accommodation facility for the duration of the pipeline construction. Personnel will be transported to site from these locations by

shuttle buses prior to and at the end of each shift. The WJV may also consider the development of temporary construction facilities to accommodate the workforce during pipeline construction. There is potential for such temporary facilities to be shifted to another site as construction progresses. The WJV will consult with local property owners and the Dalby and/or Roma Regional Council before any decision is made in relation to accommodation arrangements.

5.3.6 CONSTRUCTION SERVICES REQUIREMENTS AND INSTALLATION

Power

Power for construction equipment, lighting and security fencing at the construction compounds and along the corridor will be supplied by on-site generators.

Water Supply

The WJV is exploring a number of options to provide raw water for the site preparation and construction phases for the pipeline. Minimal supplies of raw water will be required for dust suppression and compaction. Options include trucking from town supplies at Wandoan; or entering into arrangements with adjacent landowners for short term supply. Additional raw water required for testing and commissioning of the pipeline is likely to be obtained from the CSM water supplier.

Sewage

Temporary sewerage package plants located at any proposed construction facility will be installed to manage sewage waste, under a commercial agreement with a licensed contractor. Appropriate approvals will be obtained from the Dalby and/or Roma Regional Council and the EPA, as required.

Telecommunications

There is an existing Telstra fibre optic cable and mobile phone tower that will provide telecommunications to the pipeline construction staff.

5.4 CONSTRUCTION ACTIVITIES

5.4.1 SITE CLEARANCE

Progressive clearing and grading of the construction corridor

A civil construction crew will proceed ahead of the pipeline construction crew to prepare the approved construction corridor. Activities will include vegetation clearing, grading, and the construction of access tracks from nearby roads to the construction corridor, if necessary. The use of existing access tracks will be given first preference to avoid any unnecessary clearing.

Vegetation clearing and grading will be carried out only when absolutely necessary to provide for safe construction within the corridor, and will follow the protocol for vegetation clearing outlined in Chapter 17 Ecology.

The proposed maximum width of the construction corridor will be 20 metres along the entire route to allow construction activities to be carried out in a safe and effective manner.

This width may be reduced to less than 20 metres at some locations where there may be environmentally sensitive areas near or at the edge of the corridor. The width may also be increased slightly for works that occur at or near a watercourse to provide additional room to stockpile vegetation and/or soil.

The corridor will be cleared of heavy vegetation but root stock will be left in the ground, where practicable, to stabilise the area and reduce soil erosion. Native seed will also be collected prior to clearing for use in the revegetation of the cleared areas during final site rehabilitation works. In scrubby areas, the vegetation will be mulched and stockpiled for future respreading in rehabilitated areas. All stockpiles will be placed away from drainage lines.

Stringent weed management procedures will be implemented during these tasks to ensure appropriate protocols are implemented to prevent or minimise the spread of noxious weeds to surrounding bushland. Weed-infested vegetation will be separated and disposed off-site to an approved waste management facility.

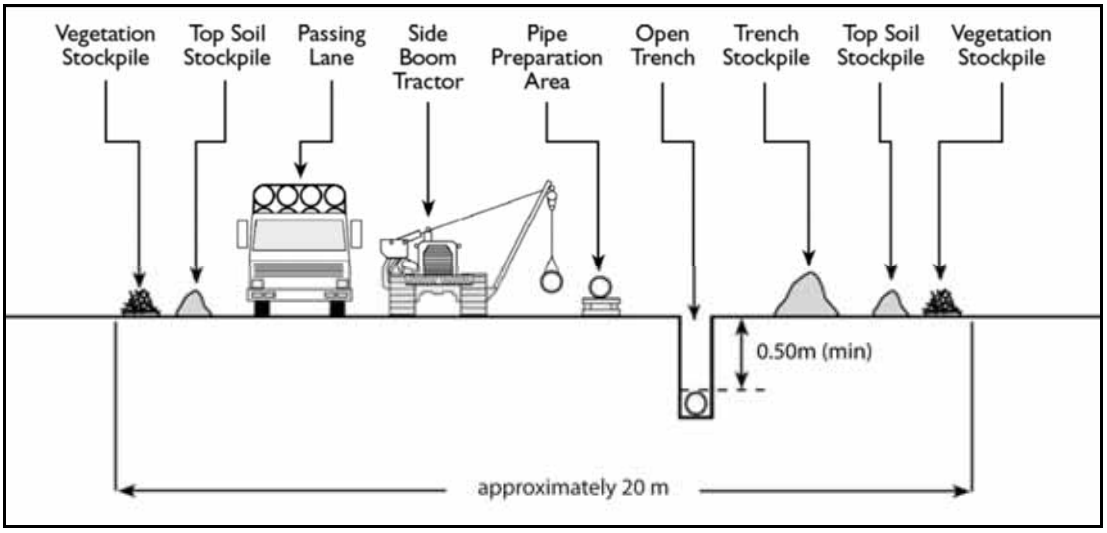
Tree hollows, dead logs and other areas of potential fauna habitat found within the corridor will either be preserved in-situ or relocated to an appropriate location outside the corridor.

