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8.0 ANALYSIS OF FEASIBLE ALTERNATIVES

Key points

- Underground mining methods are not economically or technically feasible for the safe recovery of the coal resource contained within the No. 1 Open Cut Extension areas at MCC;
- The use of hydraulic excavators is favoured over the use of face shovels as the primary means of overburden and coal removal for reasons of safety;
- The use of draglines is not feasible due to geological constraints;
- The use of a coal preparation plant is assessed as not being economically viable;
- As the proposal relies heavily on existing mine infrastructure, any alternative that duplicated such facilities was deemed unfeasible, for both economic and environmental reasons;
- Not proceeding with the No. 1 Open Cut Extension proposal will:
  - allow the spontaneous combustion problem of the No. 2 Underground to continue indefinitely as there is no alternative practical solution to this issue;
  - allow the subsidence/potholing area to continue as a safety and environmental hazard; and
  - leave the long term control of spontaneous combustion for both the No. 1 and No. 2 Open Cuts compromised; and
- Not proceeding with the proposal would result in a considerable loss of employment and the loss of many millions of dollars, in wages, expenditures, production and government revenues. This would have significant social and economic effects in the Muswellbrook Shire, with impacts also being felt at a regional, State and national level.

8.1 Overview

In the development of the mine plan for the No. 1 Open Cut Extension proposal, alternative options were considered in a number of key areas including:

- Mining method;
- Mine plan;
- Production rates;
- Transport infrastructure;
- Coal preparation and reject disposal; and,
- Alternative use of voids.

The final mine plan was greatly influenced by environmental, economic and social aspects. To be considered, any feasible alternatives must evaluate all these aspects.

8.2 General Mining Method

The proposed mining method is influenced by the geology and history of the coal deposit. Almost half of the coal reserves in the No. 1 Open Cut Extension proposal have previously been recovered by underground methods. The proposal seeks to open cut mine any remaining coal, which has been estimated at approximately 55 percent of the original in-situ resource. The recovery of the identified coal reserve by underground mining methods is not considered to be safe or to be economically or technically feasible.

8.3 Open Cut Mining Methods

Dragline Operations

Draglines are not suitable to mine through areas that have been previously mined by underground methods for safety reasons and also for the inability of draglines to selectively remove geological material. The proposed mining operations do not include the use of a dragline. The geological structures contained within the reserve, such as steeply dipping seams, complex faulting and disturbance prohibits the use of a dragline. Draglines also create greater amounts of dust during the mining process than other mining equipment available and are not considered as a feasible alternative.

Electric Shovel and Hydraulic Excavator Operations

Electric shovels were not generally considered for the proposal due to safety issues over old underground workings. It is intended that the No. 1 Open Cut Extension area will be mined with hydraulic excavators as the primary means of overburden and coal removal, instead of electric shovels. Recent improvements in the capacity of hydraulic excavators have made them a viable alternative to both dragline and electric face shovel operations. The advantages of hydraulic excavators include:

- An economical method of mining;
- Great flexibility;
- Minimisation of environmental impacts, particular dust and noise;
- Ability to selectively mine areas of complex geology;
- Ability to recover a greater number of coal seams; and,
- Enhanced ability to mine thinner parting horizons.

The proposal will utilise hydraulic excavators with any alternative mining equipment not considered an economically feasible alternative for most of the planned mining operations of the No. 1 Open Cut Extension.

Front-end Loader Operations

There is some scope for the use of a front-end loader as a primary means of overburden removal. There are significant sections of the No. 1 Open Cut Extension where overburden may be removed by "free dig" operations i.e. blasting will not be required to loosen the overburden prior to its removal. In areas of "free dig" it will be possible to consider the use of large capacity front-end loaders to remove and load overburden into haul trucks. Areas which may be amenable to the use of front-end loaders particularly occur in the early years of the No. 1 Open Cut Extension, close to the eastern highwall of the existing No. 1 Open Cut Void.

Some of the "free dig" areas are due to the nature of the overburden which exists, in places, as "coal-fired rock". This is heat-affected rock formed thousands of years ago by portions of the coal seams being on fire and heating surrounding rocks to high temperatures which caused the rocks to alter in structure, become brittle and fracture. The fractured coal-fired rock is anticipated to be relatively easy to remove, allowing the potential use of front-end loaders.

In other sections of the proposed No. 1 Open Cut Extension there will be a requirement to remove overburden material that has been previously mined by open cut methods. The re-mining of this material will also involve "free-dig" and a variety of mining equipment could be considered, dependant upon its availability. This may include front-end loaders, face shovels or excavators, but will not include the use of a dragline.

