

MOOLARBEN COAL COMPLEX OC3 EXTENSION PROJECT

ENVIRONMENTAL IMPACT STATEMENT

APPENDIX N

LANDSCAPE AND VISUAL ASSESSMENT



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1 INTRODUCTION

1.1 BACKGROUND

The Moolarben Coal Complex is located approximately 40 kilometres (km) north of Mudgee in the Western Coalfields of New South Wales (NSW) (Figure 1). The Moolarben Coal Complex is operated by Moolarben Coal Operations Pty Ltd (MCO).

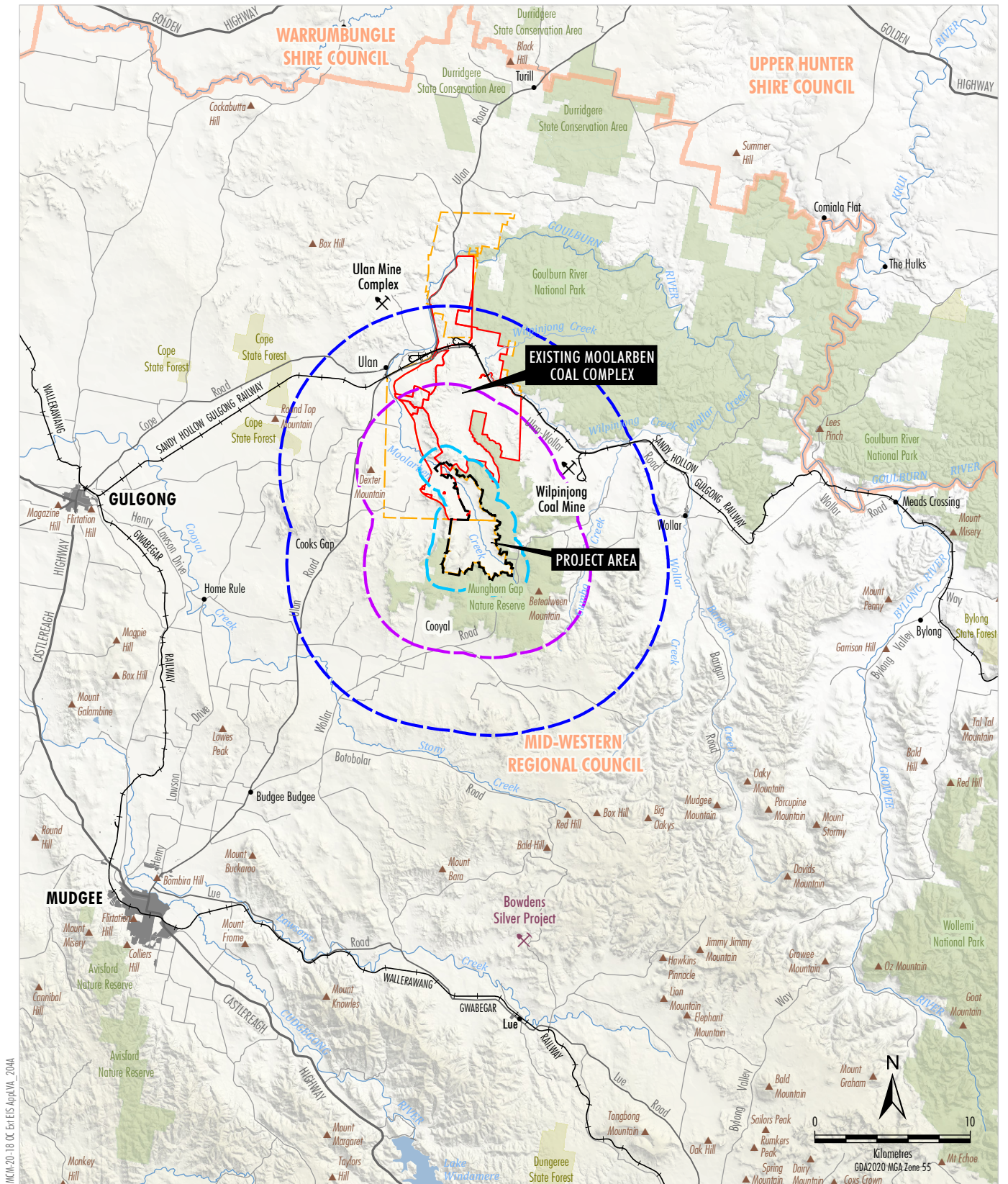
Mining operations at the Moolarben Coal Complex are currently approved until 31 December 2038 with a combined coal production rate of 22 million tonnes per annum (Mtpa) in accordance with Stage 1 Project Approval (05_0117; as modified) and Stage 2 Project Approval (08_0135; as modified). The Moolarben Coal Complex comprises four approved open cut mining areas (OC1 to OC4), three approved underground mining areas (UG1, UG2 and UG4) and other mining related infrastructure (including coal processing and transport facilities).

