MOOLARBEN COAL PROJECT

Stage 2

SECTION 4

Project Description

SECTION 4 – PROJECT DESCRIPTION

Contents

4. PROJECT DESCRIPTION S4-3
4.1 Overview 4-3
4.2 Geology and Coal Resources 4-3
4.2.1 Regional Setting and Stratigraphy 4-3
4.2.2 Mining and Exploration History 4-3
4.2.3 Site Geology 4-3
4.2.4 Coal Quality 4-5
4.2.5 Coal Resources and Reserves 4-5
4.3 Project Description 4-7
4.4 Approved Stage 1 Project 4-7
4.5 Proposed Stage 2 Project 4-9
4.5.1 Summary 4-9
4.5.2 Open Cut 4 4-10
4.5.3 Underground 1 and Underground 2 4-15
4.5.4 Stage 2 Coal Handling Infrastructure 4-19
4.5.5 Reject and Tailings Disposal 4-21
4.5.6 Stage 2 Supporting Facilities 4-21
4.5.7 Water Management 4-22
4.5.8 Waste Management 4-24
4.5.9 Hazardous Materials Management 4-25
4.5.10 Contamination 4-25
4.5.11 Existing Infrastructure 4-25
4.5.12 Stage 2 Construction 4-26
4.6 Proposed Modification of Stage 1 4-26
4.6.1 Stage 1 Open Cuts 4-27
4.6.2 Stage 1 Underground 4 4-27
4.6.3 Stage 1 Coal Handling Infrastructure 4-28
4.6.4 Stage 1 Mineral Waste 4-28
4.6.5 Project Life 4-28
4.7 Mine Closure 4-28
4.8 Integrated Mining Complex Summary 4-29
4.8.1 Construction and Operations Schedule 4-30

Figures

Figure 4.1 Generalised stratigraphic section and the Ulan Seam S4-4
Figure 4.2 Indicative working sections for the Ulan Seam for underground and open cut operations 4-6
Figure 4.3 Schematic diagram of a longwall mining operation 4-17
Figure 4.4 Anticipated project schedule for Stage 1 and Stage 2 of the Moolarben Coal Project 4-31

Tables

Table 4.1 Summary of Stage 2 coal resources and reserves S4-5
Table 4.2 Stage 1 project summary 4-7
Table 4.3 Stage 2 project summary 4-9
Table 4.4 Indicative equipment required for mining OC4 4-13
Table 4.5 Indicative open cut shifts and working hours 4-14
Table 4.6 Indicative Stage 2 open cut mining schedule 4-14
Table 4.7 Indicative underground shifts 4-18
Table 4.8 Indicative Stage 2 underground mining schedule 4-18
Table 4.9 Modification of Stage 1 summary 4-27
Table 4.10 Summary of the proposed integrated mining complex 4-29

4. PROJECT DESCRIPTION

4.1 Overview

The Stage 2 Project Area is bordered by the Stage 1 development to the west, the Munghorn Gap Nature Reserve to the south, the Wilpinjong coal mine to the east and the Goulburn River National Park to the north (see Plan 4 in Volume 2).

4.2 Geology and Coal Resources

4.2.1 Regional Setting and Stratigraphy

The MCP is located in the northern part of the Western Coalfield, on the northwest margin of the Sydney Basin.

Coal occurs in mid to late Permian age (approximately 250 to 275 million years before present) sediments collectively known as the Illawarra Coal Measures (also referred to as Permian coal measures). These units dip between 1 and 2 degrees to the northeast, away from OC1. Stage 2 will extract coal from the Ulan Seam, and the Moolarben Seam where it occurs. The Ulan Seam occurs toward the base of the Illawarra Coal Measures, the Moolarben Seam about 40 m above the Ulan Seam. The Ulan Seam is considered the equivalent of the Lidsdale Seam, which has been extensively mined further south in the Greater Lithgow District.

Narrabeen Group sediments (sandstones and conglomerates) of Triassic age (approximately 200 to 250 million years before present) overlie the coal measures, which in turn overlie older basement rocks of sedimentary (Shoalhaven Group) and igneous origin. Small intrusive plugs and remnant Tertiary-age (approximately 5 to 65 million years before present) basalt flows also outcrop in the area. Unconsolidated and partially consolidated Tertiary-age palaeochannel and Quaternary-age (less than approximately 5 million years before present) sediments occur as valley fill and along dominant drainage lines. The stratigraphy of the area is shown in **Figure 4.1**.

4.2.2 Mining and Exploration History

Coal mining has been ongoing in the district since the early 1900s. The Ulan coal mine, which is to the northwest of and adjacent to Stage 1, was commissioned in the 1980s as a source of open cut thermal coal for domestic and export use. In 2006, the Wilpinjong open cut coal mine (to the east of the Stage 2 Project Area) was granted development approval and was subsequently commissioned in early 2007.

In August 2004, the NSW government awarded MCM the right to explore for economically recoverable coal resources within Exploration Licence (EL) 6288 located between the Ulan and Wilpinjong coal mines. This resulted in Stage 1, which was approved for development in September 2007. Stage 1 is expected to be operational early in 2010.

Stage 2 will access additional coal resources within EL 6288.

4.2.3 Site Geology

Within the Stage 2 Project Area, the Narrabeen Group sediments and basalt flows form low relief ridge and plateau features. The depth to the coal under these features is about 35 to 135 m. In these areas, coal will be extracted using underground mining methods.

In the central and eastern parts of the Stage 2 Project Area the Narrabeen Group sediments have been eroded to form valleys (Murragamba Creek valley and the adjacent valley to the east that

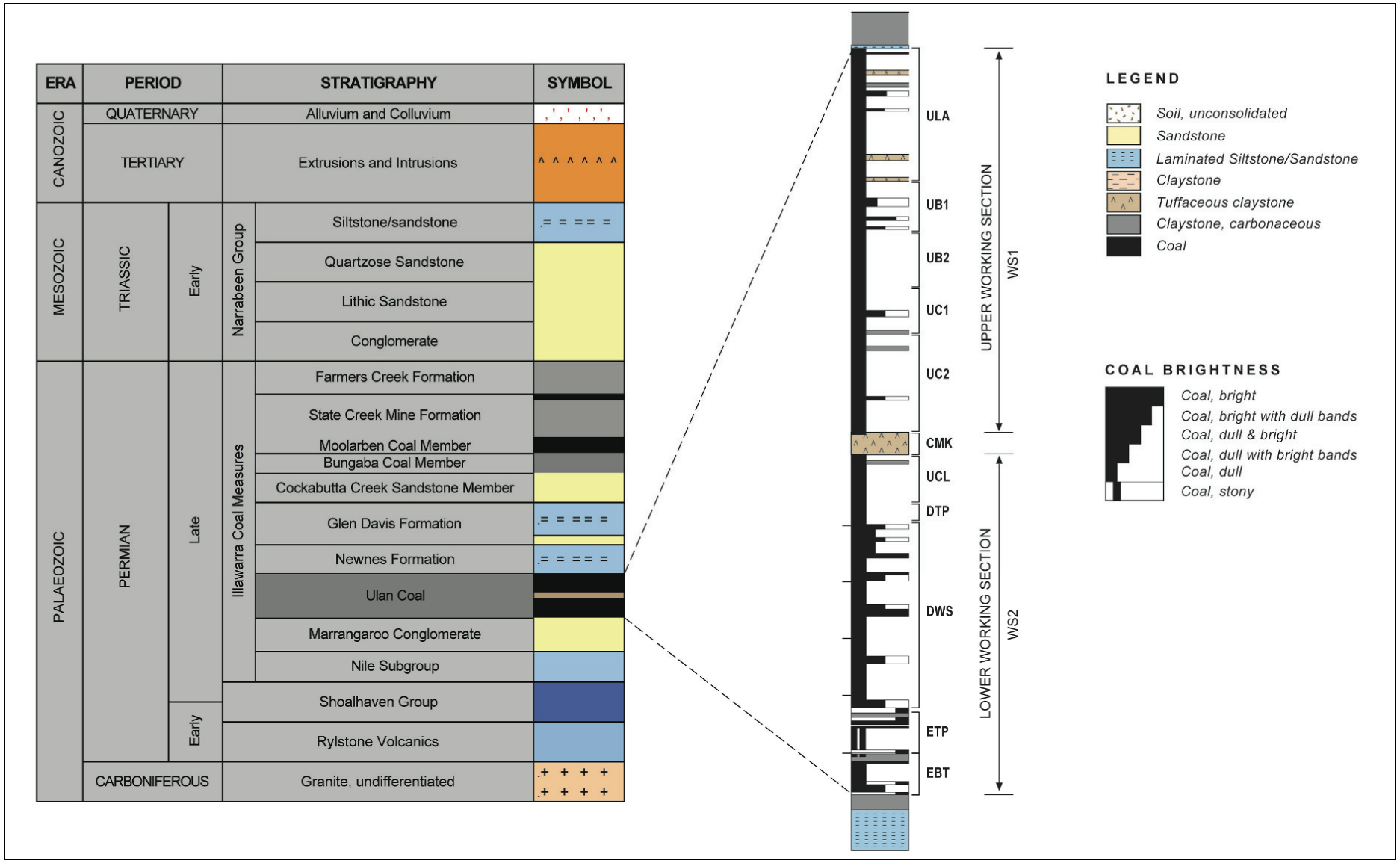

Figure 4.1 Generalised stratigraphic section and the Ulan Seam

has been referred to as the Eastern Creek valley). In these OC4 areas, the Ulan Seam is covered by up to 60 m and up to 80 m of overburden respectively. The Moolarben Seam is not consistent across the Stage 2 Project Area. These coal resources will be extracted where economical using open cut mining methods.

The Ulan Seam ranges in thickness from around 6 to 13 m and comprises numerous coal plies separated by partings of tuffaceous claystone and carbonaceous shale. The seam is divided into five major sections – A to E, and 11 subdivisions – ULA, UB1, UB2, UC1, UC2, CMK, UCL, DTP, DWS, ETP and EBT (see Figure 4.1 and **Figure 4.2**). These are grouped into two recoverable (or working) sections: WS1 (ULA to UC2, which form the upper half of the seam down to the CMK horizon) and WS2 (UCL to EBT, which form the lower half of the seam from the CMK horizon). The CMK is removed separately to waste.