Large mature trees that have not already been identified as environmentally sensitive and fenced off will be preserved, where possible, particularly in areas where they may be located near the fringes of the construction corridor.

The maintenance of the existing vegetative barrier along the fringes of the construction corridor will be a key aspect of the vegetation management plan associated with the Construction EMP, as this will limit the impact of habitat clearing on resident fauna species, as well as providing a visual screen between the construction corridor and the nearest residential premises.

The construction corridor will be levelled to the required grade using graders, backhoes and bulldozers. Topsoil will be removed and stockpiled separately for reuse during final site rehabilitation works.

The conceptual layout of stockpiles and general construction site layout is shown in Figure 5-1.



(Source: APIA, 2005)

Figure 5-1: Typical right-of-way construction layout

5.4.2 CIVIL WORKS

Trenching of the pipeline route

Trenching will be used to construct the majority of the proposed pipeline route and will be prepared ahead of construction. It is expected that a wheel trencher and excavator will be used to dig the trench for the majority of the route. In some areas, harder rock may be encountered and hydraulic rock breaking equipment may be required.

The distance covered by trenching will be dependent on terrain, equipment availability and weather conditions. It is proposed that only sufficient trench will be opened to accommodate up to two days of pipeline construction, which will equate to about 300 m/day.

Breaks in the trench may be left to facilitate wildlife crossing. In addition, methods to prevent fauna entrapment, such as trench breakers, ramped ends of trench and fauna ladders may also be implemented. These methods will ensure that fauna egress points in the trench are no more than 200 m apart.

Typical trench dimensions for this size of pipe will be about 2 m wide and an average of 2 m deep, allowing for a minimum depth of cover to top of pipe of approximately 600 to 1,000 mm (varied depending on geology and land use) and a layer of bedding material at the bottom of trench. The actual depth profile will be determined during the detailed design phase.

Pipe boring under infrastructure

A specialist crew will be used to construct any major road crossing. It is expected that the crossing will be constructed ahead of the main pipeline construction works using thrust boring or micro-tunnelling techniques.

For these construction methods, a circular hole will be excavated using a horizontal boring machine form inside a casing. As the hole progresses, the casing pipe will be forced forward to hold the hole open and guide the bore. It is expected that pre-cast concrete sections will be used for these crossings, as the concrete is able to pass cathodic protection current.

Once the casing is complete, the pre-tested pipe will be pulled through and made ready for connection to the rest of the pipe. The annulus between the pipe and concrete casing pipe will be filled with a cement grout to establish electrical continuity between the pipe and the soil and to preserve the integrity of the cathodic protection system.

The proposed pipeline will be installed beneath the roadway at a depth that is sufficient to minimise the risk of damage to the above ground infrastructure, and sufficient to ensure the bore is located in a layer of uniform strata for the length of the crossing (to avoid an uncontrolled deviation). The actual length of the constructed tunnel will be determined during detailed design, based on the profile of the crossing, the soil conditions and the flexibility of the pipe used in the crossing.

Detailed design for creek crossings is yet to be undertaken. Creek crossings will generally be undertaken in accordance with the recommended mitigation strategies outlined in Chapter 11 Water Resources and Chapter 17 Ecology. Methods for crossings will be determined in consultation with the Department of Natural Resources and Water (NRW) and the Department of Primary Industries and Fisheries (DPI&F).

Pipe stringing and bending

Stringing is the term used to describe the laying out of pipe sections near the trench in preparation for welding. The pipe sections will be hauled by road to site and laid out or ‘strung’ progressively along the side of the trench. The pipe will be held off the ground on skids to protect the pipe coating from damage.