1.2 PROJECT OVERVIEW

MCO has identified an opportunity to extend open cut mining operations immediately south of the approved OC3 open cut pit as well as develop four new open cut pits to the east and south-east of the approved OC3 mining area, within existing mining treatments (the Project). The extended open cut mining operations would provide 10 years of mining (from 2025 to 2034), maximise use of the existing mining infrastructure and equipment, and maintain steady production of run-of-mine (ROM) coal at the Moolarben Coal Complex following completion of mining within the approved OC3 mining area.

It is expected the Project would include the following activities:

- extension of open cut mining operations within mining lease (ML) 1691, exploration licence (EL) 6288, and EL 7073 to allow mining of additional coal resources;
- extraction of up to 9 Mtpa of ROM coal with a total of approximately 40 million tonnes (Mt) over the life of the Project;
- mining operations between approximately 2025 to 2034 (which is within the approved life of the Moolarben Coal Complex ending on 31 December 2038);
- extension of employment of existing open cut workforce;
- construction and operation of ancillary infrastructure, services, plant and equipment in support of mining operations;
- construction and operation of water management and water storage infrastructure in support of mining operations;
- development of an integrated final landform with the approved OC3 mining area;
- ongoing exploration activities in the Project area;
- construction of haul road creek crossings;
- quarrying and/or excavation of borrow pits within approved disturbance areas to retrieve construction materials;
- conventional open cut mining related activities such as drilling and blasting, and other associated activities; and
- rehabilitation, decommissioning and closure.



YANCOAL
MOOLARBEN COAL
MOOLARBEN COAL COMPLEX
Project Location and Visual Setting

Figure 1

1.3 EXISTING LANDSCAPE AND VISUAL SETTING

This Landscape and Visual Assessment forms part of an Environmental Impact Statement (EIS) which has been prepared to accompany a Development Application made for the Project in accordance with Part 4 of the *Environmental Planning and Assessment Act 1999* (EP&A Act).

This Landscape and Visual Assessment has been prepared to assist with addressing the following components of the Secretary's Environmental Assessment Requirements for the Project:

The EIS must address the following specific matters:

...

3. Amenity – including:

...

- *an assessment of the likely visual impacts of the development from key public and private vantage points, and methods to minimise the lighting impacts of the development; and*
- *the lighting impacts of the development on local receivers and on Siding Spring Observatory in accordance with the Dark Sky Planning Guideline, including measures to minimise lighting impacts.*

...

Potential night-lighting impacts have been considered in Section 5.4 in accordance with the *Dark Sky Planning Guideline* (NSW Department of Planning & Environment [DPE], 2016).

The following sections are included as part of this Landscape and Visual Assessment:

- Section 2 – Characterisation of the existing landscape and visual setting.
- Section 3 – Review of previous visual assessments undertaken for the Moolarben Coal Complex.
- Section 4 – Description of the Project components that could have potential visual impacts.
- Section 5 – Assessment of potential visual impacts.
- Section 6 – Proposed mitigation and management measures.
- Section 7 – References.

2 EXISTING LANDSCAPE AND VISUAL SETTING

2.1 LANDSCAPE CHARACTER AND SCENIC QUALITY

Consideration of the landscape character aids in determining the overall impact of the Project on the surrounding character and sense of place (Transport for NSW [TfNSW], 2020).

The level of visual impact is primarily determined by the contrasting difference between the existing landscape and any changes to this landscape observed from various viewing locations as a result of a development (TfNSW, 2020). Previous studies have established that scenic quality increases as topographic ruggedness and relative relief increase (Burns and Rundell, 1969; Leonard and Hammond, 1984; and Anderson *et al.*, 1976).

Landforms within and in the vicinity of the Project area are characterised by lower lying areas associated with Moolarben Creek, with surrounding undulating foothills and ridges of the adjacent Munghorn Gap Nature Reserve.

