Central Queensland Coal Project

Chapter 2 – Project Need and Alternatives

Environmental Impact Statement

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2 Project Need and Alternatives

This chapter describes the need for the Central Queensland Coal Project (herein referred to as the Project) based on economic and social justifications. It includes a description of current market demands for coal and the social and financial benefits of the Project to local communities as well as the State and Commonwealth. This chapter also discusses the main alternatives studied by Central Queensland Coal as part of the Project's feasibility study and the reasons for selecting the proposed layout. Alternatives have been considered with particular regard to the principles of ecologically sustainable development (ESD). Key Project alternatives considered during the Project design process included location alternatives for infrastructure, technological alternatives for processes and plant and conceptual alternatives for open pit and underground design and supply services.

2.1 Project Overview

The Project is located 130 km northwest of Rockhampton in the Styx Coal Basin in Central Queensland. The Project will be located within Mining Lease (ML) 80187 and ML 700022, which are adjacent to Mineral Development Licence (MDL) 468 and Exploration Permit for Coal (EPC) 1029, both of which are held by the Proponent.

The Project will involve mining a maximum combined tonnage of up to 10 million tonnes per annum (Mtpa) of semi-soft coking coal (SSCC) and high grade thermal coal (HGTC). Development of the Project is expected to commence in 2018 and extend for approximately 20 years until the current reserve is depleted.

The Project consists of three open cut operations that will be mined using a truck and shovel methodology. The run-of-mine (ROM) coal will ramp up to approximately 2 Mtpa during Stage 1 (Year 1-4), where coal will be crushed, screened and washed to SSCC grade with an estimate 80% yield. Stage 2 of the Project (Year 4-20) will include further processing of up to an additional 4 Mtpa ROM coal within another coal handling and preparation plant (CHPP) to SSCC and up to 4 Mtpa of HGTC with an estimated 95% yield. At full production two CHPPs, one servicing Open Cut 1 and the other servicing Open Cut 2 and 4, will be in operation.

A new train loadout facility (TLF) will be developed to connect into the existing Queensland Rail North Coast Rail Line. This connection will allow the product coal to be transported to the established coal loading infrastructure at the Dalrymple Bay Coal Terminal (DBCT).

The Project is located within the Livingstone Shire Council (LSC) Local Government Area (LGA). The Project is generally located on the "Mamelon" property, described as real property Lot 11 on MC23, Lot 10 on MC493 and Lot 9 on MC496. The TLF is located on the "Strathmuir" property, described as real property Lot 9 on MC230. A small section of the haul road to the TLF is located on the "Brussels" property described as real property Lot 85 on SP164785.

2.2 Project Justification

2.2.1 Global Coal Demand

The Project will produce both coking (SSCC) and thermal (HGTC) coal for export. Thermal and coking coals are in demand globally to generate electricity and steel, respectively. Recent demand for both thermal and coking coal has increased significantly with spot prices reaching US$100 and US$300 free on board (FOB), respectively. Quarterly contract sale prices have also significantly increased with the next quarter contracts for thermal and coking coal reaching US$100 and

US$200/tonne, FOB respectively. As an indication of the extent to which global demand has changed, coking coal spot price (daily market price), was $US73.40/tonne in November 2015 and in November 2016 prices reached $US289.30/tonne; a four year high (~400% increase) (Office of the Chief Economist 2016; Kerr 2016). The demand for thermal and coking coal, and subsequent coal spot prices makes this Project economically viable.

With respect to thermal coal, the United States (US) International Energy Agency (IEA) predicts global energy consumption to grow by 37 per cent (%) by 2040 (US IEA 2014). This is taking into account existing and planned government policies regarding climate change. In 2040, natural gas, oil and coal will each account for roughly one-quarter of the world's energy needs (US IEA 2014).

Among these fossil fuels, coal demand is predicted to grow most rapidly, driven largely by growth in non-Organisation for Economic Co-operation and Development (OECD) countries. Asia accounts for 60% of the growth of energy demand and it is predicted that by 2025, China will make up 24% of the global energy demand. From 2025 to 2040, India is likely to take over China as the main source of global demand growth (US IEA 2014). Increases in demand are predicted to continue for approximately the next ten years (US IEA 2014).

Australia exported 201.3 million tonnes (Mt) of thermal coal during the 2015 – 2016 financial year, valued at over $14.7 billion, and is expected to increase to 202.2 Mt with a revenue of $18.9 billion this financial year (2016 – 2017)(DFAT 2017). Australia's thermal coal exports are expected to increase by 11% per annum between 2013 and 2017, from approximately 162 Mtpa to approximately 271 Mtpa (Australian Coal Association 2012). Southeast Asian thermal coal demand is expected to triple in the next 25 years (IEA 2015). This Project will help supply the demand growth.

As with thermal coal, non-OECD countries are also predicted to drive global growth in coking coal consumption and production over the medium term as steel is required to support growing infrastructure needs (Office of the Chief Economist 2017). Australia exported 188 Mt of coking coal during 2015 – 2016 financial year, valued at over $19.7 billion, and this is expected to increase to 191.7 Mt this financial year (2016-2017) at a relative value of $36.6 billion (Office of the Chief Economist 2017). Importantly, about $1.59 billion (80%) of the royalties paid to the Queensland Government in 2015–16 were attributed to coal sales (Queensland Treasury 2017). With increased pricing in both thermal and coking coal it is expected that the royalty contribution will increase.

Australian production rates of coking coal are expected to increase at a rate of 2.1% per year until 2020. This growth will be supported by new developments such as this Project. The current increases in global demand for coal and forecast increases in production support the justification for the Project.

2.2.2 Policy Framework for Coal in Queensland

In 2014 the Queensland Government established the ResourcesQ 30-year vision and action plan to deliver the objectives of the Queensland Plan pertaining to the resources sector. The intention is that by 2044 Queensland will be recognised as a preferred resource destination, with an enviable investment track record and competitive operating environment.

A number of initiatives are being implemented to deliver the ResourcesQ vision by the Queensland Government, including a number of strategic plans to support the development of coal, particularly in central Queensland. The government's commitments to the development of coal are overseen by the Coal Infrastructure Taskforce. The Coal Infrastructure Taskforce is responsible for delivering the CoalPlan 2030 and the Coal Infrastructure Program of Actions.