Where the Ulan Seam is fully developed, the upper working section (WS1) ranges in thickness from 5.0 to 7.5 m, and the lower working section (WS2) from 4.9 to 6.2 m. The complete seam is amenable to open cut mine recovery. The D working section (DWS) is a subset of WS2 occurring in the lower half of the seam. This section is amenable to underground mining (Figure 4.2), having a recoverable thickness of about 2.2 to 3.2 m.

The Moolarben Seam ranges in thickness from around 1.0 to 3.8 m, where it is known to occur.

4.2.4 Coal Quality

Ulan coal is a medium to high volatile bituminous ranked coal, with a calorific value of about 33 MJ/kg (dry ash free). The individual plies of the Ulan Seam have varying ash content. The in situ ash content can be reduced by washing to produce a range of export and domestic quality coals.

4.2.5 Coal Resources and Reserves

The total coal resource within the Stage 2 Project Area is estimated at about 295 Mt. This includes a probable run-of-mine (ROM) coal reserve of approximately 253 Mt. The distribution of coal resources across the Stage 2 Project Area is summarised in **Table 4.1**.

Table 4.1 Summary of Stage 2 coal resources and reserves

Mine Resource Area	Coal Resource (Mt)			Coal Reserve (Mt)	
	Measured	Indicated	Total	Probable	Total
OC4	206.2	32.4	238.6	217.6	217.6
UG1	–	39.6	40.0	24.7	24.7
UG2	–	16.1	16.0	10.2	10.2
Total	206.2	88.1	294.6	252.5	252.5

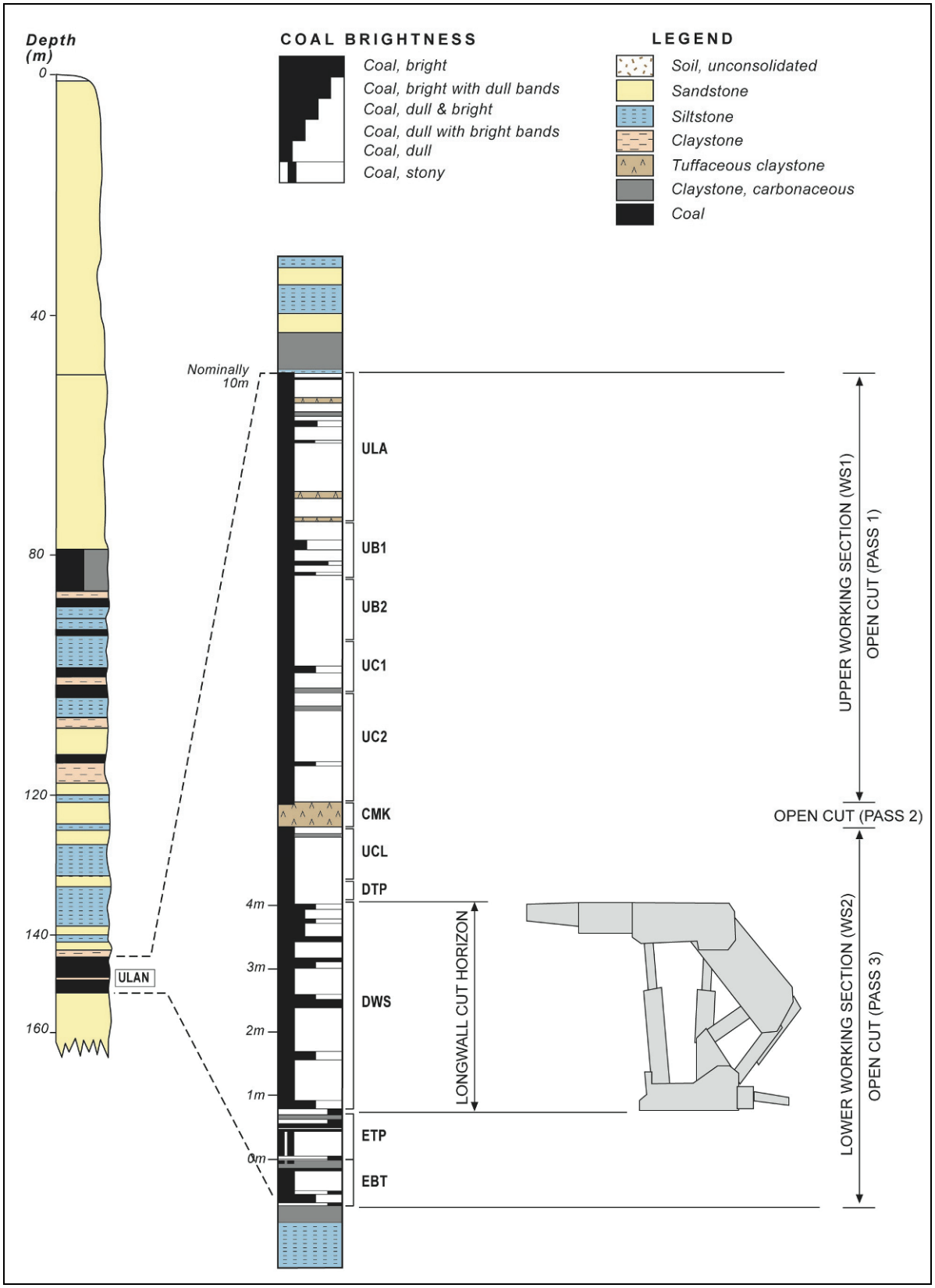

Figure 4.2 Indicative working sections for the Ulan Seam for underground and open cut operations

4.3 Project Description

Stage 2 will involve the construction and operation of open cut and underground mines and associated infrastructure and facilities. When complete, the two stages will operate as an integrated mining complex comprising:

- Stage 1:
  - Three open cut mines (Open Cut 1 (OC1), Open Cut 2 (OC2) and Open Cut 3 (OC3)).
  - An underground mine (Underground 4 (UG4)).
  - A coal handling and preparation plant (CHPP).
  - A rail loop and rail load out facility.
  - Supporting infrastructure and surface facilities.
- Stage 2:
  - An open cut mine (Open Cut 4 (OC4)).
  - Two underground mines (Underground 1 (UG1) and Underground 2 (UG2)).
  - Additional supporting infrastructure and surface facilities.

The integration of Stage 1 and Stage 2 operations will enable mine crews, mine equipment, infrastructure and facilities to be shared across the whole MCP project area. This will maximise the efficient extraction, handling and processing of ROM coal from the mining complex, and the transport of product coals to market. Other benefits from operating the two stages in a coordinated manner include integrating environmental management, rehabilitation and final landforms across the whole MCP project area.

The construction and operation of Stage 1 was approved in September 2007 (see Section 2.7). Stage 1 will generally proceed as approved producing up to 10 Mtpa of product coal. Stage 2 will produce additional ROM coals. In total, up to 17 Mtpa of ROM coal (13 Mtpa from open cuts and 4 Mtpa from underground mining) will be extracted from the integrated mining complex (the MCP), which in total will produce up to 13 Mtpa of product coal.

Stage 2 is described below along with modification of the Stage 1 Project Approval that will allow both Stage 1 and Stage 2 to be operated as an integrated mining complex.

Taken in isolation from Stage 2, the previously approved coal extraction rate from the Stage 1 mines will not be exceeded.

4.4 Approved Stage 1 Project

A summary of Stage 1 as approved by the Minister in September 2007 is provided in **Table 4.2**. The general layout of Stage 1 is shown in Plan 3 in Volume 2.

Table 4.2 Stage 1 project summary

Aspect		Description
Project life		21 years, to 20 December 2028.
Mining operations	Open cut	Three open cut mines (OC1 – 302 ha, OC2 – 150 ha and OC3 – 550 ha) will be mined at a combined rate of up to 8 Mtpa ROM coal. Overburden (30 m average depth) will be blasted where necessary and be removed using excavator and truck operations. Coal will be blasted and recovered using excavator and truck operations.

Table 4.2 Stage 1 project summary (cont'd)

Aspect		Description
Mining operations	Underground	One underground mine (UG4 – depth 70 to 140 m) will be mined at up to 4 Mtpa ROM coal. Coal will be recovered by longwall mining and transferred to surface by conveyor. UG4 mine drift entries in the Stage 1 Main Infrastructure Area.
Coal handling, preparation, and processing		Coal from open cut and underground mines will be transferred to the CHPP ROM coal stockpile by conveyors. Coal from OC2 and OC3 will be transferred by truck to the OC1 ROM coal facility, prior to transfer to the CHPP ROM coal stockpile. Crushing and sizing facilities will be included at both the OC1 ROM coal facility and CHPP. Up to 12 Mtpa of ROM coal will be processed.
Coal production, loading and rail transport		Product coal will be produced at up to 10 Mtpa. Product coal will be loaded onto trains on a dedicated rail loop and rail load out facility, and railed to market on the Gulgong-Sandy Hollow rail line in up to four trains a day (four trains during any 24 hour period).
Water demand and supply		Water demand at peak production will be about 6.9 ML/day (2,520 ML/year). Water will be supplied from bores and surface water storages from across the site, and where possible, through sharing arrangements with adjoining mines.
Waste rock, coarse rejects and tailings management		Excavated overburden initially used to form environmental bunds through out-of-pit emplacement on the western side of OC1 and OC2, around the OC3 facilities and along the haulage road between OC3 and the OC1 ROM coal facility. Remaining overburden will be placed within open cut mine voids. Coarse rejects and tailings will be emplaced with overburden in open cut mine voids. An emergency tailings dam will be established adjacent to the CHPP.
Mine access		Access to the open cut mines OC1, OC2 and OC3, will be from Ulan-Wollar Road. Access to UG4 and the CHPP will be from Ulan-Cassilis Road, north of Ulan-Wollar Road junction.
Support facilities and utilities		Support facilities, including offices, bathhouses, workshops and fuel storages (where required), will be established at the Stage 1 Main Infrastructure Area (to service UG4 and the CHPP), and at OC1 and OC3. Power will be supplied from the 66 kV Ulan to Wilpinjong transmission line, via a 66/11 kV substation constructed on-site.
Hours of operation		Construction will occur during daylight hours with limited night-time activities. Some noisy activities will be conducted outside of school hours to minimise noise impacts on Ulan Public School. Mining operations to occur 24 hours a day, 7 days a week.
Employment		220 construction and 317 full time positions.
Rehabilitation		All disturbed areas will be progressively rehabilitated.