The Project area ranges in elevation from 466 metres above Australian Height Datum (m AHD) along Moolarben Creek to 691 m AHD on the eastern, southern and south-western ridgelines which border the Project area adjacent to the Munghorn Gap Nature Reserve. The Munghorn Gap Nature Reserve comprises dense vegetation at elevations between approximately 665 m to 730 m AHD. The elevation decreases towards the north of the Project area, at the most downstream point of Moolarben Creek, where the land has been subject to historical clearance activities and grazing.

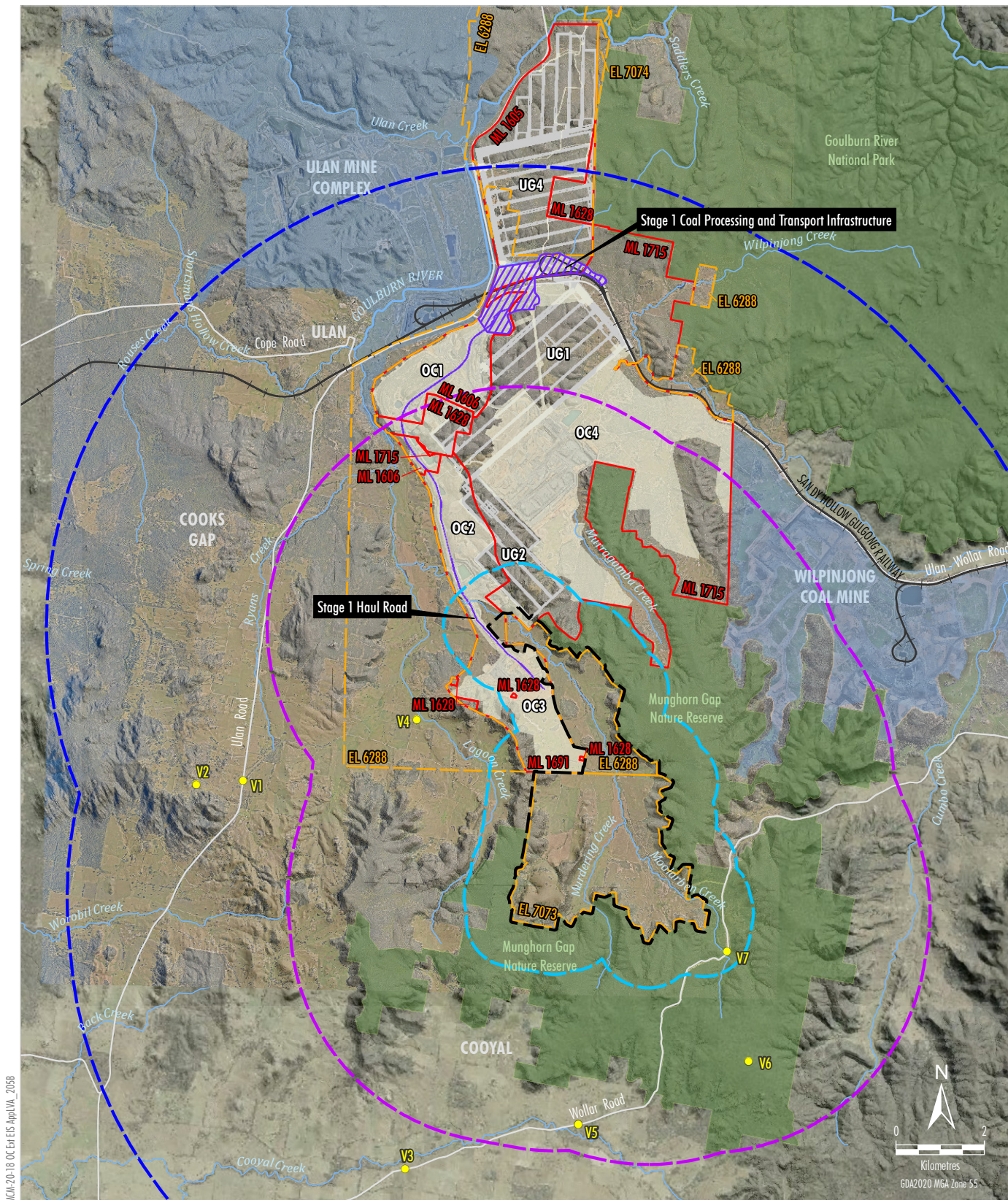
The ridgelines within the Project area and surrounds are generally covered by remnant native vegetation, while the flats and undulating country have generally been cleared for various agricultural activities.