8.4 Changes Considered to the Mine Plan

The proposed mine plan has been chosen as the most economically feasible and environmentally sound within the constraints of geological features and mining lease boundaries. The plan to extend mining operations at Muswellbrook will preserve the economic viability of MCC, while retaining the employment and markets until access to the Sandy Creek Colliery resource and the potentially recoverable coal resource from the Rosehill/Castlerock area are available.

Some variations to the mine plan, as presented, have been considered. Some of the coal resource proposed to be mined can only be accessed by the relocation of a portion of Coal Road. Consideration was given to leaving this portion of the coal resource in the ground and avoidance of the costs associated with the re-location of Coal Road. Without the relocation of Coal Road a section of old underground workings would remain which could collapse and threaten the stability of the ground surface. Due to geological features and past mining the stability of the low wall would be in danger of collapse which would increase the safety risk in mining other portions of the No. 1 Open Cut Extension. The area contains underground workings with a propensity for spontaneous combustion. Failure to mine this coal would lead to ongoing problems in this regard. On balance, and under current economic conditions, a decision was made to include this portion of the coal resource in the overall mine plan.

Consideration was given to a variation to the mine plan by the commencement of mining of the coal resource in the east and the progression of mining toward Muswellbrook. This mine plan delayed access to the underground workings that currently are affected by spontaneous combustion and consequently delayed the elimination of spontaneous combustion from the worst affected areas. The eastern start to mining operations would also interfere with the operations of the No. 2 Open Cut Mine, by severing the main ROM coal haul road to the existing coal crushing facilities. The eastern start of mining option requires the excavation of significant quantities of spoil and overburden to commence mining operations. In comparison, the eastern start to mining operations has the advantage of the existing No. 1 Open Cut void which will allow almost immediate access to mineable coal. For the above reasons the eastern start to mining operations options was considered inferior in terms of ease of mining, economic benefits and environmental outcomes.

All alternative mining methods and mining plans have been actively considered by MCC. The proposal presented for development approval is based upon a mining plan that incorporates due consideration for:

- Maximum economic recovery of the available coal resource;
- Removal of subsidence/potholing area;
- Elimination of short and long term spontaneous combustion issues by the removal of coal and sealing off underground mines;
- The provision of sufficient inert capping material to treat all relevant areas of the No. 1 and No. 2 Open Cuts to provide a long term solution for spontaneous combustion;
- The most efficient use of capital resources;
- Best economical time to access coal;
- Most economical and efficient rehabilitation plan;
- Retention of markets for saleable coal;
- Continued employment opportunities and the retention of mining skills; and
- The use of existing mining equipment.

8.5 Production rates

Alternative production rates greater than 2.0 Mtpa were considered in the development of the mine plan. However the existing maximum production rate of up to 2.0 Mtpa was found to be the most feasible for to several reasons. MCC have the equipment, workforce and infrastructure to continue the current maximum production rate of up to 2.0 Mtpa. Any increase in production would require expansion, which would not be economically feasible. The existing maximum rate of 2.0 Mtpa will also allow sufficient time for the

exploration and development of other mines to progress. A greater production rate may result in a future gap in production with adverse impacts on the retention of a trained workforce and coal markets. It should be noted that actual production rates are likely to be closer to 1.5 Mtpa over the life of the No. 1 Open Cut Extension.

8.6 Coal Transport

A feature of the No. 1 Open Cut Extension is its use of existing infrastructure for the transportation of coal. An overland coal conveyor from MCC to the RCT was considered as an alternative. However a coal conveyor was found to be unfeasible due to the conveyor length, the visual aspect, land requirements and the life expectancy of the mine. A rail link extension was also investigated by MCC in an EIS for the Sandy Creek Colliery, however this was found to be uneconomic and unfeasible due to the life of the mine. Coal from the mine will continue to be transported off site by highway trucks to the RCT or local power stations. Any alternative proposal for coal transport that effectively duplicates existing infrastructure has not been considered as feasible.

8.7 Mine Infrastructure

The existing operations at MCC are fully supported by infrastructure that allows the mine to produce coal at a rate of up to 2.0 Mtpa. This infrastructure includes administration offices, engineering and production offices, bathhouse, workshop facilities and store, coal crusher, conveyors, stockpiles, water management dams, and private haul roads. As outlined in **Section 5.9** the No. 1 Open Cut Extension will not increase the annual rate of coal production and will continue to use the existing mine infrastructure. Alternative mine infrastructure may include temporary site offices from Year 8 of the mine plan.