4.5 Proposed Stage 2 Project

4.5.1 Summary

Stage 2 is summarised in **Table 4.3** and described in detail in the following sections.

Table 4.3 Stage 2 project summary

Aspect		Description
Project life		24 years (to 31 December 2033).
Mining operations	Open cut	Maximum pit depth of 90 m with approximately 1,270 ha of surface disturbance over the life of the pit. Overburden will be blasted where necessary and be removed using excavator and truck operations. Coal will be blasted and recovered using excavator and truck operations. Up to 12 Mtpa ROM coal will be mined from OC4.
	Underground	Two underground mines (UG1 and UG2 – depth 50 m to greater than 100 m) will be mined at a combined rate of up to 4 Mtpa ROM coal. Coal will be recovered using longwall mining and transferred to the surface by conveyor. UG1 and UG2 mine highwall entries will be in the eastern highwall of OC1.
Coal handling, preparation, and processing		Coal from OC4 will be transferred by haul truck to the Stage 2 ROM coal facility. Coal from UG1 and UG2 will be transferred by conveyor to the OC1 ROM coal facility. Crushing and sizing facilities will be included at the Stage 2 ROM coal facility. Coal will be transferred from these ROM coal facilities to the CHPP.
Water demand and supply		Water demand at peak production will be about 5.1 ML/day (1,862 ML/year). This does not include water for washing Stage 2 coal. Water will be supplied from mine inflows, surface water capture, recycled process water, groundwater bore field, and where possible through sharing arrangements with adjoining mines.
Waste rock, coarse rejects and tailings management		Initial out-of-pit overburden emplacement until sufficient void space is available to safely backfill the pit. Coarse rejects and tailings will be emplaced with overburden in the open cut void.
Mine access		Open cut and underground mine access from Ulan-Wollar Road.
Support facilities and utilities		Support facilities, including offices, bathhouses, workshops and fuel storages (where required), will be established at the main Stage 2 ROM coal facility and at UG1 entry. Temporary facilities will be established in advance of mining at OC4. A network of internal roads to enable coal haulage and access around the site. Power will be supplied from the Stage 1 66/11 kV substation.
Hours of operation		Construction during daylight hours 7 days a week, with some 24 hour construction activities. Mining operations to occur 24 hours a day, 7 days a week.
Employment		Potentially 122 additional full time positions (above approved Stage 1 employee numbers).
Rehabilitation		All disturbed areas will be progressively rehabilitated.

The design and layout of Stage 2 aims to maximise the efficient extraction of the economically-viable coal resource, while avoiding or minimising impacts on adjacent features such as the Goulburn River National Park, Munghorn Gap Nature Reserve, Gulgong-Sandy Hollow rail line and Ulan-Wollar Road (see Plan 4 in Volume 2).

Over the course of Stage 2, MCM will review its mining practices and implement revised mining methods where applicable, in line with industry best practice.

4.5.2 Open Cut 4

4.5.2.1 Pit Design

The Stage 2 open cut mine (OC4) will be developed in the two valleys in the eastern part of the Stage 2 Project Area (Murragamba Creek valley and Eastern Creek valley). The pit will have a maximum depth of about 90 m and will disturb about 1,270 ha of land in total (see Plan 4 in Volume 2). However, only a relatively small working area (i.e., 31 ha at Year 5, 17 ha at Year 7, 11 ha at Year 9, 43 ha at Year 12, 27 ha at Year 15, and 38 ha at Year 19) will be open at any one time to enable the coal resource to be accessed. Mining will commence in the southern-most part of the Murragamba Creek valley. Mining will progress to the north, down the valley (see **Plans 5, 6, 7, 8, 9 and 10** in Volume 2).

Open Cut 4 will be developed and operated concurrently with the Stage 1 open cut mines (OC1, OC2 and OC3), such that the total amount of open cut coal extracted across the mining complex (Stage 1 and Stage 2 combined) in any year will not exceed 13 Mt (ROM coal).

Open Cut 4 has been designed with 75 degree wall batters. This batter runs from the floor of the coal seam to the base of weathering. A 15 m bench has been designed at the base of weathering. The wall angle from the base of weathering to the natural surface topography is 63 degrees. This lessened angle allows for the weathered and hence less competent nature of this material. It is anticipated that there will be operational benches within the overburden zone. These benches will be in the order of 4 to 7 m wide, and will depend on the general size and geometry of the equipment employed to excavate the weathered overburden.

4.5.2.2 Mining Sequence

Open Cut 4 will be progressively developed and rehabilitated, as follows:

- Construction of temporary creek diversions.
- Construction of water and sediment control structures.
- Vegetation clearing, topsoil stripping and stockpiling.
- Blasting of overburden where required and removal using excavator and trucks.
- Blasting of coal seam and coal extraction using excavator and trucks with coal trucked to the Stage 2 ROM coal facility.
- Once sufficient coal has been extracted, overburden will be used to backfill the mine void.
- Progressive rehabilitation.
- Pit closure.

4.5.2.3 Construction of Creek Diversions

Murragamba Creek and Eastern Creek will be temporarily diverted and realigned as described in Section 5.5. The final realignments will be designed to be geomorphically stable and ecologically diverse following the closure of OC4.

4.5.2.4 Construction of Water and Sediment Control Structures

Clean water diversions, and erosion and sediment controls will be established prior to disturbance of the downslope land surface, including:

- Diversion channels to divert clean surface water runoff around disturbed areas.
- Sumps and sediment ponds within mine and infrastructure development areas to collect surface water runoff from disturbed and exposed mine areas.
- Water storage dams.
- A network of pumps and pipelines to convey water around the site.

The design of the surface water diversions, erosion and sediment control measures and structures is described in Section 5.5. Effective management of water at OC4 and across the mining complex will enable reuse of captured mine water, generally for dust suppression and rehabilitation activities.

4.5.2.5 Vegetation Clearing and Topsoil Stripping

Vegetation clearing will generally be undertaken 6 to 12 months in advance of mining. Topsoil stripping will be undertaken no more than one month prior to mining. Vegetation clearing and topsoil management practices will be employed to reduce the risk of impact on flora and fauna, and soils as described in Sections 5.7 and 5.11, respectively.

4.5.2.6 Overburden Removal

The overburden in OC4 varies in thickness throughout the pit. It is typically up to 60 m thick in the Murragamba Creek valley and up to 80 m thick in the Eastern Creek valley.

Overburden will be mined in multiple passes. The overburden will be blasted or ripped and loaded by excavator into rear dump trucks. Typical blasting depths will be in the order of 30 m, depending on the coal and topographical geometry. Each 30 m blast will be excavated in smaller benches, typically 4 to 7 m, to provide a safe work range for the excavator and minimise dust generation. Overburden will be hauled to the overburden emplacement area.

Blasting

Blasting will be designed to achieve optimal fragmentation of the overburden while protecting surrounding sensitive receivers, features, and infrastructure, including culturally sensitive sites, roads, railways, transmission lines and buildings. Fragmentation of overburden will require large blasts with a maximum instantaneous charge (MIC) of up to 1,788 kg (depending on the number of excavator passes).

Blasting will generally be conducted between the hours of 9.00 a.m. and 5.00 p.m. Monday to Saturday with up to two blasts per day and nine blasts per week averaged over any 12 month period. Blasting will be coordinated with blasting in Stage 1 pits and the adjoining Ulan and Wilpinjong mines to minimise potential impacts on surrounding receivers.

Out-of-pit Waste Rock Emplacements

At the start of OC4 development, a total of approximately 37 million bank cubic metres (Mbcm) of overburden will be placed in two out-of-pit waste rock emplacements, the South Western Out-of-pit Emplacement and the Southern Out-of-pit Emplacement (see Plans 4 and 5 in Volume 2).

The Southern Out-of-pit Emplacement located immediately south of OC4, at the head of the Murragamba Creek valley, will be developed first. When complete, it will contain approximately 12 Mbcm of waste rock, occupy an area of about 47 ha and will reach a maximum reduced level (RL) of 550 m (above the) Australian Height Datum (AHD).

The South Western Out-of-pit Emplacement will be developed second and will be located southwest of initial mining activities and to the east of the ridge under which UG2 will be developed. Approximately 25 Mbcm will be placed in this area. When complete, it will occupy an area of about 71 ha and reach a maximum RL of 570 m AHD. Where possible, vegetation will be retained as a visual screen along the western extent of this emplacement.

Both emplacements will be reshaped and rehabilitated as soon as practicable.

In-pit Waste Rock Placement

When sufficient pit void becomes available, waste rock (overburden and partings) will be directly placed in the mine void. Waste rock will be placed to form a final topography that meets the closure objectives (see Section 5.19). In some areas, the top of the overburden may exceed the height of the original ground surface.

4.5.2.7 Coal Extraction

Coal will be mined in three passes once exposed. The first pass will extract coal from the WS1 section; the second pass will extract the CMK horizon, which will be removed as waste; and the third pass will extract the WS2 section. The coal will be blasted or ripped and loaded by excavator into rear dump trucks. It is expected that the full section of the Ulan Seam (up to 13 m thick) will be recovered from OC4. During the removal of overburden, the Moolarben Seam, where it is encountered, will be recovered.

Blasting

Fragmentation of coal will typically require a MIC of about 240 kg (i.e., less than that for the overburden). Blasting will generally be conducted between the hours of 9.00 a.m. to 5.00 p.m. Monday to Saturday with up to 2 blasts per day and 9 blasts per week averaged over any 12 month period. Blasting will be coordinated with Stage 1 and the adjoining Wilpinjong and Ulan coal mines to avoid simultaneous blasting thereby minimising potential impacts to surrounding receivers.

ROM Coal Transport

Extracted coal will be transported by truck along the haul road to the Stage 2 ROM coal facility (see Plans 5 to 10 in Volume 2 and Section 4.5.2.11).

4.5.2.8 Progressive Rehabilitation

As mining advances, previously worked areas will be backfilled and progressively rehabilitated. The goals for the rehabilitation of OC4 and out-of-pit emplacements are to:

- Re-establish stable and safe landforms and surfaces.
- Reinstate surface drainage.
- Improve soil condition and the native seed bank.