Visual settings (e.g. local, sub-regional and regional) are based on distance from the Project area and are as follows (Figure 2):

- Regional Setting – land use and key landscape features located greater than approximately 5 km from the Project area.
- Sub-regional Setting – land use and key landscape features located 1 to 5 km from the Project area.
- Local Setting – land use and key landscape features located less than 1 km from the Project area.

Areas within and surrounding the Project area comprise of a number of land uses and landscape units of varying levels of landscape quality, and are defined as follows:

- Existing coal mines – the Project area is located within an existing mining precinct for the Moolarben Coal Complex along with the Ulan Mine Complex (7 km north) and Wilpinjong Coal Mine (4 km east).
- Agricultural areas – the Project area is surrounded by grazing and seasonal cropping land uses in the sub-regional setting largely to the west.
- Conservation areas – the Munghorn Gap Nature Reserve surrounds the Project area on the southern, eastern and south-western sides. The Project is located approximately 7 km south-west of the upper reaches of the Goulburn River, which flows east through the Goulburn River National Park.
- Commercial, industrial and residential areas – there are 23 state suburbs within the wider vicinity of the Project area. Within a 10 km radius of the Project lies Ulan, Cooks Gap, Moolarben, Munghorn, Cumbo, Cooyal, Linburn and Wilpinjong. Detached private residences are located to the north, west and south of the Project area (Figure 3).
- Existing and proposed electricity transmission lines and renewable energy projects – several solar and wind renewable projects are located or proposed to be located in the regional setting, largely to the west, east and north of the Project area.



LEGEND

- National Park/Nature Reserve
- Other Mining Operation
- Exploration Licence Boundary
- Mining Lease Boundary
- Existing/Approved Development
- Underground Longwall Layout
- Moolarben Coal Complex Disturbance Footprint
- Stage 1 Coal Processing and Transport Infrastructure
- Project Area
- Local Setting (<1 km)
- Sub-regional Setting (1-5 km)
- Regional Setting (>5 km)
- Viewpoint

Source: MCO (2022); NSW Spatial Services (2021)
Orthophoto: MCO (Jan 2021)



MOOLARBEN COAL COMPLEX

Approved Moolarben Coal Complex and
Proposed Open Cut Extension
with Assessment Viewpoints

Figure 2

2.1.1 Regional Setting (> 5 km)

The regional setting predominately consists of broad scale agricultural activities (i.e. grazing and crop production). The Project is regionally situated in the NSW Western Coalfields which is known for large scale thermal coal production.

Existing mining operations in the regional vicinity of the Project include the Ulan Mine Complex (approximately 7 km north). The Sandy Hollow-Gulgong Railway line, located approximately 6.5 km from the Project, is used to transport product coal from the Moolarben Coal Complex rail load out facility to the Port of Newcastle for export.

The Goulburn River National Park (approximately 7 km to the north-east) has elevations between 140 m AHD and 940 m AHD acting as a large visual asset to the regional surrounds.

Privately-owned residences located to the north in Ulan are approximately 7.5 km from the Project.

Gulgong is the nearest urban locality situated approximately 20 km west of the Project, followed by Mudgee approximately 40 km south. Both Gulgong and Mudgee are located on the Castlereagh Highway which runs north to south.

The regional setting possesses attributes of moderate to high scenic quality due to the vegetation and topography of the surrounding vegetated ridgelines and enclosed valleys as well as the presence of the Goulburn River National Park. The regional setting also has attributes of low scenic quality due to the flat, cleared agricultural areas and existing mining operations.

2.1.2 Sub-regional Setting (1 to 5 km)

Within the sub-regional setting, to the east and south of the Project, the Munghorn Gap Nature Reserve comprises elevated dense vegetation on topographic features ranging from approximately 665 m AHD to 730 m AHD.

The majority of the existing Moolarben Coal Complex and the Wilpinjong Coal Mine are located in the sub-regional setting. The Wilpinjong Coal Mine is located approximately 4 km east of the Project at its closest point. The Project is located directly adjacent the Moolarben Coal Complex.

Cooks Gap and Cooyal are both state suburbs situated approximately 5 km to the west and 2.5 km to the south of the Project, respectively. The rural suburbs are comprised of agricultural land interspersed with remnant woodland vegetation, predominately along local roads, watercourses and surrounding residential residences. Rural properties are largely surrounded by sporadic trees bordering farms and residential gardens.