Special care will be required to prevent damage to the pipe coating between delivery and installation. Pipe deliveries will be scheduled so that the minimum length of pipe is strung ahead of the welding and installation crew.

The bending crew will, under the direction of the construction surveyor, follow the stringing crew placing bends in the pipe as required to achieve the design horizontal and vertical alignment.

Pipe welding and inspection

Once the pipe is strung, a line-up crew will position the pipe using side boom tractors and internal line-up clamps. The specialist welding crew will then follow, joining the pipes into a continuous string. It is expected that for this size of pipe, welding will be undertaken using an automatic welding machine.

All welded joints will be inspected using non-destructive tests (radiographed) to verify compliance with the design specifications and to ensure the integrity of each weld. This task will be carried out immediately after welding has been completed so that any weld defects can be repaired as quickly as possible.

Consideration will also be given to examining all welds using automatic ultrasonic inspection equipment, which will provide a better resolution of defects. It will also provide instantaneous feedback to the automatic welding machine to modify the weld parameters and ensure the weld quality is maintained to the highest possible standards.

Joint coating and coating inspection

After the weld is accepted, the uncoated pipe on either side of the weld will be cleaned using grit blasting and the joint coating will be applied. The joint coating system that will be used on this pipe will require the pipe to be heated to promote the coating cure, and/or to shrink the coating sleeve to the pipe.

The pipe coating will also be inspected and tested for defects before the pipe is laid in the trench.

Trench preparation and pipe placement

The trench will be prepared to ensure that the pipe is bedded on fine grained selected soil. The trench will be backfilled with a similar fine-grained material to sufficient depth to ensure that the pipe coating does not come into contact with coarse-grained material, which may damage the coating.

Bedding and padding will be compacted progressively to the required density as it is placed in the trench to ensure it properly supports the pipe. Padding or supports may also be placed in the invert of the trench to support the pipe off the trench bottom so that the fine bedding material can flow beneath the pipe to protect the coating.

Multiple tractors fitted with side cranes and counterweights will be used to lift and move the pipe string over the trench and lower the pipe into position.

Impermeable trench blocks, also known as trench breakers, may be installed prior to backfilling of the trench to control water movement along the backfilled trench in sloping areas. Trench breakers are commonly installed under a number of environmental conditions, including steep slopes or where drainage patterns change.

Where possible, screened trench subsoil will be used as backfill material. The remaining subsoil will then be placed in the top layers of the trench with compaction between each layer.

Pump station installation

Initial design concepts indicate that the pipeline will be approximately 100 km in length and will require a single lift pump station at the point of supply nominated by the CSM water provider (that is, adjacent to the existing Spring Gully reverse osmosis plant). The pump will operate for approximately 20 hours per day. Installation of the ‘package pump station’ will follow the laying of the pipeline. The main components will be pre-fabricated and delivered complete to site to minimise the extent of on-site assembly work.

5.4.3 COMMISSIONING AND TESTING

Once the proposed pipeline has been installed and backfilled, it will be hydrostatically tested using water at a pressure of no less than the design maximum operating pressure and no more than 25% above the rated pressure of any pipeline component to demonstrate its integrity, and confirm the design operating pressure.

It is expected that approximately 30 ML of water will be required to undertake the hydrostatic tests. Once completed, this water will be tested for compliance with relevant environmental standards and captured in the mine's Water Management System (WMS). It should be noted that smaller sections of the laid pipeline will also be progressively tested during construction and managed similarly to the commissioning phase.

As outlined with Chapter 6 Project Operations, water used in these tests is likely to be disposed of in the Project's raw water dam, or, due to water quality constraints, in the Project starter tailings dam.

5.4.4 SITE DEMOBILISATION

As the construction phase nears completion, construction areas will be demobilised ready for clean up and rehabilitation works. The construction compounds will be disassembled and all waste materials will be removed from site.

Progressive rehabilitation of the construction corridor will be completed in accordance with that recommended in the Chapter 17 Ecology. An approximate 20 m wide easement access track adjacent to the pipeline will remain cleared to provide sufficient room for use by security and maintenance vehicles.

5.5 CONSTRUCTION WORKFORCE

5.5.1 WORKFORCE NUMBERS AND PHASING

Indicative work force numbers at any time during construction will be in the order of 20 to 50 employees.

