2 PROJECT NEED AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the need for the proposed western coal seam methane (CSM) water supply pipeline and the alternatives considered by the Wandoan Joint Venture (WJV), in terms of:

- an outline of the alternative water supply options considered
- alternative water supply delivery options and technologies
- alternative pipeline routes.

2.2 PROPOSED PIPELINE NEED

During mining operations, the Wandoan Coal Project (the Project) will include on-site coal processing plant (CPP). It is anticipated that the Project's raw water demand will be approximately 9,100 ML/a at peak demand in Year 18 (assumed as 2029), with 80% of that demand expected to be required for the CHPP.

Project raw water demand may increase to 11,400 ML/a if the mine was to expand in future.

Other critical uses of operational raw water include fire fighting services, site dust control, light and heavy vehicle washdowns, and for haul road dust suppression.

During operations, raw water will therefore need to be reticulated to the following locations within the mining lease application (MLA) areas:

- the CPP and overland conveyor systems (OLC)
- mine infrastructure area (MIA)
- raw coal dump stations.

Regardless of which raw water supply option is eventually chosen by the WJV, raw water will be delivered to a raw water storage dam on the mine site with a capacity of 400 ML. The raw water storage dam will be located adjacent to the CPP area, and from there reticulated to the CPP, MIA, and dump stations.

The proposed western CSM water supply pipeline alignment is an alternative water supply option and a component of the environmental impact statement (EIS) for the Project.

2.3 PROPOSED SUPPLY ALTERNATIVES

2.3.1 DO NOTHING

If the western CSM water supply pipeline did not proceed, and in the absence of other feasible bulk raw water supply alternatives, the mining project is unlikely to proceed, given the critical requirement for a long term and reliable water supply for mine operations. If the mine did not proceed, there is potential for the global demand for thermal coal to be lost to an international competitor, with losses of export revenue, losses in potential coal

royalties, losses in local, regional and state employment and ancillary business opportunities.

2.3.2 ALTERNATIVE RAW WATER SUPPLY SOURCES

Three separate potential water supply alternatives have been identified for the Project:

- Coal Seam Methane (CSM) Water from south of the MLA areas (see Volume 2)
- Coal Seam Methane (CSM) Water from west of the MLA areas (this Volume 3)
- Glebe Weir raising and pipeline (see Volume 4).

The WJV will source its water supply on the basis of a comparative analysis of environmental and social impacts, reliability of supply, water quality and cost.

The WJV is committed to setting and meeting a range of sustainable development targets, including measures to reduce its total potable and raw water usage. Measures to reduce raw water use have included the current strategy for recycled water to be used in the CPP (with water captured and pumped back to the CPP from the Project's tailings disposal dams); and use of surface water collected on site for haul road dust suppression and/or for use in the CPP.

The WJV is committed to investigate further measures to reduce its overall water consumption, including further measures to maximise CPP water re-use (through the potential use of belt-press filters), non-water dust suppressants for haul roads and raw coal dump stations, and the potential use of evaporation covers over the raw water storage dam, if such methods can be demonstrated to be practicable and feasible.

2.4 WATER SUPPLY DELIVERY OPTIONS AND TECHNOLOGIES

2.4.1 WATER QUALITY

An analysis of the quality of CSM by-product water, in particular for use in the CPP and its application for haul road and dump station dust suppression, has been undertaken. Preliminary analysis indicates that the quality of this water, in particular the relatively high levels of salinity, would not be a prohibiting factor in either its transport to or use on site, with some treatment to reduce total dissolved solids (TDS) levels. Generally, treatment of water to TDS concentrations of around 4,000 mg/L or less will be suitable for use across the mine.

However, costs associated with some CSM by-product water treatment and/or additional corrosion proofing of plant will need to be taken into account in the decision making process for the various bulk raw water supply options under consideration. If required, any treatment of CSM by-product water will be undertaken by the CSM by-product water provider prior to intake into the pipeline, to a specification agreed with the WJV.

2.4.2 DESIGN BASIS

Six pipeline route options were examined, as discussed in Section 2.5.3. A preliminary hydraulic analysis was performed on each of the options.