The sub-regional setting has attributes of low scenic quality due to the presence of relatively flat, cleared agricultural areas, but also has attributes of moderate to high scenic quality due to the presence of the Munghorn Gap Nature Reserve.

2.1.3 Local Setting (< 1 km)

Portions of the Munghorn Gap Nature Reserve are directly adjacent to the Project area to the east, south and south-west and comprises elevated dense vegetation. Scattered vegetation extends from the Munghorn Gap Nature Reserve into the Project area along undulating ridgelines on the eastern and southern boundaries with occasional patches of vegetation along waterways and roads.

Apart from the Munghorn Gap Nature Reserve, the local setting has been heavily modified over time with a large part of previous vegetation disturbed for historical agricultural purposes and existing mining operations (i.e. the approved OC3 mining area within the existing Moolarben Coal Complex).

There are no villages, towns or privately-owned residences in the local vicinity of the Project (Figure 3).

The Project is located within the Moolarben Creek catchment. Moolarben Creek is the main drainage feature associated with the Project, commencing in the Munghorn Gap Nature Reserve to the south, and flows in a northerly direction through the Project area as well as through the approved Moolarben Coal Complex. Moolarben Creek also marks the lowest elevation point within the Project area. Murdering, Spring and Lagoon Creeks are ephemeral tributaries of Moolarben Creek flowing in a northerly direction.

The local setting is considered to be of low scenic quality with the exception of Munghorn Gap Nature Reserve representing moderate to high scenic quality.

2.2 LANDSCAPE CHARACTER SIGNIFICANCE

A review of relevant environmental heritage items within the regional setting of the Project was undertaken.

The *Mid-Western Regional Local Environmental Plan 2012*, NSW State Heritage Inventory and the Australian Heritage Database list the Goulburn River National Park and the Munghorn Gap Nature Reserve as heritage items.

The Munghorn Gap Nature Reserve is situated adjacent to the Project area and borders the eastern, southern and south-western edges. There would be no disturbance of the Munghorn Gap Nature Reserve and the topography of the Munghorn Gap Nature Reserve ensures current views from publicly accessible points would not be impacted by the Project.

The Goulburn River National Park is located approximately 7 km north-east of the Project area and would not be affected by the Project.

There are no other registered environmental heritage items in the local and sub-regional setting of the Project.

3 REVIEW OF PREVIOUS VISUAL ASSESSMENTS

A number of visual impact assessments have been undertaken for the approved Moolarben Coal Complex, including detailed assessments for the Stage 1 Environmental Assessment (EA) (O'Hanlon Design, 2006), Stage 2 EA (O'Hanlon Design, 2008) and Stage 1 Optimisation Modification EA (Modification 9) (EMGA Mitchell McLennan [EMM], 2013). All assessments considered the impacts of the Moolarben Coal Complex on the visual amenity of sensitive viewpoints.

This Landscape and Visual Assessment has considered the previously identified key issues in terms of landscape and visual impacts of the Moolarben Coal Complex, as well as previously recommended mitigation measures. The key impacts identified for the existing Stage 1 and Stage 2 operations (as modified) are not relevant to the Project, due to the location of the Project within the Moolarben valley, ancillary infrastructure areas (i.e. no coal handling and preparation plant [CHPP]), emplacements of waste rock within open cuts and intervening ridgelines to the south and west of the Project in the Munghorn Gap Nature Reserve.

Stage 1 Moolarben Coal Project – Visual and Lighting Impact Assessment (O'Hanlon Design, 2006)

O'Hanlon Design (2006) assessed the visual impact of the Stage 1 Moolarben Coal Project from 11 viewpoints representative of views along public roads surrounding the proposed Stage 1 operations. O'Hanlon Design (2006) revealed that a large proportion of the impacts identified were in relation to the location of the main infrastructure areas such as the stockpile and CHPP areas, rail loop and processing areas. Due to the lack of intervening ridgelines and vegetation, views of the approved Moolarben Coal Complex Stage 1 operations from the selected public road viewpoints were possible, particularly from roads adjacent the main infrastructure areas.