The CoalPlan 2030 provides a strategic framework for coal infrastructure development throughout the state. The plan provides a linked network of rail systems to four export port facilities on the east coast. There are five rail systems that provide infrastructure for delivery of coal export: Newlands, Goonyella, Blackwater, Moura and Western systems. The Project is consistent with the objectives of the CoalPlan 2030 through its reliance on key existing coal export infrastructure, that is the use of the existing North Coast Rail Line to connect into the Goonyella Rail Corridor and then to existing port capacity at Mackay, or alternatively, use the existing North Coast Rail Line to connect into the existing Blackwater Rail Line and into the existing port facilities at Gladstone.

Since 2008, the Coal Infrastructure Program of Actions has committed more than $19.3 billion to coal related infrastructure, including transport systems, water and energy supplies, skills and social infrastructure. It is anticipated that the Project will also contribute to a variety of plans outlined in the Coal Infrastructure Program of Actions including, but not limited to, skills development and contribution to social infrastructure (see Chapter 19 – Social and Economic for further details).

The Queensland Government has undertaken strategic planning activities to support the growth and development in areas of mining communities and coal export facilities. These legislative and non-statutory frameworks include:

- Building our Regions;
- Queensland Ports Strategy; and
- Central Queensland Regional Plan 2013.

The Central Queensland Regional Plan 2013 recognises that coal growth and development underpins the economic wealth in the area (DILGP 2013). With the further expansion of the coal industry in the Galilee basin, the subregion's economy will continue to grow.

The Central Queensland Sustainability Strategy 2030 has been developed as an initiative of the Fitzroy Basin Association, to provide a blueprint to better manage and protect Central Queensland's assets. The CQSS2030 has been developed collaboratively by FBA with regional stakeholders and is written for members of the community, natural resource managers and the institutions that influence resource management in Central Queensland.

2.2.3 Project Benefits

Coal is Queensland's second largest export commodity and provides significant benefits to the State and Federal governments through strong financial returns and significant employment opportunities. In the 2015/2016 financial year coal contributed to the Queensland economy by:

- Contributing $32.7 billion gross regional product (equating to 11% of Queensland's total gross regional product);
- Employing 183,554 full time employees (equating to 8% of Queensland total employment);
- Paying $2.7 billion in wages to 19,072 direct full time employees;
- Paying $1.6 billion in royalties (out of a Queensland total of $2.2 billion) to State governments which was then distributed across Queensland; and
- Spending $11.3 billion within Queensland on locally purchased goods and services, benefitting 10,727 local Queensland businesses, and community contributions benefitting 469 Queensland community organisations (QRC, 2016).

The Project is predicted to provide a significant contribution to these economic benefits, including employment and a boost to the townships of Ogmore, St Lawrence and Marlborough, as described in detail within Chapter 19 – Social and Economics.

The Project will provide a boost to the Livingstone Shire and Queensland's and Australia's economy. Capital expenditure for the Project is anticipated to total $242.68 million (see Chapter 19 – Social and Economics). The Project will provide key social and economic benefits to the locality, region and state including flow on business, employment skills and training programs, and royalties and taxes.

2.2.3.1 Flow on Business

A significant proportion of this investment will flow directly into the regional economy from the goods and services required during the construction and operation phases. During the construction stage the predominant economic advantage comes from capital expenditure (CAPEX) on goods and services. This will continue during operations but at a reduced demand. Goods and services expected to be sourced locally and from the region include:

- Consumables (food, beverages etc.) for the workforce;
- Fuel supply and transport;
- Housing;
- Light engineering and engineering support services;
- Professional and technical services;
- Road transport services for consumables, equipment and supplies;
- Tools, plant and equipment;
- Training and personnel management services; and
- Vehicle hire or purchasing.

Ongoing supply lines during the operational phase of the Project are likely to be from regional centres such as Rockhampton and Mackay. As such the flow on effects are expected to benefit these centres through the provision of goods and services. Indirect businesses and infrastructure development are also expected to benefit from the additional personnel in the region. Beyond local and regional suppliers, the Project will also require support from the broader Queensland supply and services base for technical and specialist skills or equipment to deliver and sustain operations.

2.2.3.2 Employment, Skills and Training

Throughout the three phases of the Project (construction, operation and decommission) the Project will provide potential employment opportunities in Ogmore, St Lawrence and Marlborough, in addition to the broader regional area. The Project will directly create a total demand of approximately 136 full-time equivalent (FTE) positions in Queensland and 38 FTEs from the rest of Australia for the construction period. At full operating capacity, the Project will directly employ between 90 to 1,900. The variance in the operational workforce is associated with the tonnages being produce at the mine. The Project will also ensure employees are appropriately trained in their relevant industry skills and provide training programs to further develop industry skills.

Additional employment will be created from flow-on effects. This will ease some pressure in the local community resulting from recent down-sizing of workforces and add to the over 44,000 directly employed throughout the Australian coal industry as of February 2017(ABS 2017).

2.2.3.3 Royalties and Taxes

Economic modelling for the Project (see Chapter 19 – Social and Economic and Appendix A10a – Economics Technical Report) indicates that the Project will contribute approximately $4.41 billion over the life of the mine. This assessment is based on the below:

- The exchange rate outlook for Australia is anticipated to remain, at least in the medium term, at approximately ~US$0.76;
- The price of semi-soft coking coal is anticipated to decrease from its current high of US$160 per tonne to approximately US$125 per tonne in the short to medium term; and
- The price of high grade thermal coal is anticipated to remain at approximately US$95 per tonne for the medium term.

Thus, based on these anticipated prices and exchange rate, the total export value of the coal produced is estimated to be in the order of AUD$4.41 billion of the life of the mine. Assuming Queensland coal mining royalty rates remain unchanged, this will yield royalties of approximately $525.26 million over the life of the mine.

It is pertinent to note that both coal prices and exchange rates are subject to fluctuations and shocks, so these estimates are intended to be indicative only, based on the current trade environment.

2.3 Alternatives to the Project

During the Project design process, a number of alternative scenarios were considered to evaluate the relative social, economic and environmental advantages and disadvantages of different Project alternatives. Results from this analysis were used to select the final Project scope in the context of fixed locations for the coal resource and MLA areas. This process ensures the Project design has been underpinned by relevant environmental, social and economic drivers.