5.5.2 GENERAL AND SPECIALIST WORKFORCE

Specialist trade professionals will be expected to carry out works and leave the site throughout the construction period.

5.5.3 WORKING HOURS

Construction activities will generally be undertaken 6:00 am to 6:00 pm, Mondays to Saturday. While it is not intended to undertake construction activities on Sundays or public holidays, it may be necessary to do so to meet Project delivery timeframes. The WJV will consult with appropriate government authorities and property owners in these instances.

In non-residential areas (i.e. locations in excess of 400 m from the nearest residence), it may also be possible to extend working hours and/or work on Sundays and public holidays due to the lack of sensitive receptors adjacent to the areas. Works may also be undertaken outside the above hours if:

- materials can be delivered more safely and with less impact to community
- works are undertaken along major roads or busy intersections
- emergency remedial works are required.

5.6 MATERIALS QUANTITIES, SOURCING, TRANSPORTATION AND STORAGE

All materials, plant and equipment will be delivered to the pipeline site by road. Just-in-time delivery of materials is anticipated for the proposed pipeline; however, this will be subject to the final construction program of the contractor and subcontractors.

Transportation of construction materials contributes to the pipeline's environmental impact, particularly in relation to use of fossil fuels and vehicle emissions. Sourcing materials from local suppliers potentially reduces their environmental footprint. However, some materials and equipment will be required to be sourced from across Australia and overseas, if necessary.

Large and over-size loads are anticipated. Loads will mostly be hauled from either the Port of Brisbane or the Port of Gladstone. Where possible, consideration will be given to the timing of such transportation to minimise disruption to other road users.

Construction traffic will involve rigid and articulated vehicles, and light goods vehicles. Traffic flows and vehicles types are expected to vary over the construction period, reflecting the types of materials and equipment required at a specific time. Chapter 12 Transportation (Volume 1) provides further assessment on transportation issues via road for the construction and operational phases of the proposed pipeline.

5.7 SAFETY, HEALTH AND ENVIRONMENT

The activities involved in the construction program will be in compliance with the Queensland *Workplace Health and Safety Act 1995*, the Commonwealth *Occupational Health and Safety Act 1991* and other relevant legislation and regulations.

As required by the above legislation, site specific management plans will be formulated which will address health and safety issues from the design stages through to the completion of the construction and commissioning phases and into operations. Plans will be reviewed as the pipeline progresses. Chapter 23 Hazard and Risk and Chapter 24 Health and Safety provide further information on the hazards, risks, health and safety associated with the construction and operational phases of the pipeline.

The WJV will require access to the proposed easement for construction, monitoring and maintenance purposes. The conditions of access to the pipeline corridor by respective property owners and the WJV will be clearly specified in the land access agreement that will be established prior to the commencement of construction activities.

As the proposed pipeline will be buried, property owners will generally be able to resume previous land based activities, provided that they do not undertake deep excavation works near or above the clearly marked pipeline trench, or construction of structures over the easement and access points. Restrictions will apply regarding the planting of deep rooted trees or plant species in the proposed easement, to avoid potential damage to the pipeline and pipe coating.

The final pipeline route will be clearly signposted with warnings that an underground pipeline is present.

5.8 SITE MANAGEMENT AND SECURITY

Construction site management

There will be a Superintendent appointed by the Proponent, and a Principal Contractor management team on site for the duration of the construction phase. The team will supervise the construction of the pipeline including monitoring the contractors' performance to ensure that the proposed construction phase mitigation measures are implemented and that construction impacts and nuisance are minimised.

Emergency response provisions

Every team working on site will include an appropriately trained first-aid attendant and an Emergency Management Plan which will address all foreseeable site specific risks, such as fire, flood, and accidents, including appropriate contact details of emergency services agencies will be available on-site.

Designated construction personnel will have appropriate spill response training and contact details of relevant responsible persons, should a significant spillage of oils or chemicals occur.

Site security

The construction area will be securely fenced as part of early works or as construction works are established in a particular area. As well as protecting the public by preventing entry to potentially hazardous working areas and helping to prevent theft, security fencing will define the boundary of construction activities and prevent encroachment into adjacent areas. This will avoid unnecessary disturbance to wildlife and help protect habitats against accidental damage.