O'Hanlon Design (2006) concluded that no views of the currently approved OC3 area would be possible, and the Stage 1 operations would, on average, result in a moderate daytime and night-time impact for select viewpoint locations. Recommended mitigation measures to minimise these impacts, included;

- Implementing mixed vegetative screening along the north edge of the realignment of Wollar Road as well as on the edges of open cut pits, to reduce the visual impacts of infrastructure areas and emplacements.
- Incorporation of a revegetation strategy to mirror existing vegetation previously removed.
- Use of mounted wall lights with horizontal bodies and low brightness design.
- Shielding of floodlights within open cut areas where practicable.
- Use of other 'good-lighting principles' and visual screening practices.

The above mitigation measures have been implemented at the Moolarben Coal Complex for Stage 1 operations, where practicable.

Stage 2 Moolarben Coal Project – Visual and Lighting Impact Assessment (O'Hanlon, 2008)

The Stage 2 EA included a Visual and Lighting Impact Assessment undertaken by O'Hanlon Design (2008) which assessed the visual impact from eight viewpoints located on public roads surrounding the proposed Stage 2 operations. A review of the visual impacts of the Stage 2 operations (incorporating surface facility upgrades, underground mining of UG1 and UG2, and mining operations of OC4) revealed that viewpoints around the main infrastructure area were significantly impacted throughout the life of the mine. Assessed viewpoints would be affected by the works in OC4 and the main infrastructure area to varying degrees. Visual impacts of mining operations in UG1 and UG2 were limited apart from associated surface infrastructure.

O'Hanlon Design (2008) provided a number of recommendations to mitigate the predicted impacts consistent with those recommended in the Stage 1 Visual and Lighting Impact Assessment, as well as retaining existing vegetation surrounding new infrastructure areas and on the road fringes of OC4. These mitigation measures have been implemented at the Moolarben Coal Complex for Stage 2 operations, where practicable.

Moolarben Coal Project – Stage 1 Optimisation Modification (Modification 9) (EMGA Mitchell McLennan [EMM], 2013)

EMM (2013) assessed the visual impacts from all relevant locations around the Stage 1 Modification 9 area. In some locations, the combination of distance and intervening topography and vegetation minimised any visual impacts of the Modification. However, where elements of the Modification were predicted to be visible from public locations, measures were proposed to reduce exposure and/or minimise the contrast between the Project components and the surrounding landscape, including progressive rehabilitation, visual screening and night-lighting principles. These mitigation measures have been implemented at the Moolarben Coal Complex where practicable. Overall, considering implementation of mitigation measures, the Modification was not predicted to significantly impact the visual amenity of the surrounding area (EMM, 2013).

4 PROJECT DESCRIPTION – VISUAL CHARACTER

4.1 OVERVIEW

As described in Section 1, the Project would include a physical extension to the approved Moolarben Coal Complex to gain access to additional ROM coal, development of an integrated waste rock emplacement landform and construction of haul road crossings of Moolarben Creek and Murdering Creek. The extraction of Project coal resources would be supported using existing and approved infrastructure at the Moolarben Coal Complex.

ROM coal would be mined within the Project area by conventional open cut mining methods (i.e. drilling and blasting).

The Project would involve the extension of mining activities south within a valley containing land previously cleared for low-intensity agricultural purposes. Mining within the Project area would move further away from private landholders in Cooks Gap and closer to Cooyal. Significant intervening topography (greater than 665 m AHD) associated with the Munghorn Gap Nature Reserve sits between the Project mining areas and private landholders.

Figure 2 shows the general arrangement of the Project, with a more detailed description of the Project provided in Section 3 of the EIS.

The following sub-sections provide a more detailed description of major aspects of the Project that could potentially impact the visual landscape.

4.1.1 Project Landforms

Open Cut Pits

The Project would involve open cut mining of the Ulan Seam within the Illawarra Coal Measures (consistent with the target seam of the existing Moolarben Coal Complex).

ROM coal from the Project would be hauled to the Stage 1 ROM coal facility (ROM coal stockpile and transfer bin) where it would be sized and conveyed to the coal handling and processing plant (CHPP) along with coal from the rest of the Moolarben Coal Complex. Project open cut mining activities and associated mobile equipment movements would occur 24 hours per day, seven days per week consistent with currently approved operations for the Moolarben Coal Complex.

Open cut mining for the Project is relatively shallow and intervening topography and vegetation limit views of active mining areas and infrastructure within the Project area. The open cut pits would be progressively rehabilitated to minimise the total area disturbed at one time.

Waste Rock Emplacement

Waste rock (overburden and interburden) mined during development of the Project would be progressively placed in the mine voids once the coal has been mined. A portion of the waste rock would be hauled to the approved OC3 area to assist with landform integration.