Alternative scenarios considered were those that are practicable, feasible and available to Central Queensland Coal. These included locality, technological and conceptual alternatives. The scenarios assessed as part of the EIS included the following alternative actions:

- No development scenario;
- Locality alternatives;
  - Mine infrastructure area (MIA)
  - Transport corridor
  - TLF
  - Mine access road for the workforce
- Technological alternatives; and
  - Mining methods
  - Rejects and tailings management

- Conceptual alternatives;
  - Open cut configurations
  - Water supply
  - Energy supply
  - Alternative accommodation during the construction and operational phases

The following subsections discuss each of the aforementioned alternative scenarios.

2.3.1 No Development Scenario

The no development scenario predicts the future scenario which would exist in the absence of any Project. The no development scenario would avoid the potential impacts of the Project on the existing environment and cattle grazing would likely continue to be the primary land use.

This scenario would also have a significant impact socially and economically as between 475 to 4,600 direct and indirect jobs and business expansion opportunities would not be realised. The region will not benefit from employee opportunities, financial donations to community groups, training programs or receive local business support. With the significant reduction in the resource industry workforce within central Queensland the broader region will continue to experience social and economic stress.

In economic terms, the no development scenario would result in a loss to the Queensland Government in approximately $525.26 million in royalties over the life of the mine.

2.3.2 Locality Alternatives

2.3.2.1 Mine Location and Layout

The mine location is determined by the targeted coal deposit and ML80187, held jointly by Central Queensland Coal and Fairway Coal. The proposed mining lease boundaries are defined by existing geological conditions which are suitable to mining based on the results of exploration studies undertaken within the ML. As such alternative mine locations are not available to Central Queensland Coal. The existing location is suitable for development of a mine as the proposed location:

- Is in the Styx Coal Basin which has previously supported coal mining;
- Is not within any Environmentally Sensitive Areas [although a small section of the Project does lie within an area shown as Strategic Cropping Land (SCL) on the SCL trigger map (see Chapter 5 – Land for more information)];
- Is within close proximity to the existing North Coast Rail Line which connects to the existing Goonyella rail and port infrastructure system, or alternatively, use of the North Coast Rail Line to connect into the existing Blackwater Rail Line and port infrastructure at Gladstone;
- Has direct access to the area off the Bruce Highway; and
- The rail distance between the Project and the Dalrymple Bay Coal Terminal is 190 km.

2.3.2.2 Mine Infrastructure Area

Two options were considered for the operation of the MIA and CHPP. The original concept was for a single MIA and CHPP servicing all three open cut pits. This concept was optimised to allow for the future extraction of SSCC. Further assessment of the mine operability resulted in decision to move towards two smaller MIA and CHPPs. One MIA and CHPP will be located on the western side of the Bruce Highway and will service Open Cut 1. The second MIA and CHPP will be located on the eastern side of the Bruce Highway servicing Open Cut 2 and Open Cut 4. The use and development of two MIAs and CHPPs concept was adopted, as a balance between the long term haulage of ROM coal, reject material and product coal while allowing for the economic extremities of the mine area. A further key reason was to significantly reduce the volume of trucks crossing the Bruce Highway moving to and from the single MIA / CHPP as originally proposed.

2.3.2.3 Transport Corridor Locations

A preliminary study was undertaken by Central Queensland Coal to identify potential haul road and TLF options. The options included in the assessment are shown at Figure 2-1. The TLF options that were considered are located at:

- Option 1 - Lot 119 on CP900367;
- Option 2 - Lot 4973 on SP275117;
- Option 3 - Lot 9 on MC230;
- Option 4 - Lot 193 on MC550; and
- Option 5 - Lot 561 on SP1301093 and 3 on RP602328.

Options 4 and 5 were ruled out as a feasible alternative because of the relatively longer haulage distances required (approximately 20 km and 42 km) and the need to use public roads (i.e. Ogmore and Kootandra roads and the Bruce Highway) to haul coal to the respective TLFs.

Options 1 -3 were selected for detailed consideration. This assessment took into account a number of economic, environmental and social criteria including: earthwork volumes, CAPEX and operating expenses (OPEX), impacted areas of mapped environmental values (Threatened Ecological Communities (TECs), Reginal Ecosystems (REs), SCL and watercourses), and impacted landholdings and roads. The three options evaluated were:

- **Option 1** – the haul road is approximately 3 km in length, heading north from the MIA and adjacent to Deep Creek for approximately 2.5 km before crossing Deep Creek and running approximately 0.5 km to the northeast to connect to the TLF. The rail connection is approximately 1.5 km in length in a northeast direction to the North Coast Rail Line;
- **Option 2** – the haul road is approximately 2.5 km in length, heading north from the MIA and adjacent to Deep Creek for approximately 2 km before crossing Deep Creek and running approximately 0.5 km to the northeast to connect to the TLF. The rail connection is approximately 1.5 km in length in a northeast direction to the North Coast Rail Line; and
- **Option 3** - the haul road is approximately 4.5 km in length, initially heading southeast from the MIA for approximately 2 km before crossing Deep Creek and running approximately 0.1 km to the east and then heading approximately 2.4 km to the east to connect to the TLF. The rail connection is approximately 3.5 km in length in a northeast direction to the North Coast Rail Line.

The comparative environmental, social and economic impacts of each alternative, with particular regard to the principles of ESD are provided in Table 2-1.