- Maintain the diversity and genetic resource of the flora currently existing within the locality.
- Maintain and enhance habitat for native fauna.
- Improve habitat linkages across the Murragamba Creek valley.
- Provide necessary access for the suppression of fires, control of competitive native and exotic fauna and noxious weeds, and to monitor the rehabilitation.
- Progress towards meeting closure and land use objectives that will be described in the Mine Closure Plan (see Section 5.19).

Proposed rehabilitation is described in Section 5.18, while the proposed realignment and re-instatement of Murragamba and Eastern creeks is described in Section 5.5.

4.5.2.9 Pit Closure

Backfilled overburden within the OC4 void will be placed and shaped to form an undulating landform. Where possible, elevated areas will be reinstated where they have been removed as part of mining or constructed so as to extend spurs adjacent to the open cut. Similarly, drainage lines entering the backfilled pit area will be drained by depressions and swales constructed as part of the final landform so as to convey drainage from outside the open cut through to Murragamba Creek or Eastern Creek. A series of ponds will be established to control the velocity of drainage and provide future habitat. The out-of-pit emplacements will be shaped to be self-draining.

A small final void will remain following pit closure. This will be located along the eastern boundary of OC4 and will have an areal extent of approximately 32 ha and be about 80 m deep. This void may be used to access future coal resources using open cut or underground mining methods. In the absence of active management, it will partly fill with water to form a pit lake. Measures to ensure that the final void is safe will be developed in the Mine Closure Plan.

The indicative final landform for OC4 is shown schematically in Plan 10 in Volume 2.

4.5.2.10 Mining Fleet

The indicative Stage 2 open cut mining fleet and equipment is provided in **Table 4.4**. This is in addition to the Stage 1 open cut mining fleet and equipment. Both Stage 1 and Stage 2 open cut mining fleet and equipment will be used across the MCP to optimise open cut mining production.

Table 4.4 Indicative equipment required for mining OC4

Equipment Description	Indicative Capacity	Additional to Support Stage 2 Operations
Overburden excavator	34 m^3	1
Coal excavator	18 m^3	1
Overburden trucks	240 t	8
Coal trucks	240 t	6
Dozers - dump	19.0 m^3 blade	2
Dozers - face	19.0 m^3 blade	2
Graders	4.9 m blade	2
Water carts	100,000 L	2
Rubber tyred dozers	26.0 m3 blade	1
OB drill	-	1
Coal drills	-	1
Coal dozers	14.0 m3 blade	2

4.5.2.11 Haul Road

The haul road will extend from the Stage 2 ROM coal facility to the working section of the pit. It will be shortened and realigned as OC4 is mined (see Plans 5 to 10 in Volume 2).

The parts of the haul road that are adjacent to Ulan-Wollar Road will be partly bunded and screened (on the public road side) to reduce the visual impact of mine vehicles, including headlight glare on passing motorists.

4.5.2.12 Pit Dewatering

Advanced dewatering is not expected to be required in OC4 as the Ulan Seam and overlying sediments are only partly saturated and disconnected through most of the area. Any water that collects in the base of the pit will be removed to a series of water storages (see Sections 4.5.7 and 5.5.6) using sump pumps.

4.5.2.13 Open Cut Workforce and Working Hours

Stage 2 open cut and associated activities will result in the direct employment of approximately 115 personnel. This is equivalent to one open cut mine shift employed to operate the proposed Stage 2 mining fleet. The mine workforce will be sourced locally wherever possible.

Open cut operations will be carried out 24 hours a day, 7 days a week. Indicative open cut shift hours are shown in **Table 4.5**.

Table 4.5 Indicative open cut shifts and working hours

Open Cut Mine Shifts	Working Hours
Monday to Sunday day shift 1	07:00-17:00
Monday to Sunday day shift 2	06:30-19:00
Monday to Sunday night shift	18:30-07:00

4.5.2.14 Mining Schedule

The indicative open cut mining schedule is presented in **Table 4.6**.

Table 4.6 Indicative Stage 2 open cut mining schedule.

Anticipated Calendar Year	Year	Overburden (Mbcm)	OC4 Coal (Mt)	Total OC Coal (Stages 1 and 2) (t)	Operating Pits
2009	0	-	-	-	-
2010	1	12.5	-	up to 7	OC1
2011	2	8.4	4	up to 12	OC1, OC4
2012	3	16.7	4.5	up to 12	OC1, OC4
2013	4	16.7	4.5	up to 12	OC1, OC4
2014	5	16.7	4	up to 12	OC1, OC4
2015	6	16.7	6.5	up to 12	OC1, OC4
2016	7	16.7	4	up to 12	OC1, OC2, OC4
2017	8	16.7	4	up to 13	OC2, OC4
2018	9	29.2	11.3	up to 13	OC2, OC3, OC4

Table 4.6 Indicative Stage 2 open cut mining schedule (cont'd).

Anticipated Calendar Year	Year	Overburden (Mbcm)	OC4 Coal (Mt)	Total OC Coal (Stages 1 and 2) (t)	Operating Pits
2019	10	33.4	12	up to 13	OC3, OC4
2020	11	33.4	12	up to 13	OC3, OC4
2021	12	33.4	12	up to 13	OC3, OC4
2022	13	33.4	12	up to 13	OC3, OC4
2023	14	33.4	12	up to 13	OC3, OC4
2024	15	41.8	12	up to 13	OC3, OC4
2025	16	50.1	12	up to 13	OC3, OC4
2026	17	50.1	12	up to 13	OC3, OC4
2027	18	41.8	12	up to 13	OC3, OC4
2028	19	41.8	12	up to 13	OC3, OC4
2029	20	41.8	12	up to 13	OC3, OC4
2030	21	41.8	12	up to 13	OC3, OC4
2031	22	41.8	11.5	up to 13	OC3, OC4
2032	23	41.8	10	up to 13	OC4
2033	24	34.8	9.4	up to 13	OC4

4.5.3 Underground 1 and Underground 2

4.5.3.1 Underground Mine Design

The underground mine design and layout maximises the efficient extraction of the economically viable coal resource, without compromising the integrity of various natural and built surface features (i.e., significant cliff lines, native vegetation, archaeological features, roads, rail lines, etc.).

The Stage 2 underground mines (UG1 and UG2) will be developed under the sandstone ridges between the Moolarben Creek and Murragamba Creek valleys (see Plan 4 in Volume 2). The Stage 2 underground coal resource is estimated to be about 56 Mt. However, not all of this coal will be mined. Some coal will be left in place to protect a range of surface features from the effects of mine subsidence. Mining will extract the DWS section of the Ulan Seam (see Section 4.2.3), with up to 3.2 m (2.8 to 3.2 m) of the seam to be recovered in UG1 and up to 3.0 m (2.2 to 3.0 m) in UG2. Longwall panels will range from about 1,700 to 3,000 m in length and will be about 300 m wide. The panels in UG1 will be oriented northeast to southwest and the panels in UG2 from northwest to southeast (see Plan 4 and **Plan 11** in Volume 2).

Underground mining will progress at a rate of up to 4 Mtpa. The areal extent of the two underground mines is about 990 ha, including the area of predicted mine subsidence (see Section 5.8). Development of UG1 will occur first followed by UG2 (see Plan 11 in Volume 2 and Section 4.5.3.11).

4.5.3.2 Mining Sequence

The Stage 2 underground mines will be developed in the same manner as the Stage 1 UG4 mine:

- Construction of highwall entries.
- Installation of ventilation.
- Installation of the drift conveyor.
- Development of main headings and gate roads including installation of associated conveyors.
- Longwall mining and subsidence.
- Transfer of ROM coal to a short-term stockpile adjacent to the highwall entries and then to the OC1 ROM coal stockpile.

4.5.3.3 Construction of Underground Entries

Two entries to UG1 will be constructed in the eastern highwall of OC1 (Stage 1 open cut) for workers, materials and the drift conveyor (see Plan 11 in Volume 2). Construction of the entries would commence after approximately four to five years of mining in OC1, when the highwall will be safely exposed. Alternatively, a box cut would be made in Years 2 to 3 to expose the eastern highwall of OC1 so that construction of underground mine entries could commence. Access into UG2 will be from UG1.

4.5.3.4 Development of Headings and Gate Roads

Access to the underground mine workings is provided by the main headings, while gate roads between sets of parallel headings divide the coal into mineable panel sections.

The main headings and gate roads will be developed using a 'continuous miner'. This uses a rotating drum fitted with dozens of cutting picks that mechanically cut the coal to form an access tunnel. The excavated coal will be delivered directly to shuttle cars from the rear of the continuous miner. The coal will then be transferred to a conveyor system which will extend in line with the advancement rate of the continuous miner. The continuous miner will produce coal at about 200,000 t/annum.

4.5.3.5 Ventilation and Gas Management

Fresh air throughout the mine will be provided by a series of surface mounted ventilation fans. The ventilation fans provide fresh air in areas where personnel are working and extract exhaust air. Ventilation fans will be established adjacent to the entrance of the mine in the highwall of OC1. An additional ventilation shaft and fan arrangement will be established in the vicinity of the junction between UG1 and UG2.

Tests on coal core samples from UG4 indicate coal resource methane levels of less than 0.5 m^3/t. At this level, gas yield from the underground mines is expected to be low and will not support effective capture or co-generation.

4.5.3.6 Longwall Mining and Subsidence

The underground coal will be mined using conventional longwall methods (see **Figure 4.3**).

Longwall mining is performed in a nearly continuous operation using an integrated mining and roof support system. Each longwall panel is mined in linear slices by a shearer moving backwards and forwards across the coal face. The cut coal falls onto a chain conveyor that transports the coal to one end of the working face. It is then transferred to a belt conveyor established along the gate road and main heading for transport to the surface (i.e., development, gate and drift conveyors). These conveyors will be capable of transferring coal at a rate of up to 2,500 t/hour.

Large, self-advancing hydraulic supports support the roof immediately adjacent to the face. As the cut advances the roof support line also advances. The unsupported roof above the mined panel is then allowed to collapse behind the advancing face and longwall miner. The collapsed roof area behind the working face is termed the 'goaf zone'.