Waste rock would be removed and placed in both out-of-pit and in-pit waste rock emplacements. Temporary out-of-pit emplacement areas would be located adjacent to the open cut mining operations but within the approved disturbance footprint to ultimately assist in managing waste rock throughout the life of the Project in preparation for establishing the final landform.

The temporary emplacement areas would be strategically placed near other large disturbance areas, such as dams and infrastructure areas, to expedite backfilling and rehabilitation and to minimise rehandling of overburden material. Some temporary overburden emplacement areas would be higher in elevation than the final landform (however remain lower than surrounding ridgelines) to minimise disturbance areas and material rehandling prior to final emplacement.

Final Landform

The nature of open cut mining results in the formation of voids when the open cut resource is fully extracted. The Project open cut voids would be progressively backfilled as mining progresses to reinstate the landform to approximate the gently undulating pre-mining topography. As such, the Project would result in no final void remaining in the rehabilitated landform (including the approved OC3 area) as mine voids within the Project area would be backfilled so they are free-draining.

4.1.2 Project Infrastructure

The level of construction activity for the Project is significantly reduced through the proposed use of the existing CHPP and transport infrastructure at the approved Moolarben Coal Complex.

Water Management Infrastructure

The water management strategy for the Project would be based on maximising the diversion of clean water runoff around disturbance areas, containing and re-using mine water as well as controlling sediment runoff from disturbed areas such as waste rock emplacements or areas cleared in advance of mining.

Water management infrastructure would include the progressive development of dams, pumps, water diversions, pipelines, drains, storages and other water management equipment and structures.

Development of Mine Infrastructure Area and Internal Haul Roads

The main infrastructure area approved at the Moolarben Coal Complex is the CHPP, coal stockpiles and rail loadout facility approved under the Stage 1 Project Approval (05_0117). All ROM coal from Stage 1 and Stage 2 mining operations is handled, processed and loaded to trains using the Stage 1 infrastructure.

A mine infrastructure area would be constructed during the first year of the Project to the east of the existing OC3 area. The mine infrastructure area would include administration offices, workshops, stores, buildings, washdown facilities, laydown and hardstand areas, ROM pads, ablution facilities and other related ancillary infrastructure.

All employees, contractors and deliveries would access the Project area from the existing main site access for Stage 1 via Ulan-Wollar Road. Workers and delivered materials would then be transported to the Project area via internal roads.

Water and Electricity Supply Infrastructure

The Project would involve progressive construction of ancillary infrastructure (e.g. electricity distribution infrastructure, potable water supply and site communications).

Power supply to the Project area would be via extension of the existing on-site power distribution infrastructure for the Moolarben Coal Complex and/or via onsite electricity generation (e.g. diesel generators, solar panels). Standard electrical safety practices and laws (including considerations of vehicle clearance) would continue to apply.

The potable water supply for the Project would be sourced from a combination of rainwater captured from roofs of facilities, suitably treated bore water or imported water from external sources. A water supply truck would be used to distribute potable water for the Project to service areas around the site.

4.1.3 Vegetation Clearance

The Project would require the progressive clearance of native woodland/forest, derived native grassland and land previously cleared for low-intensity agricultural activities (e.g. grazing and seasonal cropping).

4.1.4 Landform Profiling and Rehabilitation

Temporary out-of-pit emplacement areas would be located adjacent to the open cut mining operations (within approved disturbance areas) to assist in managing waste rock throughout the life of the Project in preparation for establishing the final landform.

A surge emplacement area would be located in the approved OC3 mining area and temporarily rehabilitated as required over the life of the Project. Waste rock from the surge emplacement area would be used to backfill the final void at the end of mining.

Waste rock would be used to progressively backfill emplacement areas/pits and as such, there would be minimal potential visual impact prior to final profiling and rehabilitation. Landform profiling and rehabilitation of waste rock emplacement areas would be undertaken progressively over the life of the Project.

Soil stripping would be undertaken progressively and stripped topsoil would either be used directly in progressive rehabilitation, or placed in stockpiles for later re-use. Stockpiles would be managed to reduce the potential for soil degradation and would be temporary structures.

Temporary rehabilitation of waste rock emplacement areas and soil stockpiles would be undertaken to stabilise landforms, until further mining operations or final landform profiling is carried out in the future.

A detailed description of the rehabilitation strategy and proposed post-mine landform and land use for the Project is provided in Attachment 8 of the EIS.