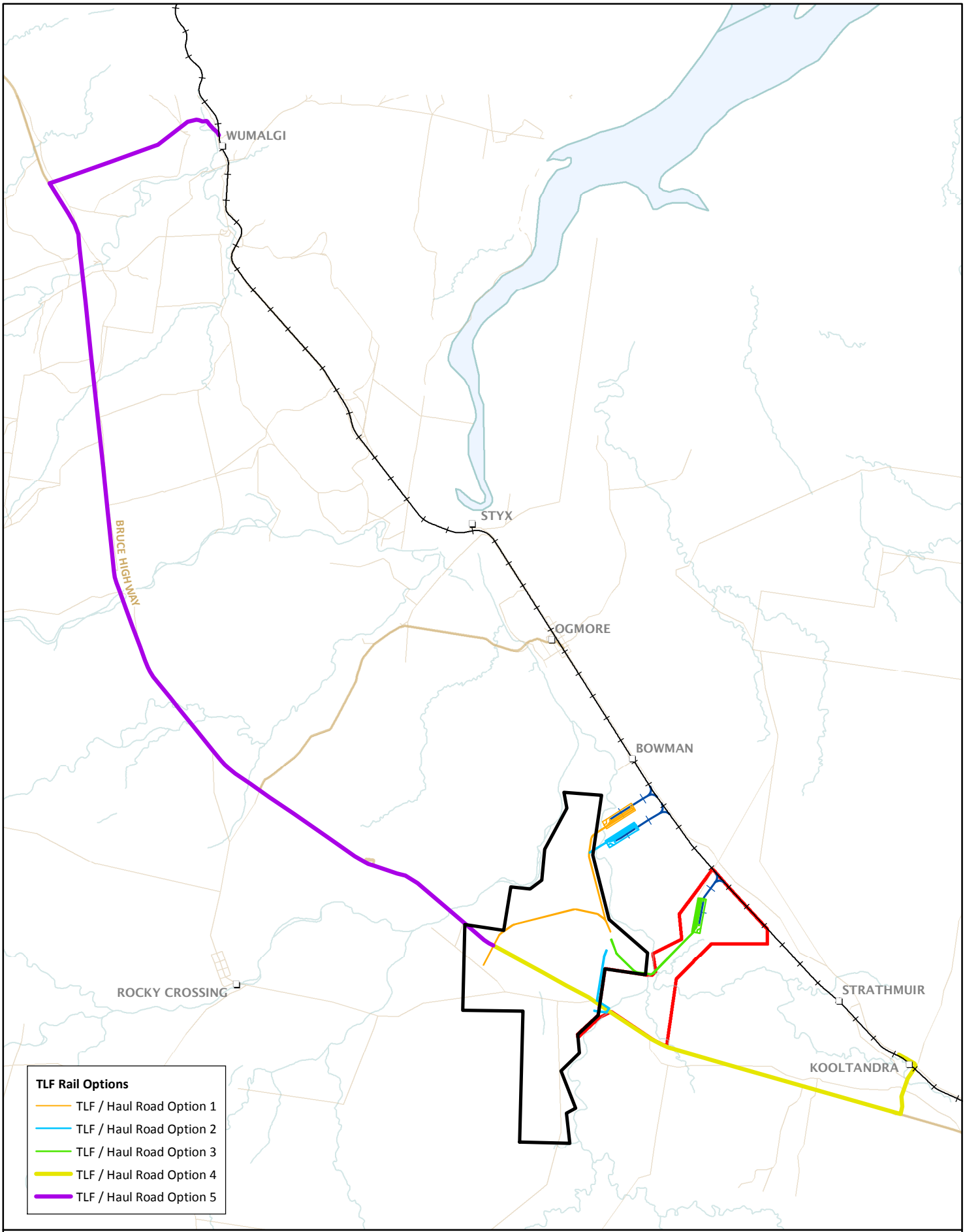

Figure 2-1
Transport corridor options

Table 2-1 ESD decision framework for transport corridor

Options considered	Environmental	Economic	Social
Option 1	Infrastructure is located predominantly on cleared land (mapped as non-remnant) utilised for cattle grazing. The haul road crosses Deep Creek at a single location and may require clearance of <1 ha of Of Concern RE 11.3.4 *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains. Less than 1 ha of the endangered RE 11.4.9 *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains may be impacted by the construction of the TLF, although the opportunity may exist to design the TLF infrastructure to sit outside of the RE and therefore avoid any disturbance to the RE. The haul road and TLF will be constructed on gently undulating land dominated by vertosol soils. Will require the clearance of approximately50 ha of land mapped as SCL and Good Quality Agricultural Land (GQAL).	Second longest of the three haul road options (i.e. 3 km in length). Whilst occurring on generally gently undulating land this option will require civil works associated with the creek crossing (approximately 100 m in length). The tenure for ML 80187 does not include the bed and banks of Deep Creek and as such a new EPC application would be required to incorporate this potential creek crossing into the ML for the Project.	Impacts two landholders of which one is a related party to the Project and one MDL held by Central Queensland Coal. The haul road crosses one internal boundary track on the property not owned by the related party. Native Title is generally extinguished as the land where the disturbance will occur is freehold title, except for the creek crossing which may be a boundary waterway crossing.
Option 2	Infrastructure is located predominantly on cleared land (mapped as non-remnant) utilised for cattle grazing. The haul road crosses Deep Creek at a single location and may require clearance of <1 ha of Of Concern RE 11.3.4 *Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains. The haul road and TLF will be constructed on gently undulating land dominated by vertosol soils. Will require the clearance of 29.1 ha of land mapped as SCL and GQAL.	Shortest of the three haul road options (i.e. 2 km in length). Whilst occurring on generally gently undulating land this option will require civil works associated with the creek crossing (approximately 100 m in length). The tenure for ML 80187 does not include the bed and banks of Deep Creek and as such a new EPC application would be required to incorporate this potential creek crossing into the ML for the Project.	Impacts two landholders of which one is a related party to the Project and one MDL held by Central Queensland Coal. The haul road crosses one internal boundary track on the property not owned by the related party. The TLF is located within the Darumbal Native Title area on Pastoral lease and as such will impact on Native Title. A further impact to Native Title may occur at the crossing of Deep Creek which may be a boundary waterway crossing.

Options considered	Environmental	Economic	Social
Option 3	Infrastructure is located predominantly on cleared land (mapped as non-remnant) utilised for cattle grazing. The haul road crosses Deep Creek at a single location and may require clearance of <1 ha of Of Concern RE 11.3.4 *Eucalyptus tereticornis* and / or *Eucalyptus* spp. woodland on alluvial plains. The haul road and TLF will be constructed on gently undulating land dominated by vertosol soils. Avoids mapped areas of SCL and GQAL.	Longest of the three haul road options (i.e. 4.5 km in length). Whilst occurring on generally gently undulating land this option will require civil works associated with the creek crossing (approximately 120 m in length). The creek crossing in this location has not be excised from the original EPC and as such this area is included in ML 80187 and ML 700022. Consequently, no further EPC application would be required.	Impacts two landholders of which one is a related party to the Project and one MDL held by Central Queensland Coal. The haul road crosses one road easement on the property not owned by the related party. Native Title is extinguished as the land where the disturbance will occur is freehold and there are no boundary waterway crossings unlike with Options 1 and 2.