Mining will commence in UG1 at the furthest end of panel 1 (LW1), and will progress back to the southwest, toward the mine entrance. The longwall miner will then be relocated to the far end (northeast end) of LW2 with mining to continue to the southwest. LW3, LW4 and LW5 will be mined in a similar manner. The longwall miner will then be relocated to the far end (southwest end) of LW6, with mining to progress along the panel to the northeast. LW7, LW8 and LW9 will be mined in a similar manner. Once LW9 is completed, the longwall miner will be relocated to UG2. Mining will commence in UG2 at the furthest end of LW10 (southeast end), mining will then progress along this panel toward the northwest. LW11, LW12 and LW13 will be mined in a similar manner, except that the width of LW12 and LW13 will vary to leave a block of coal in situ (see Plan 11 in Volume 2). This in situ block of coal will protect a rock shelter containing Aboriginal art in the cliff line above these panels from the effects of mine subsidence (see Section 5.8 and Section 5.9). A Subsidence Management Plan (SMP) will be prepared prior to mining.

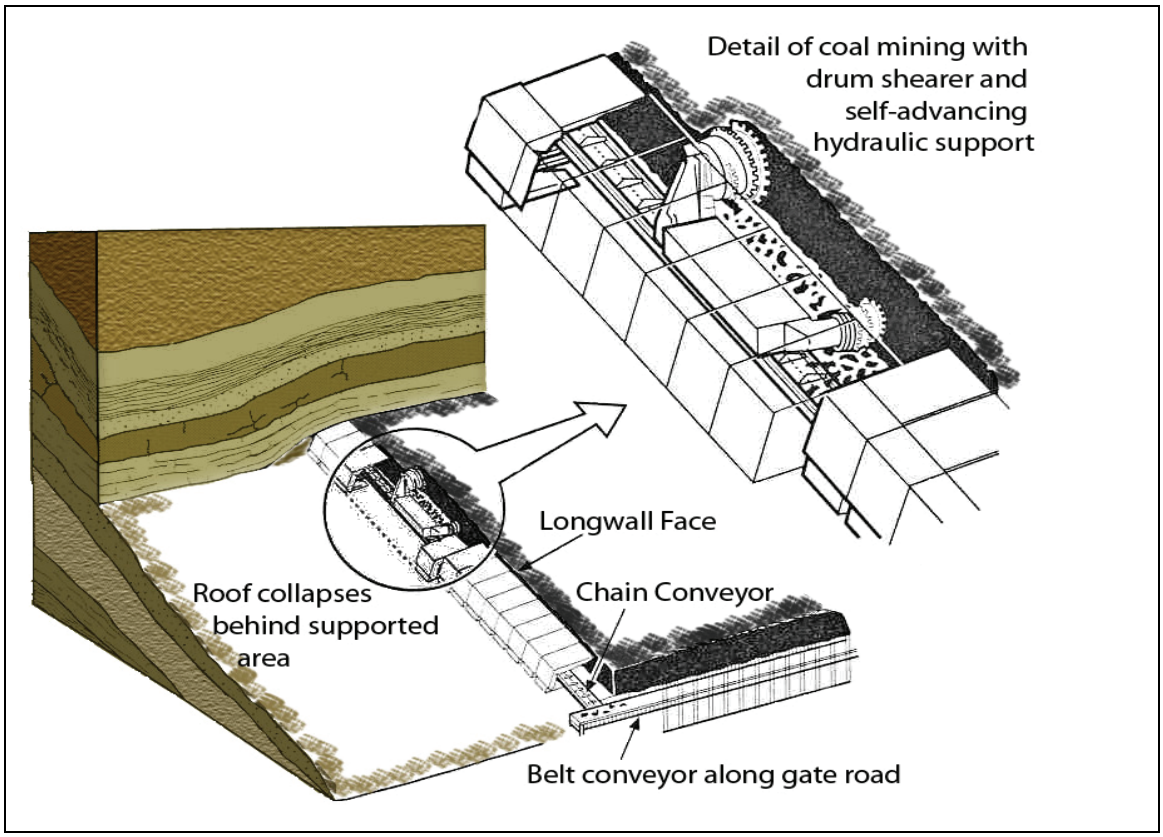

Figure 4.3 Schematic diagram of a longwall mining operation

4.5.3.7 ROM Coal Handling

Coal extracted from UG1 and UG2 will be conveyed to a short-term ROM coal stockpile in OC1 adjacent to the highwall entries. Coal from this stockpile will be transported by conveyor about 800 m to a second ROM coal stockpile located adjacent to the OC1 ROM coal facility (see **Plan 12** in Volume 2). These short-term ROM coal stockpiles will have a typical operating capacity of 100,000 t each, with a maximum height of about 35 m. The ROM coal stockpile pads will be developed to accept a maximum capacity of up to 200,000 t ROM coal (i.e., up to two times the

typical operating capacity). Dozers will be used to manage the placement of ROM coal at these stockpiles.

The conveyors will be partially enclosed, where practical, and their arrangement will be similar to that as for Stage 1. Their heights above ground will generally be about 1 m, but will rise to 22 m at the ROM coal stockpiles.

4.5.3.8 Dewatering

Based on drill testing (see Section 5.4.3), the Stage 2 underground mines are not expected to have significant water inflow. It is also expected that open cut mining adjacent to the undergrounds (i.e., OC1, OC2 and OC4) will effectively dewater the Ulan Seam prior to underground mining. However, where water inflow is greater than expected, bores will be established to assist in the dewatering of the mine. Where required, bores and associated piping will generally be located within existing cleared tracks or infrastructure corridors. Extracted groundwater will be managed in accordance with the water management strategy (see Sections 4.5.7 and 5.5.6 and Plan 15).

4.5.3.9 Mining Fleet and Equipment

The underground fleet and equipment for Stage 1 UG4 will be used for UG1 and UG2 and no additional equipment will be required.

4.5.3.10 Underground Workforce and Working Hours

There will be 162 mine personnel for UG4 (Stage 1). The UG4 workforce will be used for UG1 and UG2. No additional mine personnel will be required for Stage 2 underground operations.

Underground operations will be carried out 24 hours a day, 5 days a week, with 2 days maintenance each week. However, at times the mines will operate 24 hours a day for 7 days a week. Indicative underground shift hours are shown in **Table 4.7**.

Table 4.7 Indicative underground shifts

Underground Mine Shifts	Working Hours
Monday to Friday day shift 1	07:00-17:00
Monday to Friday day shift 2	06:30-15:00
Monday to Friday afternoon shift 2	14:30-23:00
Monday to Friday night shift	22:30-07:00
Weekend day shift	06:30-19:00
Weekend night shift	18:30-07:00

4.5.3.11 Mining Schedule

The indicative mining schedule is presented in **Table 4.8**. If mined according to this schedule, UG1 will have a mine life of about 10 years and UG2 about 8 years. This assumes underground mine development commences in Year 5 of Stage 2 operations.

Table 4.8 Indicative Stage 2 underground mining schedule.

Anticipated Calendar	Year	UG1 (Mt)	UG2 (Mt)	LW Panel Number
2014	5	0.34	-	1
2015	6	2.4	-	1,2
2016	7	3.4	-	2,3
2017	8	3.2	-	3,4

Table 4.8 Indicative Stage 2 underground mining schedule (cont'd).

Anticipated Calendar Year	Year	UG1 (Mt)	UG2 (Mt)	LW Panel Number
2018	9	3.3	-	4,5
2019	10	3.2	0.15	6,7
2020	11	2.6	0.18	7,8
2021	12	3.2	0.18	8,9
2022	13	3.1	0.14	9
2023	14	0.05	2.3	9, 10,11
2024	15	-	3.0	11,12
2025	16	-	2.3	12A, 12B
2026	17	-	2.0	13

4.5.4 Stage 2 Coal Handling Infrastructure

Stage 2 will include the development of the following coal handling infrastructure (see Plan 12 in Volume 2):

- Stage 2 ROM coal facility, consisting of the following:
  - Receival dump hopper.
  - ROM coal stockpile (adjacent to the receival dump hopper).
  - Crushing and sizing plant.
  - Raw coal stockpile and overhead conveyor (tripper).
  - Raw coal reclaim conveyors and tunnels.
  - Transfer conveyors to the (Stage 1) CHPP.
  - Reject conveyor and bin.
- Underground 1 and Underground 2 ROM coal handling, comprising:
  - ROM coal stockpile.
  - Transfer conveyor to OC1 ROM coal stockpile.

4.5.4.1 Stage 2 ROM Coal Facility

The Stage 2 ROM coal facility will receive ROM coal from OC4 and UG4 and will have the ability to handle up to 17 Mt of ROM coal annually.

Open cut ROM coal will be dumped into the receival hopper, crushed and sized, then transferred to either the CHPP surge bin as direct wash plant feed or to Stage 1 or Stage 2 raw coal stockpiles for future beneficiation (i.e., washing). Underground ROM coal will be dumped into the receival hopper, crushed and sized, then transferred directly to the Stage 1 product coal stockpile, unless beneficiation is required.

Generally, ROM coal will be dumped directly into the receival dump hopper. However, where stockpiling is required it will be dumped onto the Stage 2 ROM coal stockpile located adjacent to the receival dump hopper.

Receival Dump Hopper

The receival dump hopper will be constructed partially below ground level with a built-up pad to allow direct dumping of coal into the hopper (see **Plan 13** in Volume 2). The top of the hopper will have 1 to 2 m side walls supporting dust suppression sprays.

ROM Coal Stockpile

The ROM coal stockpile will be located adjacent to and south of the receival dump hopper (see Plan 12 in Volume 2) and, when direct dumping of ROM coal into the receival hopper is not available, ROM coal will be placed on this stockpile. The ROM coal stockpile will have a typical operating capacity of 100,000 t, with a maximum height of about 35 m. The ROM coal stockpile pad will be developed to accept a maximum capacity of up to 200,000 t ROM coal (i.e., up to two times the typical operating capacity). Dozers will be used to manage the placement of ROM coal at this stockpile and mobile equipment will be used to reclaim the ROM coal into the receival dump hopper.

Crushing and Sizing Plant

Immediately after ROM coal is dumped into the receival dump hopper it will pass through the primary crusher located below the receival dump hopper. The primary crusher will be located below the natural ground level (see Plan 13 in Volume 2). Secondary and tertiary crushers, to reduce the coal top size to about 50 mm, will be located directly downstream of the primary crusher within the raw coal transfer tower (see Plan 12 in Volume 2).