The initial elevation at Spring Gully Reverse Osmosis (RO) Plant is 308 m Australian Height Datum (AHD). Maximum elevations on all pipeline routes are of the order of 310 m and occur near the RO plant. Surface elevations fluctuate moderately with minimum elevations on the order of 240 m AHD in stream beds. The final elevation at the raw water storage dam is approximately 250 m AHD.

Preliminary hydraulic analysis draped all six routes over existing topographic data, including reviews for a number of different pipeline diameters and materials (i.e. ductile iron with cement mortar lining (DICL), mild steel with cement mortar lining (MSCL) and polyethylene (PE)). While the use of PE pipe was considered, high heads (pressure) at the pump station require very thick walled pipe. As a result PE pipe is not cost competitive to DICL or MSCL pipe. Maximum pressure in the pipe was limited to 350 m of head; therefore DICL PN35 could be used. It was assumed that a single pipe diameter would be used for the length of the route.

During subsequent detailed design, the pipeline design should be optimised to ensure that both capital costs associated with pipe and pump works and operation costs are minimized. Final design considerations may include the use of non-DICL pipe for some or all of the alignment. Note that water hammer analysis must be performed in subsequent design stages and incorporated into pipeline design and material selection, however this is not expected to significantly impact pipeline design or relative capital cost estimates.

The main assumptions made in preparing the design parameters included:

- pipe and pump size is based on a flow rate of a maximum 11,400 ML/a (to allow for increased demand, if required)
- pumps operating 20 hours per day
- electric motors will be used to directly drive a set of pumps
- full duty/standby arrangement
- a 0.75 % pump efficiency
- a 30 year life.

2.4.3 DESIGN CONSTRAINTS

There are no substantial electrical power sources along the proposed pipeline routes, and so allowance has been made for a single pump station at the intake point at the Spring Gully RO plant to provide sufficient head to drive the water to the Project's raw water storage dam.

The preferred design seeks to minimise the pipe diameter as much as possible to maintain cost effectiveness. As pipe diameters are reduced, friction within the pipe increases, and the pump head required to drive the water through the pipeline increases, consequently increasing costs.

Maximum pressure in the pipe is limited to 350 m of head to accommodate the use of ductile iron with cement mortar lining (DICL) pipeline. Allowance has been made for a single pipe diameter for the length of the route. Further optimisation of pipeline material and diameters will be undertaken during detailed design. Water hammer analysis will also be performed in detailed design and incorporated into pipeline design and material selection.

2.4.4 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 Roma and Dalby Regional Councils before any decision is made in relation to accommodation arrangements.

2.5 ROUTE SELECTION OPTIONS

2.5.1 METHODOLOGY FOR PIPELINE ROUTE SELECTION

The main production objectives of the western CSM water supply pipeline are to:

- connect to a constant and reliable water supply
- provide the Wandoan Coal Project with the expected peak demand 9,100 ML/a bulk raw water requirements for mine operations.

Investigations of potential pipeline route options involved a review of available desktop information, data sources and also observations made during a preliminary field reconnaissance. Potential pipeline route options were assessed by considering a range of issues that could be interpreted from this information. Appendix 2-1-V3.4 contains the Route Selection Report for the southern CSM water supply pipeline. Note that figures/documents with numbering ending in V3.4 refer to figures/documents contained in Volume 3, Book 4 of the EIS.

Route options were initially assessed through preliminary desktop investigations and a field reconnaissance was later conducted to ground-truth desktop information. In order to assess the potential environmental, planning and social constraints associated with these routes, a range of selection criteria were identified. These selection criteria covered relevant issues that are specific to the Project and also regularly addressed in pipeline route selection and environmental assessment.

Potential selection criteria were categorised as regulatory, planning, environmental, social and economic criteria. Each selection criterion was then reviewed to determine whether it would add value to, or provide differentiation in the assessment of corridor options. Where selection criteria would not add value to the assessment process, they were not included in the comparative assessment of options. This occurred in cases where:

- there was little or no variation in the selection criterion across the study area, making differentiation between the merits of route options difficult to assess or negligible
- paucity of available information made differentiation between the merits of the different route options too difficult to assess without undertaking significant additional studies.