The assessment identified all three options as being suitable for the Project. The amount of disturbance to REs were similar between the three options assuming the design of the haul road and TLF for Option 1 avoids the Endangered RE. Options 1 and 2 both affect areas of mapped SCL noting; however, that no cropping has occurred in the area. All three routes affect two landholders, with one being a related party to the Project and consents to the land being used for the haul road. All three options were located on land held under freehold title, although Options 1 and 2 both had uncertainty associated with a potential boundary waterway crossing, whereas Option 3 has a road easement through Deep Creek which will be utilised as the haul road crossing and thereby avoids impacts to Native Title. Following this assessment, a ground-truthing exercise was carried out to confirm the vegetation types within the disturbance footprints of the three options.

The area of the crossing of Deep Creek proposed for Option 3 has not been excluded from the original underlying EPC, whereas the crossing locations for Options 1 and 2 have. To avoid the need to obtain a further underlying EPC to cover the area excluded from the original EPC, Central Queensland Coal has adopted Option 3 in this regard.

Following this, Option 3 was considered the best option notwithstanding it required the longest haul road and civil works associated with the creek crossing. No SCL areas were mapped along this haul road corridor, the TLF or rail connection. Similar to Options 1 and 2, Option 3 impacts two landholders, with one of the two land holders already consenting to the haul road development. One MDL is affected by the haul road and TLF; however, this MDL is held by Central Queensland Coal. Option 3 does not traverse land with Native Title, whereas Options 1 and 2 cross a potential boundary waterway crossing and for Option 2 the TLF and haul road to the east of Deep Creek are on land held under Pastoral Lease within the Darumbal Native Title Claim area.

2.3.2.4 Mine Access Road

The Mine will be accessed from the Bruce Highway via two new turn out lanes. Various options were assessed regarding the location of the entry turnout locations; however, at this point in time the current locations accessing the east and west pit areas were considered the most appropriate given the locations of Open Cut 2 and Open Cut 3.

2.3.3 Technological Alternatives

The technology used in processes can greatly influence the level of environmental impact of an activity. Advancements in technology allow us to conduct operations far more efficiently than

historically. This efficiency can translate to a smaller footprint (the amount of surface area disturbed), less waste generated, cleaner and safer operations, and greater compatibility with the environment. Various technologies were considered for transferring coal from the south pit to the MIA and reject and tailings management during concept development of the mine. These considerations are discussed in the following sections.

2.3.3.1 Assessment of Alternative Mining Methodologies

A conceptual study to determine the most appropriate mining methodologies was carried out by Central Queensland Coal. The study examined key mine design parameters to the application of various mining technologies. Those considered included:

- Open cut mining; and
- Underground longwall mining.

The key mine design parameters included: percentage recovery, annual production volumes, value per tonne of ROM and the mining design limitations of each mining method. These were compared using a margin ranking process to identify the most suitable method for the site.

The Project mining operation will target up to 10 seams of coal in a relatively shallow environment, necessitating the use of an open cut mining method to an economical cut-off depth. The open cuts will utilise a truck and shovel operation to extract both overburden and coal in a strip / terrace mine configuration. The excavated void in Open Cut 2 will be back-filled and rehabilitated as soon as possible after the coal reserves have been extracted. Small final voids will be left in Open Cut 1 and Open Cut 4 to improve water storage capacity, as a defence against future droughts, to enhance ongoing grazing activities.

Underground mining was not considered to be an economical option due to the requirement to simultaneously target multiple seams for extraction.

2.3.3.2 Assessment of Alternative Rejects and Tailings Management Technologies

Rejects consist of both coarse and fine waste rock particles produced after the coal has been processed in the CHPP. The coarse rejects will be deposited by truck, initially in the voids between the waste rock stockpiles. The waste rock stockpile peaks will then be dozed to cover the coarse rejects, and subsequently overlain by topsoil as part of rehabilitation.

Two main options were assessed for the management of the reject fines from the CHPP. The use of tailings (fines suspended in waste water) storage dams and the avoidance of tailings storages through the implementation of paste thickeners and filter pressing technology. Plate press technology, another common technique used in developing countries, was also initially considered but discounted due the high labour costs involved if implemented within Australia.

Tailings dams are used to manage the waste water containing suspended fine particles from the CHPP. This process decants the water for reuse into the CHPP and allows the fine sediments to settle at the bottom of the dam. The fines can periodically be removed. This option of tailings management requires a large area for the storage pond, greater evaporative losses of water from the mine site, ongoing monitoring of water levels to reduce the risk of uncontrolled discharges, and presents some risk of dam wall failures as well as more costly rehabilitation.

Thickeners and filter press technology allows process water to be directly recycled back to the mineral processing plant (approximately 60%), reducing water losses, process chemical losses,

seepage and reducing processing plant water demand. The solid fines rejects are then discarded in pit with the coarse rejects.

The comparative environmental, social and economic impacts of each alternative, with regard to the principles of ESD are provided in Table 2-2.

Table 2-2 ESD decision framework for tailings management

Impacts	Thickeners and filter press technology	Wet tailings storage
Environmental	Eliminates the need for a surface tailings storage facility. Reduces risk of overtopping, seepage and evaporative losses. Increased water efficiency and return to the CHPP. Reduced footprint for storage area. Thickening allows accelerated access for rehabilitation.	Increased rehabilitation requirements and greater liability post-closure. Increased risk of seepage and or failure. Reduced water recovery for reuse. Sterilises potentially large areas of the mine site from future beneficial uses. Increased annual monitoring and management requirements.
Social	No legacy environmental problems after mine closure.	Downstream risk in event of seepage or containment failure.
Economic	High capital and operational costs. High maintenance and labour intensive.	Low capital cost and operating cost. High closure cost for rehabilitation.
MNES	No standing water to be accessed by listed fauna species. Minimise disturbance area.	Higher increased risk of access by wildlife to wet tailings.