Raw Coal Stockpile and Overhead Conveyor (Tripper)

Following sizing, raw coal is directed to an elevated gantry conveyor and overhead tripper for placing on the raw coal stockpiles. The Stage 2 raw coal stockpile will be located about 200 m east of the receival dump hopper (see Plans 12 and 13 in Volume 2). It will have dimensions of about 400 m long and 20 m high, with a maximum working capacity of about 500,000 t. Alternatively, sized coal will be directed to the CHPP surge bin as wash plant feed (open cut raw coal) or to the Stage 1 product coal stockpile (underground raw coal).

Raw Coal Reclaim Conveyors and Tunnels

Raw coal will be reclaimed through a combination of vibrating feeders located below the Stage 2 raw coal stockpile and dozers. Short reclaim conveyors located within the underground tunnels will deliver reclaimed coal to the reclaim conveyor running parallel and north of the Stage 2 raw coal stockpile (see Plan 12 in Volume 2). Alternatively, a reclaim tunnel will be located directly below the Stage 2 raw coal stockpile.

Transfer Conveyors to the (Stage 1) CHPP Surge Bin

Reclaimed raw coal from the Stage 2 raw coal stockpile will be directed to the CHPP surge bin via transfer conveyors that cross underneath Ulan-Wollar Road and over the Gulgong-Sandy Hollow rail line and Stage 1 rail loop (see Plans 12 and 13 in Volume 2).

Reject Conveyor and Bin

The reject bin will be located near the receival dump hopper with the reject conveyor from the CHPP running parallel to the Stage 2 raw coal transfer conveyors (see Plan 12 in Volume 2). Trucks dumping ROM coal into the receival dump hopper will backhaul reject material for placement with overburden in the open cut void.

Stage 2 Conveyors

Stage 2 conveyors will include (see Plans 12 and 13 in Volume 2):

- UG1 ROM coal transfer conveyor: from the UG1 drift entry and ROM coal stockpile to the OC1 ROM coal facility.
- Raw coal tripper conveyor: from the Stage 2 ROM recieval dump hopper to the Stage 2 raw coal stockpile.

- Raw coal reclaim conveyor: from the Stage 2 raw coal stockpile to the transfer tower.
- Coal processing plant (CPP) feed conveyor: from transfer tower to the CPP surge bin.
- Reject conveyor: from the CHPP to the Stage 2 reject bin.

The conveyors will be partially enclosed, where practical, and their arrangement will be similar to that as for Stage 1. Conveyor heights above ground will generally be about 1 m, but will rise up to about 30 m at the raw coal transfer tower, stockpile and (Stage 1) CHPP surge bin delivery points.

The conveyors from the Stage 2 raw coal stockpile to the CHPP surge bin will pass under Ulan–Wollar Road and over the Gulgong-Sandy Hollow rail line.

Light vehicle access will be provided adjacent to all conveyors to allow access for maintenance purposes.

4.5.4.2 Underground 1 and Underground 2 ROM Coal Handling

ROM Coal Stockpile

Underground ROM coal will be transferred to the surface via the development, gate and drift conveyors. The ROM coal will be stockpiled adjacent to the highwall entries when transfer to the OC1 ROM coal stockpile is unavailable.

Transfer Conveyor to OC1 ROM Coal Stockpile

Underground ROM coal will be transferred to the OC1 ROM coal stockpile by the transfer conveyor.

4.5.5 Reject and Tailings Disposal

The operation of Stage 2 will generate up to an additional 2 Mtpa of coarse reject and tailings (4 Mtpa in total from Stage 1 and Stage 2 combined) as a result of the increase in coal throughput at the CHPP. Rejects and dewatered tailings will be conveyed from the CHPP to a 250 t capacity reject bin located adjacent and to the east of the Stage 2 ROM coal facility (see Plan 12 in Volume 2). This will enable reject material to be backhauled to OC1 and OC4 for disposal with overburden in the pit voids.

4.5.6 Stage 2 Supporting Facilities

Stage 2 includes the development of office and workshop facilities. All facilities will generally be constructed out of steel frame and clad with suitably coloured profiled metal sheeting or similar product where feasible. Facilities will generally be constructed to a level free of inundation by floodwaters and will be built to appropriate building codes, including considering potential earthquakes and bushfires where applicable. The immediate surrounds of buildings, workshops and car parking areas will be landscaped.

Contractors will use relocatable buildings for site offices.

4.5.6.1 Stage 2 Office and Workshop Facilities

The Stage 2 office and workshop facilities area will be located to the east of the Stage 2 ROM coal facility. This office and workshop facilities area will contain an administration office and vehicle parking area, crib room, bathhouse, workshops, hardstand areas (for mine vehicle parking), equipment stores, and fuel and lubrication stores. It will be accessed from Ulan-Wollar Road (see Plan 12 and **Plan 14** in Volume 2).

The Stage 2 office and workshop facilities will service the open cut mines. There will be employee and visitor parking areas with sufficient capacity for approximately 150 personnel vehicles and 15 visitor vehicles.

The workshops will be the main service facilities for all light vehicles and mining equipment used across the mining complex.

A hardstand area will be located adjacent to the workshops for the parking of heavy vehicles and associated equipment. A fuel and lubrication store area will contain up to five above-ground 110,000 L diesel-storage tanks that will be bunded appropriately. Fuel will be delivered to this facility on a daily basis by semi-trailer or B-Double tankers. Hydraulic oils, engine oils and all other lubricating oils will be stored within above-ground tanks and drums within bunded storage areas.

4.5.6.2 Open Cut 4 Facilities

Relocatable facilities will be developed adjacent to OC4 due to the distance between the office and workshop facilities and some working areas of OC4. These facilities will comprise satellite offices, crib room, bathhouse, service area and vehicle parking. The approximate locations of these temporary facilities are shown in Plans 5 to 10 of Volume 2.

For both heavy and light vehicles, access to OC4 will be along the OC4 haul road from the Stage 2 ROM coal facility and Stage 2 office and workshop facilities.

During shift changes, mine workers will generally be transported to OC4 by mini-buses. This will minimise light vehicle traffic on the haul road. Refuelling trucks servicing the open cut mine fleet will be escorted to the OC4 area.

4.5.6.3 Underground 1 and Underground 2 Surface Facilities

Surface facilities will be established on the floor of the OC1 void adjacent to the highwall entries to service the UG1 and UG2 mines (see Plan 12 in Volume 2). They will include an office, bathhouse, small workshop and service area, bunded fuel storage, and light vehicle parking. An internal road will link these to the OC1 ROM coal facility, Stage 2 ROM coal facility, and Stage 2 office and workshop facilities.

4.5.6.4 Site Access

The main entry point for employees, contractors and visitors to the Administration and CHPP facilities will be via the Stage 1 mine access point off Ulan-Cassilis Road. This intersection was designed in consultation with the RTA and MWRC and complies with standard RTA design criteria.

The entry point for employees to the Stage 2 open cut and underground mines will be via the Ulan-Wollar Road access point to the Stage 2 office and workshop facilities.

4.5.6.5 Ancillary Fleet

Stage 2 does not require additional (to Stage 1) ancillary fleet. All ancillary fleet and equipment required for Stage 1 will be shared across the integrated mining complex as required.

4.5.6.6 Additional Workforce

Stage 2 will potentially require 122 additional employees to Stage 1. This number includes 115 plant operators and seven management and administration personnel.

4.5.7 Water Management

Stage 2 water management will be integrated with Stage 1 water management. An integrated Water Monitoring and Management Plan will be developed for the operation of the MCP. An

overview of the water management strategy is presented in **Plan 15** in Volume 2 and described in Section 5.5.6.

4.5.7.1 Water Demand

It is estimated that the MCP will require on average 157 ML of water for each million tonnes of ROM coal. This assumes that only open cut ROM coal requires washing at the CHPP.

At maximum production the mining complex will require up to 2,668 ML/annum of water. This is discussed in Section 5.6.3. Of this, 1,862 ML/annum will be required for Stage 2 operations.

4.5.7.2 Mine Water Supply

The Stage 2 water supply will be the same as that for Stage 1, with the exception that additional water will be sourced from inflows into OC4, UG1 and UG2, and capturing of runoff from disturbed areas in the Stage 2 Project Area.

Water supply for Stage 2 will be sought first from mine inflows, captured surface water and recycling of process and tailings water, then from the sharing of surplus water from adjacent mines (Ulan and Wilpinjong coal mines) and the Stage 1 borefield.

Additional water will be made available via pipeline from the Splitters Hollow Dam. This dam is located on MCM-owned land (Property 14) in the northern part of the Stage 2 Project Area (see Plan 4 in Volume 2). Splitters Hollow Dam is currently licensed for stock and domestic purposes. This licence will need to be converted to allow industrial use of the stored water.

In the unlikely event that water is unavailable from all of these sources in sufficient quantities to meet the demands of projected production then operations will be adjusted to meet the available supply. This may include reducing coal beneficiation, adjusting mine scheduling or by temporarily increasing on site water storage prior to predicted deficit years. This is discussed in Section 5.6.5. Alternatively, MCM will seek to supplement its water supply with local groundwater from other licensed sources.

4.5.7.3 Potable Water Supply

Potable water for offices, crib rooms, bathhouses and toilets will be required at OC4, UG1 and UG2, and the office and workshop facilities. This water will be sourced from rainwater capture (off building roofs), bore water (treated where required) or imported from external sources.

4.5.7.4 Water Storage

Clean water will be captured and diverted around the operational areas of the mine to maintain environmental flows to the Murragamba, Eastern, and Wilpinjong creeks. This will require the construction of 10 clean water dams upstream of OC4. These dams will be progressively developed then decommissioned as open cut mining and rehabilitation progresses through the valley. A small number of these clean water dams may be retained in the final post-mining landscape for environmental reasons. A further two clean water dams will be constructed upstream of the Stage 2 ROM coal facility.

Captured runoff from disturbed areas will be collected and stored in appropriately-sized sedimentation ponds and pit sumps. These will be progressively developed then decommissioned as open cut mining progresses through the valley. Runoff water and mine inflows collected in these water storages will be used for dust suppression and other mine purposes. A small number of these sedimentation ponds may be retained in the final post-mining landscape for environmental reasons. The size and location of the clean water dams and sedimentation ponds is described further in Section 5.5.6.2 and in Appendix 6 in Volume 4.