Tanks and drums of potentially polluting or otherwise hazardous materials will be stored in secure containers or compounds which are locked when not in use. Secure valves will be provided on oil and fuel storage facilities. Equipment and vehicles will be locked, have keys removed and be stored in secure compounds.

5.9 CONSTRUCTION PHASE POTENTIAL IMPACT ASSESSMENT

Potential impacts associated with early works and construction are outlined in the following section, however further details are given in respective chapters and associated technical reports of all volumes of the EIS.

5.9.1 SITE CLEARANCE AND CIVIL WORKS

Vegetation clearance

Potential impacts associated with vegetation clearance include but are not limited to:

- loss of flora and fauna species
- reduction in species diversity
- loss of species habitat
- increased spread of weed species
- loss of cultural heritage items and/or context
- noise generation from vehicles and equipment
- air quality degradation from vehicles and ground disturbance

- loss of visual amenity.

Topsoil removal and storage

Potential impacts associated with topsoil removal and storage may include, but are not confined to:

- uncovering, disturbance and loss of cultural heritage artefacts, items, sites and context
- disturbance and loss of ground dwelling flora and fauna species, including soil micro-organisms that enable the healthy functioning and structure of topsoils
- exposure and subsequent erosion and deposition of dispersive subsoils
- degradation of waterbodies due to infill from eroded topsoils and increased turbidity
- increased spread of weed species
- noise generation from vehicles and equipment
- air quality degradation from vehicles and ground disturbance.

Civil earthworks

Potential impacts associated with civil earthworks include but are not limited to:

- exposure and subsequent erosion and deposition of dispersive subsoils including tunnelling of subsoils, can result in blockage of drains, degradation and reshaping of flowpaths, and reduction of structural integrity due to erosive tunnelling
- degradation of waterbodies by subsoils, rock and unsuitable materials, resulting from waterbody infill, increased turbidity and salinity, and fluctuating pH and temperature
- degradation of waterbodies and soils from spilled fuels, oils and materials hazardous to the aquatic and riparian environments
- noise generation from vehicles and equipment, including increased background, impact and episodic noise types
- vibration impacts from the use of hydraulic rock crushers during earthworks
- air quality degradation from vehicle emissions, vehicle movements on unsealed roads, ground disturbance, excavation, and concrete batching
- light disturbance at night from vehicles and artificial lighting used during night time construction activities
- loss of visual amenity due to changes in topographical features/vegetation clearing
- increased spread of weed and pest species from imported fill and soil materials
- generation of wastes, including solid, recyclable, liquid and hazardous materials that can degrade soil and water quality, and ensnare or harm wildlife if not properly disposed
- reduction in groundwater quantities or interference in consistent supply for use by others, due to use of groundwater for construction activities
- increased social interface between earthworks construction personnel and local residents.

5.9.2 PUMP STATION INSTALLATION

Potential impacts associated with the pump station installation include, but aren't confined to:

- increase in road traffic movements due to plant and equipment deliveries and workforce movement, potentially increasing risk of traffic incidents, traffic delays to the travelling public, general nuisance, vibration from heavy vehicle movements, and road pavement wear and fatigue
- noise generation from vehicles and equipment, including increased background, impact and episodic noise types
- air quality degradation from vehicle emissions, vehicle movements on unsealed roads, and fugitive emissions of various powders and volatile liquids
- light disturbance at night from vehicles and artificial lighting used at pump station
- altered of visual amenity due to changes of features within the landscape
- generation of wastes, including solid, recyclable, liquid and hazardous materials that can degrade soil and water quality, and ensnare or harm wildlife if not properly disposed.

5.9.3 COMMISSIONING AND TESTING

Potential impacts associated with commissioning and testing include, but are not limited to:

- discharge of large amounts of water that can result in erosion, degradation and reshaping of flowpaths
- degradation of waterbodies due to infill from eroded topsoils and increased turbidity
- generation of highly saline wastewater that can degrade soil and water quality and impact on wildlife.

5.9.4 SITE DEMOBILISATION

Potential impacts associated with construction site demobilisation include but aren't limited to:

- increased spread of weed and pest species from imported soil and materials for landscaping
- generation of wastes, including solid, recyclable, liquid and hazardous materials that can degrade soil and water quality, and ensnare or harm wildlife if not properly disposed
- degradation of waterbodies and soils from spilled fuels, oils and materials hazardous to the aquatic and riparian environments
- noise generation from vehicles and equipment, including increased background, impact and episodic noise types
- air quality degradation from vehicle emissions and vehicle movements on unsealed roads
- light disturbance at night from vehicles and artificial lighting used during night time demobilisation.