The preferred method is to truck all coarse reject and dewatered fine reject material to in-pit and out of pit overburden waste areas. Filter pressing of fine rejects is an accepted process in coal preparation plants throughout Australia. The process is most in line with ESD principles identified in cleaner production, including water reclamation, maximising density of tailings, avoiding storages and reusing for mine backfill thereby eliminating the risks of failures (Edraki et al. 2014).

2.3.4 Conceptual Alternatives

2.3.4.1 Open Cut Configuration and Optimisation

The mining method considered was based on the occurrence of multiple gently dipping thin coal seams and some surface constraints. As a result, a strip / terrace mining method was selected.

The nature of the thin coal seams lends itself to a coal seam aggregation process which was conducted to develop proper coal working sections. The coal working sections were used in the determination of the economic pit limits through a margin ranking process. Alpha Mine Planning 4U conducted a margin ranking exercise and typical industry costs were used (all-inclusive cost – from pit to port).

Various washability data sets were available for the ranking exercise but to deliver the anticipated product coal qualities, a sink float setting of 1.5 was used. The net outcome of the margin rank resulted in various cut-off margins for the associated basal coal seam. These were used to ultimately determine the final pit limits and preferred basal coal seam.

This exercise further identifies the sequence and mining direction of the various pits, which resulted in a generalised direction from south to north. This mining direction had a significant impact on reducing the size of the final pit voids, in-pit dumps and potential impact on the environment (no final void for Open Cut 2).

The use of this optimisation process incorporated both the economic and environmental ESD concepts into the decision making criteria to find the optimal pit layout which minimise over burden and waste rock removal.

2.3.4.2 Water Supply

The overall water demand is 1.9 ML (including fire water) per day. The water balance for the Project indicates that there will be a slight water deficit for years 10 – 12 of the operations phase of the Project. Notwithstanding, the water supply has a 99% reliability over 16 years of mining operations. This is discussed in more detail in Chapter 9 – Surface Water.

A reliable source of water is required for the construction and operation of the Project. The total water requirement from offsite supplies will vary in relation to water use and the availability of onsite supplies. Water supply options investigated for supplying raw water to the mine have included:

- Onsite capture (mine dewatering and rainfall harvesting);
- External supply; and
- Onsite reuse.

Table 2-3 ESD decision framework for water supply

Impacts	Onsite capture (dewatering, surface water)	External supply	Reuse
Environmental	Minimal water available from the groundwater or surface water. Large disturbance area for water storages.	Sourced from commercial water supply, and thereby impacting existing storages. Lesser impact than capture and storage onsite.	Potential contamination of reused water/concentrations of chemicals. Reduced demand on water sources.
Social	Reduce yield of landholders' bores and downstream water users.	Competitive demand with surrounding users, including Ogmore township.	Reduces demand on fresh water supplies. Social acceptable water conservation approach.
Economic	No reliable supply. Significant infrastructure requirements to capture and store water for required reliability period.	Low risk, secure option. Water costs from purchasing.	Treatment costs. Cost savings from reduction in water demand and purchasing.

No one option is considered solely suitable for the Project. Water will be sourced using all available options, onsite and offsite water supplies and onsite reuse of water to have the most sustainable outcome available.

During construction and the establishment of the external water supply, water will be required to be trucked in and stored onsite.

2.3.4.3 Alternative Energy Sources

The average expected energy demand for the Project during operations will be in the order of 3 to 5 megawatt (MW) with an estimated annual usage of 35 Gigawatt hour (GWh) based on 365 days, 24 hours per day operation. An assessment was undertaken during the feasibility studies to determine the most cost-effective method for power supply.

Powerlink and Ergon Energy were consulted regarding connections into their existing networks. There is also a regional 275 kilovolt (kV) line which crosses the southwest ML boundary. From discussions with Powerlink it is not feasible to connect to this power supply. Currently there is no transformer in the area to step down the high voltage for mine supply. Consequently, this option is no longer under consideration.

A separate option to connect into the existing 11 kV transmission line maintained by Ergon Energy which provides power to the nearby township of Ogmore is under consideration. From discussion with Ergon this 11 kV line has limited capacity to support the Project; however, depending on the final power demand needed to support the mine operations, an opportunity to connect to the Ogmore substation may still be possible.

As there is currently no firm opportunity for a secure supply through connection into the existing Powerlink or Ergon network, the decision was taken to utilise 415 volt (V), three-phase dual fuel generators to provide power onsite. These generators will be installed at the MIA and the CHPP with the likely configuration for the MIA being two 300 kilovolt amperes (kVA) 415 V dual fuel generator sets mounted in a fully bunded area adjacent to the MIA 415 V Switchroom. The configuration for the CHPP would likely be one 500 kVA 415 V dual fuel generator set mounted in a fully bunded area adjacent to the raw coal 415V Switchroom. The CHPP substation will have three 500 kVA 415 V dual fuel generator sets mounted in a fully bunded area adjacent to the CHPP 415 V Switchroom.

2.3.4.4 Alternative Accommodation

Accommodation options for workers both during the construction and operation phase have been assessed. As the Project will be drive-in drive-out from local towns, Central Queensland Coal considered offsite accommodation at regional towns (i.e. Ogmore, Marlborough, St Lawrence and Rockhampton) as well as developing a new onsite accommodation village in the ML, with a second option of an accommodation camp located on Mamelon, but outside of the ML. The ESD decision considerations when assessing these alternative options are discussed in Table 2-4.

Table 2-4 ESD decision framework for accommodation options

Impacts	Onsite	Offsite Accommodation
Environmental	Increased environmental impact. Additional land disturbance. Reduction in travel requirements and reduced emission and road kill incidents. Located outside mapped SCL.	Existing facilities so no additional land disturbance. Greater vehicle emissions from travel of workers. Increased road kill of fauna due to the travel at dawn and dust times.
Social	Less travel time impact on workers day. Separation from families and communities for extended periods.	Increased risk of vehicle incident. Closer to township thus greater economic stimulus. Limited separation from families and communities. Reduction in accommodation available to the public.