4.5.7.5 Surplus Water Management

Contingencies for the management of excess water from Stage 2 operations include:

- Treatment and discharge to Murragamba Creek below OC4.
- Transfer to future mining operations within the vicinity.
- Agricultural use, including irrigation.
- Storage prior to discharge.

No water will be discharged off-site unless it meets the EPL water quality requirements for the discharge of water to local water courses. Water management is discussed in Section 5.5.6.

4.5.8 Waste Management

Stage 2 will generate a variety of waste streams, including timber, glass, paints, oils, fuels, batteries and scrap metal from construction and demolition (of farm buildings) activities; oils, fuels, scrap metal, batteries and rubber tyres from workshop areas; and paper, general domestic wastes and sewage effluent from administration, crib room, and bathhouse areas. In addition, coarse rejects and tailings will be transferred from the CHPP to adjacent to the Stage 2 ROM coal facility for disposal (see Section 4.5.5).

An integrated Waste Management Plan will be developed for the MCP. The Waste Management Plan for Stage 1 will be extended to include the management of wastes from Stage 2. This will enable an integrated approach to waste management across the whole mining complex. This is further discussed in Section 5.16.

4.5.8.1 Solid Waste

The mine site will be kept free of litter by bins positioned where food is consumed. All non-toxic waste (including putrescible and inert) will be securely stored in appropriate receptacles. All waste will be removed from site and disposed of by licensed contractors. Recyclable materials (such as aluminium cans, paper, glass and recyclable plastics) will be sent to a licensed recycler by the licensed waste contractor. Estimated quantities of waste during the construction and operation of Stage 2 are provided in Section 5.16.

4.5.8.2 Sewage

All sewage will be disposed of in accordance with NSW Department of Health and DECC requirements for on-site sewage disposal. Typically, this will be via approved on-site sewage management systems located adjacent to each bathhouse. Stage 2 sewage will be treated to the appropriate standard and used in site rehabilitation and landscaping or will be collected in a pump-out system and disposed at a licensed facility off-site.

It is estimated that approximately 66 L of wastewater will be generated per person per day.

4.5.8.3 Waste Hydrocarbons

Operation of the mining fleet will generate waste hydrocarbons such as oils, greases and hydraulic fluids. These waste hydrocarbons will be placed in suitable containers and removed from the site for disposal at either an EPA-approved hydrocarbon waste site or a recycling depot. Runoff water from mobile equipment service areas will be directed to an interceptor trap to extract hydrocarbons, prior to it being discharged into the mine water management system. The trap will be routinely emptied of hydrocarbons by a licensed contractor.

4.5.9 Hazardous Materials Management

The transportation, handling, storage and management of all hazardous materials used on-site will be carried out in accordance with the relevant legislation, guidelines and standards, and will generally adopt the following leading practice principles:

- Allocating clear management responsibility for hazardous materials management.
- Maintaining knowledge of all hazardous materials stored and used on-site.
- Keeping adequate records including material safety data sheets of all hazardous materials on-site.
- Regularly reviewing updated hazardous material safety data sheets.
- Understanding actual or potential hazards and environmental impacts associated with transporting, storing, using and disposing of the hazardous materials required for the project.
- Minimising the use and/or generation of hazardous materials.
- Implementing physical controls and procedural measures to ensure that no materials escape during normal operations and under all foreseeable circumstances.
- Seeking alternatives to disposal such as reusing and recycling products.
- Disposing of waste materials in a way that avoids or minimises environmental impacts.
- Having a Site Emergency Response Plan in place to ensure immediate action to minimise environmental effects should accidental or unplanned releases occur.
- Monitoring any discharges to the environment to detect any escape of materials and measure any subsequent impacts.

Hazardous materials management is further discussed in Section 5.15. An integrated plan for the management of hazardous materials will be established for the operation of the MCP.

4.5.10 Contamination

Potentially contaminated sites associated with prior land uses may be encountered within the Stage 2 Project Area. This may include sheep dips, workshops, and machinery sheds used for fuel, chemical and fertiliser storage and landfills. Where any potentially contaminated sites are found during construction or operation of Stage 2 then these will be assessed and appropriate management strategies formulated to treat or remediate the site.

4.5.11 Existing Infrastructure

4.5.11.1 Public Roads

Two sections of Ulan-Wollar Road will be realigned around the Stage 2 operations (see Plan 4 in Volume 2). This includes a 2-km section that begins approximately 2.75 km east of the intersection with Ulan-Cassilis Road (to avoid the Stage 2 ROM coal facility), and a 1-km section that begins approximately 7.5 km east of the intersection (to avoid OC4).

Carrs Gap Road, Murragamba Road and a small number of other unformed (’paper’) roads are within the footprint of OC4 (see Plan 2 in Volume 2). There are no private residences within this area requiring the use of these roads. Consequently, MCM has applied to MWRC and the Department of Lands to close these roads. However, where the roads cannot be closed, alternative arrangements will be made to realign them around the mining operation. Where

required, this will be done in consultation with existing users to ensure suitable access is maintained. This is discussed further in Section 5.12.

4.5.11.2 Existing Buildings

There are six rural dwellings and several associated structures, such as sheds, that will be removed in advance of OC4 mining operations. With the exception of the Murragamba Homestead, which is owned by the Ulan coal mine, all other buildings within the OC4 footprint are owned by MCM. Underground 1 will be beneath two dwellings and a number of rural structures. These are all owned by MCM, and will be demolished prior to underground mining

Demolition works will be undertaken in accordance with relevant standards, guidelines and codes (e.g., AS 2601-2001: Demolition of Structures), following archival recording where required (see Section 5.10). Demolition waste will be handled and managed in accordance with the Waste Management Plan.

4.5.11.3 Ulan Waste Transfer Station

The Ulan Waste Transfer Station is currently located immediately south of Ulan-Wollar Road in the area that will be occupied by the Stage 2 ROM coal facility. This facility is owned and operated by MWRC. Arrangements will be made for the relocation of the waste transfer station, and MCM has begun consultation with MWRC regarding this matter.

4.5.11.4 Power Lines

The Wilpinjong 66-kV power line is adjacent to Ulan-Wollar Road and may require relocation to the north side of the Gulgong-Sandy Hollow rail line.

A Country Energy 11-kV power line runs in an easterly direction over Carrs Gap. This line will be terminated at the last user in the Moolarben Creek valley. The sites to the east that are within the Stage 2 Project Area and supplied by this power line are all owned by MCM and will be removed for mining.

4.5.12 Stage 2 Construction

4.5.12.1 Construction Schedule

The Stage 2 ROM coal facility and the office and workshop facility will be developed first. Construction of the OC4 facilities will commence prior to the start of pre-strip preparations for mining in OC4. Construction of underground infrastructure and facilities will commence after the eastern highwall of OC1 is safely exposed (see Section 4.5.3).

4.5.12.2 Workforce and Working Hours

The Stage 1 construction workforce will be used for Stage 2 construction activities. This workforce will be sourced locally wherever possible.

Construction of the Stage 2 ROM coal facility and office and workshop facilities will generally occur during the hours of 7.00 a.m. to 6.00 p.m., 7 days per week. However, 24-hour construction activities may be required at some time during Stage 2 construction.

4.6 Proposed Modification of Stage 1

Operation of Stage 2 requires modifications to be made to the Stage 1 Project Approval to enable coal mined from the Stage 2 operations to be handled and processed in conjunction with coal from Stage 1.

With the exception of relocating the UG4 entry and supporting surface facilities, the modification of Stage 1 will not change or vary the location or general arrangement of OC1, OC2, OC3 or UG4; the method and rate of mining; or the location, arrangement and function of associated mine infrastructure and surface facilities as currently approved.

However, the modification of Stage 1 will increase the throughput of the CHPP facility and the transport of product coals using rail from the mining complex. In addition, the modification of Stage 1 will develop links between Stage 1 and Stage 2 to enable the efficient transfer of coal and waste around the mining complex, which will avoid the need to duplicate infrastructure. This will minimise the environmental footprint of Stage 2.

The modification of Stage 1 is summarised in **Table 4.9.**

Table 4.9 Modification of Stage 1 summary

Aspect	Description
Mining operations	The UG4 drift entries will be relocated to the northern highwall of OC1.
Coal handling infrastructure	ROM coal from UG4 will be transferred by conveyor to the Stage 2 ROM coal facility. OC1 ROM coal facility will receive ROM coal from UG1 and UG2. The CHPP will receive ROM coal from Stage 2 (and from any other future ROM coal facility developed in the mining complex). The throughput of the CHPP will increase from 12 Mtpa to 17 Mtpa. The maximum output of the CHPP will increase from 10 Mtpa to 13 Mtpa of product coal. Product coal will be transported using up to 5 trains a day.
Waste	Coarse rejects and tailings will be delivered to the OC4 ROM coal facility (for back hauling and emplacement in OC4).
Infrastructure and support facilities	Relocation of associated UG4 pit top facilities to the northern part of OC1.
Project life	The project life will need to be modified to allow the CHPP to accept ROM coal from Stage 2 for the life of Stage 2, i.e., until 31 December 2033.

4.6.1 Stage 1 Open Cuts

A void approximately 16 ha in size will be left in the northern end of OC1 to allow access to UG4 through the northern highwall. Previously it was proposed that this area of OC1 would be backfilled with overburden and coal reject materials, and rehabilitated following open cut mining.

4.6.2 Stage 1 Underground 4

4.6.2.1 ROM Stockpile and Surface Facilities Location

The UG4 entries and conveyor access will be developed in the northern highwall of OC1 (see Plan 12 in Volume 2). This is 500 m south of the currently approved location in the Stage 1 Main Infrastructure Area. Surface facilities (crib room, bathhouse, etc.) and the ROM coal stockpile will be relocated to be adjacent to the entries in the northern end of OC1.

The location of these facilities to within the open cut void will reduce the noise and lighting impacts associated with the UG4 operations. Access to the UG4 entries and surface facilities will either be from the OC1 access road, off Ulan-Wollar Road, or from an internal road from the Stage 2 ROM coal facility.

Coal from UG4 will be transported by conveyor through an excavated slot in the eastern highwall of OC1 to the Stage 2 ROM coal facility (see Plan 12 in Volume 2). The slot in the eastern highwall is required to ensure that the appropriate conveyor gradient is maintained.