5.10 SITE PREPARATION AND CONSTRUCTION PHASE MITIGATION MEASURES

As many of the potential impacts were similar across the various phases of the construction process, the mitigation measures are grouped according to the environmental element, so as to be similar to the other chapters of the EIS. The following mitigation measures do not form a comprehensive construction mitigation measures list, as specific chapters should be referenced for further measures.

Every practical effort will be made to ensure that any detrimental environment effects will be minimised during the construction phase of the pipeline. The early works and construction planning will be geared towards keeping disruption and nuisance to a minimum.

5.10.1 COMMUNITY CONSULTATION

Throughout the site preparations and construction phases, community consultation via for example newsletters, shopfront stalls, and hotlines, will assist in keeping the community informed of construction activities and allow for community feedback to the WJV on any issues they may encounter. The WJV will engage a dedicated community liaison person or team as the interface with the community to assist in getting community feedback to the appropriate construction personnel directly and quickly.

Chapter 4 Community Consultation provides further details of consultation measures undertaken.

5.10.2 LAND USE

The proposed pipeline construction will be subject to development application requirements and licensing that will be applied for to enable site preparation and construction to commence in a timely fashion. Chapter 3 Project Approvals and Chapter 8 Land Use discuss the applicable approvals, licensing and development processes associated with the tenures and designated land uses of areas affected by the early works and construction phases of the pipeline.

Contaminated land surveys and/or assessments will be undertaken prior to construction activities commencing. Chapter 8 Land Use, and the associated technical report on contaminated land assessment, provide further details on the handling of potentially contaminating materials.

5.10.3 SOILS

Degradation of topsoils and subsoils by accelerated erosion and sedimentation including tunnelling of dispersive soils will be mitigated using various measures, including but not limited to:

- preparation of an erosion and sediment control plan for early works and construction phases
- minimising clearing and topsoil removal, to limit the area and volume of soil exposed to erosive forces

- stockpiling of topsoils up to 3 m in height, with turning of the topsoil periodically to allow aeration and maintain soil microbial health
- stockpiling of soils, subsoils and unsuitable materials away from drainage paths and watercourses to minimise potential for directly washing soils into drainage areas
- capping of exposed subsoils with topsoil to minimise potential for erosion of dispersive subsoils
- revegetation of disturbed areas to minimise long-term soil exposure to erosive forces
- installation of sediment fencing to retain soils on site, rather than soil flowing into drainage flowpaths and watercourses.

Chapter 9 Geology, Overburden, Mineral Resources and Soils, and the associated technical report, provide further details on soil mitigation measures during construction.

5.10.4 GROUNDWATER

During construction, one option for raw water supply to meet construction requirements is the use of existing groundwater bores from adjacent property owners. Mitigation measures to minimise impacts on other groundwater users and the aquifer include, but are not limited to:

- the WJV ensuring continued access and supply of groundwater from community or other multi-user bores for users not within lands purchased by the WJV
- upgrading existing groundwater extraction facilities to minimise any existing losses from the system
- extracting groundwater within existing license allocations, with any additionally required water being sourced from existing farm dams lands purchased by the WJV.

Use of water from some of these sources may also require approval from NRW. Chapter 10 Groundwater, and Chapter 11 Water Resources, provide further details on groundwater mitigation measures during construction.

5.10.5 WATER MANAGEMENT AND SURFACE WATERS

Water management associated with surface waters during the construction phase is closely linked to soil management. Mitigation measures include but are not limited to:

- separation of clean overland flow from ‘worked’ water that has flowed over bare earth, so as to reduce volumes required for sediment treatment
- subdivision of construction areas into small catchments to reduce water volumes and sediment loads on sediment control measures
- daily checks of all erosion and sediment controls, and maintenance if required
- on-going monitoring of watercourses both upstream and downstream of construction areas
- gaining of appropriate licensing and permitting associated with the taking of water, clearing and filling activities within watercourses and riparian areas, and any other relevant licensing.

Chapter 11 Water Resources, provides further mitigation measures for the site preparation and construction phases.