Impacts	Onsite	Offsite Accommodation
Economic	Higher cost in camp development and set up. Increased efficiency in workers hours worked (reduced travel).	Minimal development and construction costs. Reduced productivity with increased travel times.

Central Queensland Coal intends to staff the Project as a drive-in drive-out operation using a local work force to the extent possible and encouraging personnel to live in the local area. There may be a need for some drive-in drive-out from further afield and the close proximity to regional towns supports this approach. Consequently, the use of existing accommodation at nearby townships is the preferred option. The Project will investigate establishing a bus service to transport staff to and from local townships when the annual production exceeds 5 Mtpa.

The focus on using a local workforce to the extent possible enables the workforce to stay connected with family and the community when compared to utilising an accommodation camp. This is seen as being in-line with extant best practice in the resource sector. However, where these local and regional towns are not able to service the personnel, an accommodation camp will be developed outside the ML. The potential accommodation camp is outside the scope of this EIS.

2.4 Assessment of Project Against ESD Principles

ESD as defined in the National Strategy for Ecologically Sustainable Development (NSESD) (ESD Steering Committee 1992) is development which aims to meet the needs of Australians today, while conserving our ecosystems for the benefit of future generations. The NSESD was adopted by all levels of Australian Government in 1992 and provides broad strategic directions and framework for governments to direct policy and decision-making. The key objectives of the NSESD are:

- To enhance individual and community well-being and welfare by following a path of economic development that safeguards the welfare of future generations;
- To provide for equity within and between generations; and
- To protect biological diversity and maintain essential ecological processes and life-support systems.

While planning and designing the Project, Central Queensland Coal has considered the guiding principles of ESD as outlined in the NSESD. The guiding principles of ESD and how they are addressed in the EIS are outlined in Table 2-5.

Table 2-5 Guiding principles of ESD addressed in the EIS

Guiding principle of ESD	EIS section
Enhance individual and community well-being and welfare	The Project is anticipated to provide significant benefits to the wider community in terms of employment opportunities and increased government revenues as outlined in Chapter 19 - Social and Economics. The Project has been designed such that the mining operations proposed can coexist with existing agricultural land uses and environmental values within the region. These elements ensure that the Project will result in an enhancement of individual and community well-being in the region.
Intergenerational equity	Prepare and implement management plans for waste rock, general waste, soils, land, water and rehabilitation to minimise the legacy risks of the Project.
Protect biological diversity and maintain essential ecological processes	The Project has been designed to minimise impacts to ecological and environmental values throughout the Project area. This is demonstrated by the Projects water management strategy, coal handling strategy and the size and placement of the MIA which means there will be limited direct impacts on remnant vegetation. The haul road and TLF options underwent assessment which considered RE's and TEC's as key criteria in the decision. Mitigation measures to protect biological diversity during the construction and operation phase are outlined in Chapter 9 – Surface Water and Chapter 14 – Terrestrial Ecology. Water and fire management plans will be prepared to protect ecological processes. Offsets and methods for developing offsets are discussed in Chapter 14 – Terrestrial Ecology.
Decision making based on long and short term considerations	Chapter 5 – Land, Chapter 9 – Surface Water, Chapter 10 – Groundwater, Chapter 14 – Terrestrial Ecology, Chapter 19 – Social and Economics, present the long-term and short-term economic, environmental, social and equity impacts of the Project to enable informed decision making. The EIS demonstrates that the Project has been designed, sited and will be constructed and operated considering the short and long-term potential impacts. This ensures potential impacts are identified and managed adequately and sustainably.
The precautionary principle	An assessment of the level of risk of environmental harm from the Project, consistent with the precautionary principle has been undertaken by Central Queensland Coal. Findings are detailed throughout the EIS. Mitigation measures proposed have also been developed based on the precautionary principle ensuring that Project's environmental management criteria and objectives are best practice, notwithstanding any uncertainty of impacts occurring. This includes, for example, the requirement of the Project to pay financial assurance ahead of construction and offsetting potential ecological impacts.
Global environmental impact	Greenhouse gas emissions, mitigation, and reduction options from Project construction and operation are discussed in Chapter 12 – Air Quality (although individually the Project will have a negligible impact on the global environment). The Project has been designed and will be constructed and operated such that greenhouse gas emissions are minimised and mitigated where practicable. The Project will be a very small contributor to Australia's national greenhouse gas inventory. The Project will have no impact on any internationally protected species or sites.
Development of a strong, growing and diversified economy which can enhance the capacity for environmental protection	Economic impacts of the Project and mitigation measures for potential adverse impacts are considered in Chapter 19 – Social and Economic. The Project will contribute significantly to local, State and Commonwealth revenues. The Project will also result in approximately 174 direct jobs during construction, between 90 and 1,900 direct jobs during operations and up to 1,425 indirect jobs.
Enhancing international competitiveness in an environmentally sound manner	With the adoption of the latest mining methods and good practice environmental management, environmental impacts will be minimised and the Project will enhance international competitiveness in the coal mining industry. Mining methods are detailed in Chapter 3 – Description of the Project. As outlined above the design of the Project is such that minimal direct environmental impacts are anticipated and mitigation measures to manage impacts have been proposed which will ensure the Project is undertaken in an environmentally sound manner.
Cost effective and flexible policy instruments	The design of the Project has considered current Queensland and Commonwealth Government policy.

Guiding principle of ESD	EIS section
Community involvement in decisions and actions	The EIS process includes a number of opportunities for public comment, during the development of the ToR, public exhibition of the EIS and targeted consultation of the draft EA and ML. Chapter 1 – Introduction describes the stakeholder consultation program that was undertaken for the Project. Chapter 19 – Social and Economics outlines Central Queensland Coal's ongoing commitments to the local community.

2.5 Conclusion

The Project presents a timely social and economic stimulus to the Livingstone Shire and broader regional economy when considering the high unemployment levels in the resource sector because of the cyclic downturn. The increase in coal pricing and the continuing global demand for energy and steel production, in which coal remains a predominant source into the future, presents a timely opportunity to invest and reinvigorate the local economy. Despite the recent down turn, it is still predicated that the coal market will continue to increase substantially over the next 10 years.

This Project will create a large number of jobs and will boost the economic status of local communities, the region and the State. Significant royalties, capital expenditure, wages, taxes and flow on business opportunities will be created. The development is in line with the policy framework and strategic direction of the region and relies on existing coal export infrastructure.