Where it was determined that selection criteria were relevant (either due to relevance to the study area or variation between the route options), performance measures were identified to measure the criteria. Consideration was also given to the balance between selection criteria to ensure that no single criterion received a higher priority than others. As a result, some performance measures provide a measure for more than one criterion. For example, the performance measure 'number of properties affected' provides an assessment for a number of criteria including visual impacts, social receptors and potential construction phase noise and air quality impacts or nuisance issues. The selection criteria that were chosen for the initial assessment were given an equal weighting. This method is used to avoid creating subjective criteria.

The evaluation of route options was carried out using a comparative assessment approach where each criterion was compared for each route option. A ranking system was used to provide a comparative measure of how each option meets the relative performance measures. The issues typically addressed in environmental impact assessments are also relevant to the comparison of alternatives in a route evaluation, and were used to develop suitable criteria for selecting a preferred route. The criteria can be broken into regulatory, planning, environmental, social and economic categories. These criteria consist of:

Regulatory criteria

- provisions of relevant Commonwealth legislation (including consideration of relevant matters of national environmental significance – refer Chapter 17 Ecology)
- provisions of relevant state legislation and policies

Regulatory provisions, as they relate to this proposed pipeline, are generally associated with the use, development or potential impact to environmental, planning, social and economic criteria.

Planning assessment criteria

- Land use and tenure.
- Location of petroleum and mining leases.
- Location of resource (e.g. coal, petroleum and mineral) areas.
- Local governments and planning schemes.
- Location of existing infrastructure such as pipelines, roads (local and state controlled), railway lines, dams/water infrastructure.

Environmental assessment criteria

- Topography.
- Geology and soils.
- Watercourses and wetlands.
- Fire risk.
- Flora communities and species.
- Fauna and habitat values.

Social assessment criteria

- Proximity of residences and other sensitive receptors to the proposed development.
- Properties and landholders affected.

- Visual amenity.
- Cultural heritage (indigenous and non-indigenous).

Economic assessment criteria

- Indicative pipeline cost.

The development of pipeline route options for consideration in this route selection was based on a number of common requirements for the proposed infrastructure which included:

- transport of CSM by-product water to the Project area
- has capacity for delivery of up to 11,400 ML/a
- delivery of the water direct to a 400 ML raw water storage dam on the MLA areas
- minimisation of overall route length to reduce the dynamic (friction) head loss and capital cost associated with the pipeline
- adopting a configuration warranting minimal capital cost in terms of pipeline class and diameter, against the cost of a secondary pumping station.

Additionally, a number of site specific, practicality and constructability issues were identified for inclusion in pipeline option development. The additional criteria considered included:

- minimisation of height extremes to reduce the overall static head, number of required pump stations and overall pipe diameter
- preferable co-location of infrastructure in order to reduce or avoid potential land use impacts on local landowners and reduce the number of parties involved in subsequent easement establishment negotiations.

Based on the issues outlined above, six potential pipeline route alignments were identified, to which the selection criteria above were applied and a comparative assessment undertaken (see Section 2.5.3).

2.5.2 LAND TENURE

The existing land uses within the study area are predominantly agricultural and resource based. The MLA areas are located to the east of the study area, covering approximately 32,000 ha (refer Volume 1). The Spring Gully and Fairview CSM extraction wells are located within the western portion of the study area, approximately 100 km to the west of Wandoan.

The land within the study area is predominantly utilised for agricultural purposes, including grazing and cropping activities. In terms of future land use, the Strategic Plan for the former Bungil and Taroom Shire local government areas indicates the long-term land use pattern for the regions. The land within the study area is envisaged to continue to cater for predominantly agricultural based land uses.

Reference to the Department of Mines and Energy online interactive mapping tool indicates that a number of coal resource areas have been identified within the study area. These areas are located predominantly within the eastern portion of the study area, within close proximity to the proposed pipeline. A small number of CSM wells (in various stages of exploration or development) occur sporadically across the southern portion of the study

area. Future land uses and location of key resource areas were a principal determining criterion in the pipeline route selection process to ensure that these resource areas are not sterilised to future development.

Sensitive land uses such as schools, community facilities, cemeteries (where relevant) and land uses associated with temporary or permanent infrastructure or equipment such as gas wells, mining tenements and pivot irrigation, have been considered during the route selection process and where identified, avoided if possible. Therefore, there is no variation in the selection criterion across the study area, making differentiation between the merits of route options negligible. Land use and tenure were not utilised as a determining criteria for pipeline route selection and not considered in the comparative assessment of options.