5.10.6 TRANSPORTATION

Transportation of materials for the construction phase will be all by road. Impacts on traffic volumes are predicted to be limited, as construction traffic is predicted to be less than 5% above the existing traffic levels for all state controlled roads within the study area.

Chapter 12 Transportation (Volume 1) provides details of appropriate transportation mitigation measures related to potential traffic impacts from construction of the pipeline.

5.10.7 AIR QUALITY

Atmospheric emissions during the construction phase will generally be mitigated by, but not limited to:

- ensuring all vehicles are suitably fitted with exhaust systems that minimise gaseous and particulate emissions to meet vehicle design standards
- watering unsealed roads to minimise dust lift-off from the road surface
- limiting vegetation and soil clearing, so as to minimise exposed soil surfaces that may generate dust
- monitoring air quality at designated fixed monitoring points.

Chapter 13 Air Quality and the associated technical report provide further detailed mitigation measures for air quality.

5.10.8 NOISE

Noise emissions during the construction phase will generally be mitigated by, but not limited to:

- ensuring all vehicles are suitably fitted with components that minimise noise emissions to meet vehicle design standards
- limiting evening and night works to activities away from noise sensitive receptors whenever possible
- monitoring noise at designated fixed monitoring points.

Chapter 15 Noise and the associated technical report provide further detailed mitigation measures for noise.

5.10.9 VIBRATION

Mitigation measures to minimise impacts from vibration during construction include, but are not limited to providing specific mitigation measures for potentially affected structures, based on the findings of the condition surveys.

Chapter 16 Vibration provides further mitigation measures associated with vibration during the construction phase.

5.10.10 ECOLOGY

Mitigation measures to minimise impacts on terrestrial and aquatic ecology during early works and construction include, but aren't limited to:

- obtain all applicable licenses and permits associated with fauna handling and removal, vegetation felling and clearing, working in watercourses and other relevant licences

- minimise clearing activities in fauna nesting and breeding seasons
- when selecting sites for activities such as construction materials laydown areas and hardstanding areas, select sites already historically cleared
- minimise clearing by defining clearing areas and marking limits
- undertaking certified washdown of vehicles for weed removal prior moving to weed free areas and after leaving weed infested areas
- where possible, selectively clearing millable timbers prior to commencing other types of vegetation removal
- where possible, selectively clearing potential fauna habitat hollows for reuse in rehabilitation prior to commencing other types of vegetation removal
- where possible, chipping cleared vegetation for use as mulch cover in rehabilitation
- where possible, avoiding burning cleared vegetation to minimise air quality impacts.

Chapter 17 Ecology, and the associated technical reports, provide further mitigation measures associated with ecology during the site preparation and construction phases.

5.10.11 REHABILITATION

Significant clean-up and rehabilitation works will be undertaken along the construction corridor in consultation with the respective property owners and Dalby and Roma Regional Councils. Rehabilitation will be undertaken on a progressive and ongoing basis in accordance with best practice pipeline construction methods to ensure that:

- removal of all foreign materials (e.g. construction material and wastes). These materials will either be recycled (in the case of metal, timber etc) or disposed off at an appropriate waste management facility
- the original topsoil cover is re-established and all lands disturbed by the pipeline construction are returned to a stable condition as soon as practicable after construction at a particular pipeline section is complete
- landforms and natural drainage patterns are re-established
- the environment is reinstated to the condition of the surrounding area and disturbed habitats recreated
- mulched vegetation will be spread along disturbed areas, some areas will also be reseeded with native seeds collected prior to clearing, native grasses or other approved native species.

Once construction is complete, it is proposed to reduce the width of the pipeline easement to approximately 20 m, where practicable. This width will need to provide sufficient room to maintain a cleared access track adjacent to the pipeline for use by security and maintenance vehicles, as well as to maintain a suitable buffer distance between the pipeline and adjacent land uses.

The remainder of the cleared construction corridor that will no longer be part of the pipeline easement will undergo significant rehabilitation to reinstate it to as close condition as possible to the surrounding vegetation.

Within the proposed corridor, there will be constraints on the types of native plant species that can be placed above the pipeline trench and along the access track. Deep rooted trees or plants will not be permitted, as they could affect the integrity of the trench or pipeline

coating. The selection of suitable species of plant along the pipeline easement will be undertaken in consultation with both the Dalby and Roma Regional Councils and the Environmental Protection Agency and will be specified in the approved flora and fauna management plan that will be part of the Construction Environmental Management Plan.