4.6.3 Stage 1 Coal Handling Infrastructure

4.6.3.1 Stage 1 ROM Coal Facilities

The Stage 1 OC1 ROM coal facilities (i.e., ROM coal stockpile and coal handling facilities) will need to accept ROM coal from the Stage 2 underground mines (UG1 and UG2) to avoid construction of a duplicated conveyor system for transferring underground ROM coal to the CHPP.

4.6.3.2 Coal Handling and Preparation Plant

The CHPP is currently approved to accept coal from Stage 1-approved mining operations. This will need to be modified to allow the CHPP to accept ROM coal from the entire mining complex. The CHPP throughput will increase from 12 Mtpa to up to 17 Mtpa to enable processing of ROM coal from both Stage 1 and Stage 2 simultaneously.

4.6.3.3 Rail Transport

The maximum production of product coals will increase from 10 Mtpa to up to 13 Mtpa. At maximum production, one additional train each day (above that approved for Stage 1 requirements) will be required to transport product coal to market.

4.6.4 Stage 1 Mineral Waste

Rejects and CHPP tailings are currently approved to be transferred to the OC1 ROM coal facilities for disposal within the Stage 1 pit voids. This will need to be modified to enable rejects and tailings to be transferred to a second rejects bin in the Stage 2 ROM coal facility for backhauling and disposal in the OC4 void.

4.6.5 Project Life

Stage 1 is currently approved to 20 December 2028. Stage 2 will require use of the Stage 1 CHPP to 31 December 2033.

This modification seeks to continue the operation of the Stage 1 CHPP to accept ROM coal for the life of Stage 2 (i.e., until 31 December 2033). This modification does not seek to extend the life of Stage 1 mining. If an extension of Stage 1 mine life is required beyond that approved by the Minister in the Stage 1 Project Approval then a separate application will be made when required.

4.7 Mine Closure

The closure of the mine will be undertaken in consultation with government authorities and stakeholders, and be consistent with the proponent's statement of commitments (see Section 6).

A Mine Closure Plan will be developed that addresses safety, environmental issues, financial expectations and future land uses. It will document the closure process, final rehabilitation including final voids, post closure maintenance, environmental monitoring, land tenure and future land use for the mining complex (see Sections 5.18 and 5.19).

Mining infrastructure and facilities may be used for future mining activities associated with the remaining coal reserves contained within EL 6288, EL 7073 and EL 7074. Scope exists in the future for the reuse of mine infrastructure for purposes other than mining, for example tourism, education, industry or transport interchange. The future post mining land use will be consistent with the planning provisions at that time.

4.8 Integrated Mining Complex Summary

A summary of the integrated mining complex is provided in **Table 4.10**. This incorporates the approved Stage 1 project, the proposed modification of Stage 1, and the proposed Stage 2 project.

Table 4.10 Summary of the proposed integrated mining complex

Aspect		Description
Mining operations	Open cut	Four open cut mines (OC1, OC2, OC3 and OC4) will be mined at a combined rate of up to 13 Mtpa. Up to 8 Mtpa ROM coal will be mined from OC1, OC2 and OC3 combined. Up to 12 Mtpa ROM coal will be mined from OC4. Overburden will be blasted where necessary and be removed using excavator and truck operations. Coal will be blasted and recovered using excavator and truck operations.
	Underground	Three underground mines (UG1, UG2 and UG4) will be mined at a combined rate of up to 4 Mtpa ROM coal. Coal will be recovered using longwall mining and transferred to surface by conveyors. Highwall entries for UG1 and UG4 mines will be constructed in the OC1 highwalls and UG2 will be accessed from UG1.
Coal handling, preparation, and processing		Coal from open cut and underground mines will be transferred to the CHPP by internal haul roads or conveyors. Crushing and sizing facilities will be included at the OC1 ROM coal facility, Stage 2 ROM coal facility and CHPP. Up to 17 Mtpa ROM coal will be processed.
Coal production, loading and rail transport		Up to 13 Mtpa product coals will be produced. Product coals will be loaded onto trains using a dedicated rail loop and rail load out facility, and transported to market on the Gulgong-Sandy Hollow rail line, using up to 5 trains a day.
Water demand and supply		Water demand at peak production will be about 7.3 ML/day (about 2,668 ML/year). Water will be supplied from mine inflows, site surface water capturing, and groundwater bores, and where possible through sharing arrangements with adjoining mines.
Waste rock, coarse rejects and tailings management		Excavated overburden from OC1, OC2 and OC3 will be used initially to form environmental bunds through out-of-pit emplacement on the western side of OC1 and OC2, around the OC3 facilities and along the haulage road between OC3 and the OC1 ROM coal facility. Excavated overburden from OC4 will be initially emplaced in two out-of-pit emplacements in the southern and south western areas of the Murragamba Creek valley. Remaining overburden will be placed in open cut mine voids. Coarse rejects and tailings will be placed with overburden in open cut mine voids. An emergency tailings dam will be established adjacent to the CHPP.
Mine access		Access to OC1, OC2, OC3, UG1, UG2 and UG4 from the same access point off Ulan-Wollar Road. Access to OC4, the Stage 2 ROM coal facility and Stage 2 office and workshop facility from a second access point off Ulan-Wollar Road. Access to the CHPP from Ulan-Cassilis Road, north of the Ulan-Wollar Road junction.

Table 4.10 Summary of the proposed integrated mining complex (cont'd)

Aspect	Description
Support facilities and utilities	Support facilities, including offices, bathhouses, workshops and fuel storages will be established at the Stage 2 ROM coal facility, CHPP, OC1, OC3, UG1 and OC4, where required. Power will be supplied from the 66-kV Ulan to Wilpinjong transmission line, via a 66/11-kV substation constructed on site.
Hours of operation	Stage 1 construction during daylight hours 7 days a week, with limited night time activities to minimise noise impacts on Ulan Public School. Stage 2 construction during daylight hours with some 24 hour construction. Mining operations to occur 24 hours a day, 7 days a week.
Employment	220 construction and 439 full time positions.
Rehabilitation	All disturbed areas will be progressively rehabilitated.

4.8.1 Construction and Operations Schedule

An indicative project schedule for the construction and operations of Stage 1 and Stage 2, including the modification of Stage 1, is shown in **Figure 4.4**.

STAGE 2

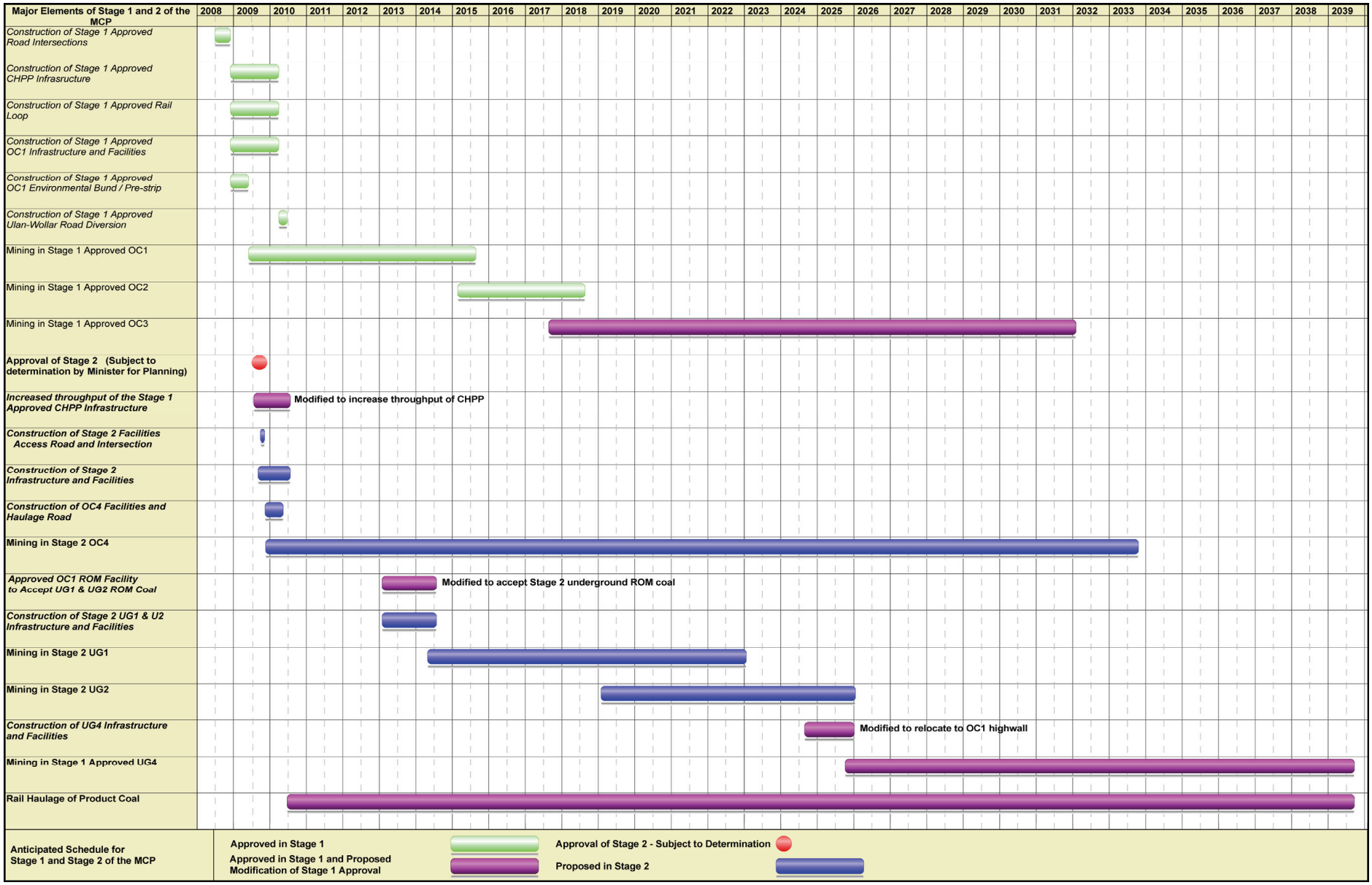

Figure 4.4 Anticipated project schedule for Stage 1 and Stage 2 of the Moolarben Coal Project

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