2.5.3 ROUTE OPTIONS

Six potential pipeline routes were identified and a comparative assessment was undertaken and detailed in the Route Selection Report as attached in Appendix 2-1-V3.4. A description of the proposed pipeline routes is included in the following sections, as shown in Figure 2-1-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.

Option 1

Option 1 commences at the existing reverse osmosis plant at the Spring Gully coal seam methane fields and will traverse the existing PLs generally in a south-easterly direction. The alignment through the PLs has not as yet been finalised and will be the subject of future negotiations between the PL holders and the WJV. At some point within the PLs the alignment is proposed to intersect with the Roma-Taroom Road.

The proposed pipeline then follows the Roma-Taroom Road in a north-easterly direction until the north-western property boundary of Lot 9 on Plan AB127. The proposed route then turns east along the property boundary between Lot 9 on plan AB127 and Lot 8 on Plan AB127. The eastern 'L' section of Lot 9 on Plan AB127 is proposed to be traversed to meet the Goldens Bimbadeen Road from which the proposed route travels east until the intersection with Ferrets Road.

From this point, the proposed route continues in an easterly direction and utilises the southern property boundary of Lot 132 on Plan SP121742. The south-eastern corner of this same allotment is then proposed to be traversed, then onto the south-western corner of Lot 58 on Plan FT556 until it meets the western boundary of MLA 50229. The proposed route within the MLA areas to the termination point at the raw water supply dam is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 1 is approximately 91 km in length, is the shortest pipeline option and is proposed to be constructed both within private properties and adjacent road reserves.

Option 2

Option 2 follows the same route as Option 1 until the intersection of Roma-Taroom Road and Lot 9 on Plan AB127. The route then turns south along Canal Clifford Road and continues to the southern boundary of Lot 10 on Plan AB120. An easterly turn is made in the route along the property boundary between Lot 4 on Plan AB20 and Lot 5 on Plan AB27.

Approximately two-thirds of the way along this boundary, a north-easterly alignment is taken before crossing the south-western corner of Lot 7 on Plan RP868228 to meet the north-eastern point of Lot 9 on Plan AB112. The proposed route then travels in a south-easterly direction across Lot 6 on Plan AB112 until reaching the intersection of Bundi Clifford and Dragon Crest Roads.

From this point, the proposed Option 2 route turns east and follows Bundi Clifford Road, Bundi Road until the north-easterly point of Lot 14 on Plan FT165. From here, the proposed pipeline route enters the southern boundary MLA 50229. The route within the MLA areas to the termination point at the raw water storage dam is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 2 is approximately 99 km in length and is proposed to be constructed both within road reserve and other land parcels.

Option 2A

Option 2A is similar to Option 2 described above for the majority of the proposed pipeline route. A deviation between the two routes occurs at the intersection of Roma-Taroom Road and Lot 9 on Plan AB12 where Option 2A turns in a south-easterly direction and traverses Lot 9 on Plan AB127 and Lot 4 on Plan AB20.

This deviation meets again with proposed Option 2 at the south-west corner of Lot 7 on Plan RP868228, from where it follows the remainder of the proposed Option 2 alignment to the southern boundary of MLA 50229. The proposed route within the MLA areas to the termination point at the raw water storage dam is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 2A is approximately 97 km in length and is proposed to be constructed both within road reserve and other land parcels.

Option 2B

Option 2B is also similar to Option 2 for the majority of the proposed pipeline route. A deviation between the two routes occurs along the property boundary of Lot 1 on Plan AB144 and the Roma–Taroom Road where the pipeline route leaves the road reserve and continues along the property boundary between Lot 1 on Plan AB144 and Lot 6 on Plan AB155.

The proposed route then continues in an easterly direction traversing both Lot 6 on Plan AB155 and Lot 11 on Plan AB153 until it insects with Canal Clifford Road. At this point, the route meets the Option 2 alignment at the southern boundary of Lot 10 on Plan AB120. From this point, Option 2B follows the remainder of the proposed Option 2 alignment to the southern boundary of MLA 50229.