5.10.12 WASTE MANAGEMENT

The principal approach to waste management for the pipeline will be to minimise the impacts on air, water and land resources, and to manage waste in a manner that avoids any direct or indirect impacts on the environment or health of people working at the pipeline and the community.

The waste management hierarchy was considered when selecting the waste management strategies for each waste stream. It is a framework for prioritising waste management practices to achieve the best environmental outcome. The waste management hierarchy as specified in the EPP (Waste) is outlined as follows, with waste avoidance being the preferred option and disposal being the least preferred outcome:

- waste avoidance
- waste re-use
- waste recycling
- energy recovery from waste
- waste disposal.

Mitigation measures associated with waste during construction include, but are not limited to:

- maintaining temporary sewage package plants to relevant standards
- removal of weed-infested vegetation separately and disposed off-site to an approved waste management facility
- surplus excavated material, if any, will be spread over the trench area as appropriate to tie in with the surrounding landform.

Chapter 18 Waste Management provides further mitigation measures associated with waste management and a detailed Waste Management Plan (Construction) will be prepared prior to the commencement of construction.

5.10.13 VISUAL AMENITY

The construction phase will involve vegetation clearing and earthworks activities that have the potential to impact on the visual amenity of the area.

Mitigation measures associated with landscape character and visual amenity during construction include, but are not limited to:

- minimising areas of clearing to keep existing vegetation where practicable
- restricting the height of temporary stockpiles to a practicable minimum to avoid visual impact on local sensitive receptors
- rehabilitation of areas with native species where practical and possible.

Chapter 19 Visual Amenity provides further mitigation measures associated with landscape character and visual amenity.

5.10.14 CULTURAL HERITAGE

Clearing and ground disturbance during construction activities provides the greatest potential for impact on indigenous and non-indigenous cultural heritage.

Cultural heritage impacts will generally be mitigated by, but not limited to:

- minimising areas of clearing and disturbance to keep existing cultural heritage items and features in-situ, where practicable
- establishing a photographic record of identified cultural heritage items
- recording histories of the area, where practicable
- leaving in-situ items of cultural heritage. However if this is not possible, removing, cataloguing and storing items under applicable licensing and permitting
- restoring cultural heritage items or features where practicable.

Chapter 20 Cultural Heritage and the accompanying documentation and technical reports provide further mitigation measures associated with indigenous and non-indigenous cultural heritage.

5.10.15 SOCIAL

Mitigation measures associated with social impacts include, but are not limited to:

- establishing a dedicated community liaison person or team as the interface with the community
- establishing and maintaining contacts with appropriate government departments and agencies in the immediate and surrounding areas, to ensure adequate services are available for the pipeline construction personnel and surrounding communities.

Chapter 21 Social provides further mitigation measures associated with social impact assessment.

5.10.16 ECONOMIC

The economic impacts of developing the western CSM water pipeline have been incorporated into the economic impact assessment undertaken for the Project. The detailed Project economic impact assessment, and accompanying technical report, are included within Volume 1.

5.10.17 HAZARD & RISK, AND HEALTH & SAFETY

Hazards and risks, and related health and safety measures will vary between specific construction activities. However some general mitigation measures associated with hazard and risk and related health and safety measures, include but are not limited to:

- preparation and implementation of an Emergency Management Plan for general and specific elements of work activities
- preparation and implementation of Health and Safety Management Plan for general and specific elements of work activities
- planned regular audits of management plan actions
- training of personnel in first aid, with designated first aiders in each work area at all times

- ensuring that suitable spill kits with instructions are available at all times in areas of high risk, with training of personnel in the use of spill kits, correct disposal of used material, and a programme for maintenance and inspection of spill kits.

Chapter 23 Hazard and Risk, and Chapter 24 Health and Safety discuss the potential impacts and appropriate mitigation measures associated with known potential hazards and risks, and health and safety issues.

5.11 REFERENCES

Department of Employment and Industrial Relations 1995, *Workplace Health and Safety Act 1995*, Queensland Government, Brisbane

Department of Education, Employment and Workplace Relations 1991, *Occupational Health and Safety Act 1991*, Commonwealth Government, Canberra