8.8 Coal Preparation and Reject Disposal

Crushing

Coal crushing in Extension A will utilise an inpit crusher. MCC may be able to utilise existing crushing facilities located adjacent to the office and stores buildings. Crushing inpit is the preferred option as this method is able to load crushed coal directly into trucks for transport with the advantage that dust is largely retained within the pit.

Preparation

The Greta Coal Measures mined by MCC contain high quality coal which can be mined selectively and does not need beneficiation prior to dispatch from the mine. Lower quality/high ash coal, which does not meet export standards, is marketable to local power stations. An alternative to selling lower quality/high ash coal to Macquarie Generation, may be to pass this coal through a CPP to improve quality coal. The use of a CPP has the advantage of allowing poorer quality coals to be mined, but still allowing quality specifications of product coal to be achieved. In this way, the recovery of the available coal reserves can often be maximised. However the ability to selective mine and sell any lower quality/high ash coal,

replaces any advantages a CPP can offer. To reinitiate the use of a CPP is not considered a feasible alternative at MCC.

Other disadvantages of the CPP include:

- Ongoing operational costs;
- Creation of tailings which would need to be treated and stockpiled in a environmentally sound manner;
- Additional monitoring and management of stockpiles; and,
- Additional water consumption during operation.

Rejects

MCC does not currently produce coal rejects, nor does it plan to produce coal rejects as a result of the No. 1 Open Cut Extension. Accordingly, no alternatives for the treatment or disposal of coal rejects were considered.

8.9 Rehabilitation of Subsidence Areas

Approximately one million dollars has been spent to date by MCC and the MSB to control subsidence in the form of "potholing" as outlined in **Section 3.9**. Historic records show that subsidence potholing has been occurring since 1929 after underground mining began in 1907. The current method of treating subsidence involves infilling pothole areas as they occur, with inert overburden. The mining of areas that are susceptible to subsidence, by open cut methods, will enable MCC to treat the underground voids responsible for potholing and consequently the access of air to support spontaneous combustion. MCC could continue treating the pothole problems as they occur, however, this alternative is not an economically feasible alternative nor does it deliver an environmentally sustainable solution to the problem which requires a long term solution.

8.10 Treatment of Spontaneous Combustion

MCC have had success in treating areas affected by spontaneous combustion through various methods such as extinguishing fires and excluding air by capping with inert material. These methods and others are outlined in full in **Section 4.6.8**. Carbonaceous material exposed to air is the main cause of spontaneous combustion problems. Mining areas prone to spontaneous combustion will remove a significant proportion of the carbonaceous material and thus remove the fuel source. Alternatively MCC could leave coal and carbonaceous material in the ground, which may result in spontaneous combustion that is never fully eliminated. These fires cause many problems for the environment of the area. The current methods of treating spontaneous combustion are not considered as long term sustainable alternatives.

8.11 Alternative use of Voids

MCC plan to rehabilitate voids in accordance with DMR guidelines for making voids safe for closure as outlined in **Section 5.13**. Feasible alternative uses for voids include:

- A waste management facility for the MSC;
- An alternative underground re-entry point to the Sandy Creek reserves;
- A regional waste management facility; and
- A passive recreational facility.

The use of the No. 1 Open Cut void as part of a waste management by MSC has been the subject of very preliminary discussions between MSC and MCC. The final shape of the void is dependant upon the outcome of further discussions. Whether this particular use of the void proceeds or not, the following factors concerning the treatment of the No. 1 Open Cut void will be unchanged:

- All spoil material will be contained within the current void space. There will be no out-of-pit emplacements required and the height of spoil material will be below the existing levels of the landforms surrounding the No. 1 Open Cut void i.e. there will be no visual impact to the urban area of Muswellbrook; and
- If MSC proceed with a waste management facility in the No. 1 Open Cut void it will be the subject of a separate development application. MCC's development application for the No. 1 Open Cut Extension **does not** seek approval for a waste management facility.

The use of the No. 1 Open Cut void as a regional/State waste management facility was canvassed in an EIS prepared for the "Bells Ridge Waste Management Facility" produced for Collex in 1998. Collex decided not to proceed with that particular proposal and there are no other proposals known to MCC to utilise the No. 1 Open Cut void as a regional/State waste management facility.
The use of the No. 1 Open Cut void, in the long term, for passive recreational uses is possible, but not necessarily probable. Voids and dams of various mine sites in Australia and around the world have, at times, been utilised as parkland. An example is the use of the former Borehill Colliery site as a recreational reserve adjacent to Blackbutt Reserve in Newcastle. However, passive recreational use will be dependent upon the cessation of mining and surrender of MCC's mining lease which is uncertain in timing. Also uncertain is the need for such facilities and a source of finance to allow for their establishment.