To ensure the most suitable and sustainable mine design is developed, locality, technological and conceptual alternatives were considered against the principles of ESD. Locations of key Project infrastructure were determined through comprehensive multi criteria analysis ensuring the optimal locations were utilised. This includes the haul road and TLF location, MIA and mine access roads. The mine designs have been modelled and conceptualised to create the most efficient layout which minimises land disturbance. Technologies will be implemented to reduce impact areas and minimise legacy environmental risks. The assessment demonstrates that the options that will be implemented for the Project are the most feasible and take into consideration the social, economic and environmental impacts of the alternative options. If the Project were not carried out, then the benefits of the Project would not be realised.

2.6 ToR Cross-reference Table

Table 2-6 ToR cross-reference

Terms of Reference	Section of the EIS
7. Project description and alternatives	
Describe all aspects of the project that are covered by the EIS's assessment. If there are any aspects of the project that would be assessed separately, describe what they are, and how they would be assessed and approved.	Chapter 2 - Introduction
The project description should include all on and off lease activities relevant to the project including construction, operation and decommissioning activities. If the delivery of the project is to be staged, the nature and timing of the stages should be fully described.	Chapter 3 – Description of the Project
7.1 Proposed development	
Describe and illustrate the following specific information about the proposed project, including but not limited to:	Chapter 3 – Description of the Project
▪ project's title;	Chapter 3 – Description of the Project
▪ project objectives;	Chapter 1 - Introduction
▪ expected capital expenditure;	Section 2.2.3
▪ rationale for the project;	Section 2.2
▪ project description, including the nature and scale of all project components and activities;	Chapter 3 – Description of the Project
▪ whether it is a greenfield or brownfield site;	
▪ regional and local context of the project's footprint with maps at suitable scales;	
▪ proposed timing of the development, including construction staging and likely schedule of works;	
▪ relationship to other major projects or developments of which the proponent should reasonably be aware;	
▪ the workforce numbers for all project phases;	
▪ where personnel would be accommodated and the likely recruitment and rostering arrangements to be adopted; and	
▪ proposed travel arrangements of the workforce to and from work, including use of a FIFO workforce.	
7.2 Site description	
Provide real property descriptions of the project land and adjacent properties, any easements, any existing underlying resource tenures, and identification number of any resource activity lease for the project land that is subject to application.	Chapter 3 – Description of the Project
Describe and illustrate with scaled maps the key infrastructure in and around the site, including state-controlled and local roads, rail lines and loading yards, airfields, ports or jetties, electricity transmission infrastructure, pipelines, and any other infrastructure in the region relevant to the project.	Chapter 3 – Description of the Project
Describe and illustrate the topography of the project site and surrounding area, and highlight any significant features shown on the maps. Map the location and boundaries of the project's footprint including all infrastructure elements and development necessary for the project. Show all key aspects including excavations, stockpiles, areas of fill, services infrastructure, plant locations, water or tailings storages, buildings, bridges and culvert, haul and access roads, causeways, stockpile areas, barge loading facilities and any areas of bed levelling. Include discussion of any environmental design features of these facilities including bunding of storage facilities.	Chapter 3 – Description of the Project

Terms of Reference	Section of the EIS
Describe and map in plan and cross-sections the geology and terrestrial and/or coastal landforms of the project area. Indicate the boundaries of water catchments that are significant for the drainage of the site. Show geological structures, such as aquifers, faults and economic resources that could have an influence on, or be influenced by, the project's activities.	Chapter 3 – Description of the Project
Describe and illustrate the precise location of the proposed project in relation to any designated and protected areas and waterbodies. This is to include the location of any proposed buffers surrounding the working areas; and lands identified for conservation, either through retention in their current natural state or to be rehabilitated.	Chapter 3 – Description of the Project
Describe, map and illustrate soil types and profiles of the project area at a scale relevant to the site. Identify soils that would require particular management due to wetness, erosivity, depth, acidity, salinity or other feature, including acid sulfate soils. Complete an assessment of the potential for acid sulfate soils, risks associated with disturbance and proposed management and mitigation measures consistent with relevant government guidelines, policies and best practice management.	Chapter 3 – Description of the Project
7.3 Proposed construction and operations	
Describe the following information about the proposal, and provide maps and concept/layout plans: ▪ existing land uses and any previous land use that might have affected or contaminated the land; ▪ existing buildings, infrastructure and easements on the potentially affected land; ▪ all pre-construction activities (including vegetation clearing, site access, interference with watercourses, wetlands and floodplain areas); ▪ the proposed construction methods, associated equipment and techniques; ▪ road and rail infrastructure, and stock routes, including new constructions, closures and/ or realignments; ▪ location, design and capacity of all other required infrastructure, including water supply and storage, sewerage, electricity from the grid, generators and fuels (whether gas, liquid and/or solid), and telecommunications; ▪ changes to watercourses and overland flow on or off the site, including stream diversions and flood levees; ▪ any infrastructure alternatives, justified in terms of ecologically sustainable development (including energy and water conservation); ▪ hours of construction and operation; ▪ the proposed extractive and processing methods, associated equipment and techniques; ▪ the sequencing and staging of activities; ▪ the proposed methods and facilities to be used for the storage, processing, transfer, and loading of product; ▪ the capacity of high-impact plant and equipment, their chemical and physical processes, and chemicals or hazardous materials to be used; ▪ any activity that would otherwise be a prescribed environmentally relevant activity if it were not undertaken on a mining or petroleum lease; and ▪ any new borrow pits, stream bed excavations, or expanded quarry and screening operations that may be required to service construction or operation of the project.	Chapter 3 – Description of the Project
7.4 Feasible alternatives	
Present feasible alternatives of the project's configuration (including conceptual, technological and locality alternatives to the project and individual elements) that may improve environmental outcomes.	Section 2.3
Summarise the comparative environmental, social and economic impacts of each alternative, with particular regard to the principles of ecologically sustainable development.	Section 2.3
Discuss alternatives in sufficient detail to enable an understanding of the reasons for preferring certain options and courses of action while rejecting others.	Section 2.3
Discuss the consequences of not proceeding with the project.	Section 2.3.1