The proposed route within the MLA areas to the termination point at the proposed raw water storage dam is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 2B is approximately 92 km in length and is proposed to be constructed both within road reserve and other land parcels.

Option 3

Option 3 also begins at the Spring Gully Reverse Osmosis Plant, then turns south and follows Wybara Road to its intersection with the Roma-Taroom Road. The proposed route then turns east and follows the Roma-Taroom Road until its intersection with Canal Clifford Road.

The route then turns south and follows Canal Clifford Road to its intersection with Bundi Clifford Road from where it turns east and follows the Bundi Clifford Road to its intersection with Dragon Crest Road. From this point, the proposed Option 3 route follows the remainder of the proposed Option 2 route to the southern boundary of MLA 50229.

The proposed route within the MLA areas to the termination point at the raw water storage dam is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 3 is the longest pipeline route at approximately 115 km and is proposed to be situated within road reserve for the entire length.

Option 4

Option 4 is similar in alignment to Option 2B until Lot 6 on Plan AB112. Shortly into Lot 6 on Plan AB112, the proposed route turns in an easterly direction and traverses the northern portion of this allotment in a straight line until it meets the road reserve of Dragon Crest Road. At this point, the alignment turns in a north-easterly direction and follows the Dragon Crest Road until the north-east corner of the western portion of Lot 37 on Plan AB180.

From this point, the proposed route traverses the eastern portion of Lot 37 on Plan AB180 and Lot 24 on Plan SP174422 until it intersects with the Goldens Bimbadeen Road from where it follows the proposed route of Option 1 to the western boundary of MLA 50229. The proposed route within the MLA areas to the termination point at the raw water storage dam is not yet finalised and will be determined dependent on the final mine layout in order to avoid proposed pit areas and other mine infrastructure.

Option 4 is approximately 93 km in length and is proposed to be constructed both within road reserve and other land parcels.

2.5.4 ROUTE OPTIONS ASSESSMENT

Options 2, 2A and 2B rated relatively similarly with regard to the criteria considered in the comparative analysis and no clear benefits or detractions for or against any of these route options were apparent. Of these options, Option 2B also had the least associated cost, but likely to have affected the second largest amount of good quality agricultural land. Option 2A rated averagely across all criteria whilst Option 2 included the second greatest length within road reserves and consequently may have impacted the second greatest amount of mapped regional ecosystems.

Options 3 and 4 may be considered as the worst rated options against the criteria in the comparative assessment. Option 3 is located predominantly within State and local government road reserves and therefore, also impacts the least number of privately owned properties. However, field observation indicates that the majority of remnant vegetation within the study area is located within road reserves as a result of extensive vegetation

clearing for historical land uses such as grazing and cropping. As such, this option is the least preferred due to its significant impact on mapped regional ecosystems. Due to its greater length, it is also the most costly of all the options analysed.

Option 4 affects the greatest number and area of privately owned properties, the greatest amount of privately owned land and the greatest amount of good quality agricultural land. Despite having the shortest length of pipeline proposed within road reserves, Option 4 may potentially affect more mapped regional ecosystems than Option 1.

Of the options considered, Option 1 is the option with the least impact to mapped regional ecosystems, affects the least number of privately owned properties and is the shortest pipeline length and therefore has the least associated cost.

In summary, Option 1 was regarded as the overall preferred alignment across a number of the criteria which were included in the comparative analysis.

It should be noted that the final pipeline alignment through identified petroleum leases will be subject to future negotiation between the WJV and relevant petroleum lease holders. Additionally, the final pipeline alignment through the MLA areas will also be dependent on finalisation of the WJV's mine layout plan.

2.6 PROPOSED PIPELINE JUSTIFICATION

Without the development of a feasible raw water supply option to meet long term operational requirements, the Wandoan Coal Project is unlikely to proceed, with the resulting loss in export revenue, employment, associated business opportunities and government royalties.

The western CSM water supply pipeline is one of three raw water supply alternatives. The selection of the preferred alternative is subject to a final comparative analysis based on environmental and social impacts, reliability of supply, water quality and cost.

The preferred route option selected for the western CSM water supply pipeline is Option 1. This option achieves the most successful balance overall and across all of the comparative assessment criteria.

For further discussion on the overall Project justification, refer to Chapter 2 Project Need and Alternatives, Volume 1.