No alternative use for the No. 2 Open Cut void could be identified other than to make it safe to the public and environment in accordance with the DMR guidelines during the mine closure process.

8.12 The Consequences of Not Proceeding with the proposal

The "Do Nothing" alternative involves not proceeding with the No. 1 Open Cut Extension. This option means that coal mining would continue in the No. 2 Open Cut in its current form until 2005, when all economically recoverable coal reserves will have been extracted. This "Do Nothing" alternative allows the Sandy Creek Colliery to be developed from an entry in the highwall of the No. 2 Open Cut as approved in the 1998 EIS. This alternative would mean that Sandy Creek Colliery could not begin operations until the No. 2 Open Cut was almost worked out.

The chosen mine plan anticipates that open cut mining will continue for 10 years. At some point during this time, the No. 1 Open Cut Extension will provide an alternative entry into Sandy Creek Colliery which will allow this mine to be developed and be fully operational before the cessation of open cut mining. This entry will allow for the continuation of coal production and the retention of a skilled workforce, which is an advantage for both MCC and the Muswellbrook community.

The "Do Nothing" alternative would result in a shortfall in inert material to properly seal the overburden dumps and exposed coal faces at No. 2 Open Cut. This will result in difficulties with treating existing overburden dumps and areas prone to spontaneous combustion.

The "Do Nothing" alternative would forego an opportunity to treat the spontaneous combustion that is taking place within the former workings of the No. 2 Underground Mine. Mining through areas affected by "heating" will pose some mining and environmental challenges but offers an assured method of successful treating spontaneous combustion. The "Do Nothing" alternative would make treatment of the underground heating very difficult with no assurance of a successful outcome. The safety implications of collapse of the ground surface as a result of the underlying coal seams being affected by spontaneous combustion would continue.

Should the mine be forced to close in 2005 there will be significant negative social and economic impacts in the Muswellbrook locality and the Upper Hunter Region through loss of employment, income and financial flow-ons addressed in **Sections 6.12.3** and **6.12.4**.

The number of jobs directly lost from the mine would be approximately 69. Total employment dependant upon the mine has been estimated at 173 persons.

The closure of this mine would significantly impact the Muswellbrook Shire and the Upper Hunter Region, where over 60% and 96% respectively of MCC employees reside.

The 2001 Coal Industry Profile reported that between 1997 and 2000 that the number of people employed by mines in the Hunter Coalfields had dropped steadily from 6,358 to 4,770 persons. This represents a loss of 25% of the coal industry workforce over three years.

The proposed No. 1 Open Cut Extension will not only provide direct employment for MCC workers but also provide indirect and induced employment in the areas surrounding the mine. Flow on employment

opportunities would arise in areas such as the mine servicing industry, retail trade and the provisions of services (e.g. government, health care, childcare, community and recreational services).

Muswellbrook and other areas in the Upper Hunter Valley had unemployment rates similar to, or higher than, the national and State averages at the March quarter 2001. The closure of a relatively large operation, such as MCC, and associated job losses would cause significant social and economic hardship in the area.

MCC anticipates spending $7.3 million per year on wages to its employees and contractors which, utilising a flow-on multiplier of 1.66, translates to $12.1 million in terms of total income per year.

Of the workforce, over 50% live in or around Muswellbrook and 96% live in the Upper Hunter Valley. It can reasonably be expected that 80% of wages and flow-on from income will remain in the locality. This represents an average year benefit of $9.3 million for these localities (i.e. $7.3 million x 1.66 x .80 x .96). In light of the economic and employment situation presently being experienced in the Upper Hunter, the income benefits in terms of salaries and wages are significant within local economies.

Based on a tax rate of 30% the Commonwealth Government can expect to raise yearly revenue of $2.2 million as a result of income tax on wages of mine employees, contractors and other flow-on income. MCC expects to pay $2.5 million per year to the NSW Government and contribute $4.8 million per year to rail and port facilities.

It is expected that up to 1.4 Mtpa of coal will be exported from MCC. This will earn export income, which will assist with Australia's balance of payments and positively impact upon the nation's balance of payments. Up to 600,000 tpa of coal will be provided to the domestic power industry. If the proposal does not to proceed this coal will need to be supplied from other sources.

All of the preceding benefits will be forgone if the "Do Nothing" option were to be applied to the No. 1 Open Cut Extension with the resultant social and economic impacts, particularly to the Upper Hunter Region and the Muswellbrook Shire.