4.1.5 Night-lighting

The nightscape of the regional area is perceived as being rural in character, with scattered residences and small concentrations of light at individual homesteads and townships. The lighting of the existing Moolarben Coal Complex, Ulan Mine Complex and the Wilpinjong Coal Mine infrastructure and working areas stands out in the existing nightscape.

Night-lighting at the Project would be sourced from:

- stationary work lights;
- fixed/permanent lights; and
- vehicle mounted lights.

Direct views of night-lighting associated with the Project would be limited due to intervening topography and vegetation.

The scale and intensity of night-lighting expected for the Project would be similar to the existing night-lighting at the Moolarben Coal Complex, other nearby coal mining operations (i.e. Ulan Mine Complex and Wilpinjong Coal Mine) and specifically the intensity assessed for the approved OC3 mining area.

The potential impacts of night-lighting associated with the Project are discussed in Section 5.4.

5 ASSESSMENT OF POTENTIAL VISUAL IMPACTS

Developments such as mining can often detract from the scenic quality if the development is conflicting with the surrounding environment. The Project area is immediately adjacent to existing mining activities and contained within a valley. The main visual impacts are the introduction of additional surface infrastructure, the presence of the open cut pits and emplacement areas, and the impacts of night-lighting that will result from the Project.

The following sub-sections present an assessment of the potential visual impacts associated with the Project.

5.1 METHODOLOGY

The potential visual impacts were assessed by evaluating the visual magnitude of the Project in the context of the visual sensitivity of relevant surrounding land use areas (i.e. those areas from which the Project may be visible). Levels of visual impact resulting from visual magnitude and sensitivity are illustrated in Table 1.

Table 1
Landscape Character and Visual Impact Rating Matrix

		Visual Magnitude			
		H	M	L	N
Visual Sensitivity	H	High Visual Impact	High-Moderate Impact	Moderate Impact	Negligible Impact
	M	High-Moderate Impact	Moderate Impact	Moderate – Low Impact	Negligible Impact
	L	Moderate Impact	Moderate- Low Impact	Low Impact	Negligible Impact

H = High, M = Moderate, L = Low, N = Negligible

Source: TfNSW (2020)

The level of visual impact of a project tends to decrease as the distance to the project from various viewpoints increases. The level of impacts is defined as (TfNSW, 2020):

- Negligible – where the project is distant and results in a minute level of impact that is indiscernible to societies day-to-day activities.
- Low – visual impacts resulting from the project that is noticeable however does not cause significant adverse impacts and does not markedly contrast with the existing modified landscape.
- Moderate – where a component of the project is visible and contrasts from the surrounding landscape whilst possessing some integration at the same time. Surrounding topography, vegetation or the existing modified landscape can provide this level of integration.
- High – where the major components of a project can be clearly seen from public viewpoints and contrasts significantly with the surrounding landscape.

5.1.1 Visual Sensitivity

Visual (viewer) sensitivity is a measure of a land use area and its sensitivity to the proposed change. In relation to visual impact, this also relates to the type of viewer and number of viewers (TfNSW, 2020). Different viewer activities are considered to have different sensitivity levels. For example, pristine natural environments (such as National Parks) that depend solely on the landscape and view for aesthetic value would be more sensitive to change than areas such as main/local roads and highways.

Sensitivity levels relevant to various viewpoints are as follows:

- High Sensitivity – includes private rural residences, National Parks and reserves and/or buildings of cultural or historical significance.
- Moderate Sensitivity – includes private rural landholdings (without residence), recreational or scenic sites and/or tourist accommodation.
- Low Sensitivity – includes local and main roads, state highways and freeways and state or interstate passenger rail lines.

5.1.2 Visual Magnitude

Visual magnitude is defined as the measurement of the scale, form and character of a development proposal when compared to the existing condition. In terms of visual and landscape assessments, visual magnitude also relates to how far the proposal is from the viewer. Combined with sensitivity, visual magnitude provides a measurement of impact (TfNSW, 2020).

The visual magnitude of a project can vary depending on a number of factors, including the proportion of the view affected, the size and scale of the change and the level of contrast and compatibility with the surrounding landscape (Australian Institute of Landscape Architects [AILA], 2018).

5.2 IDENTIFICATION OF SENSITIVE VISUAL SETTINGS AND REPRESENTATIVE VIEWPOINTS

Potential views of the Project may be available from locations including;

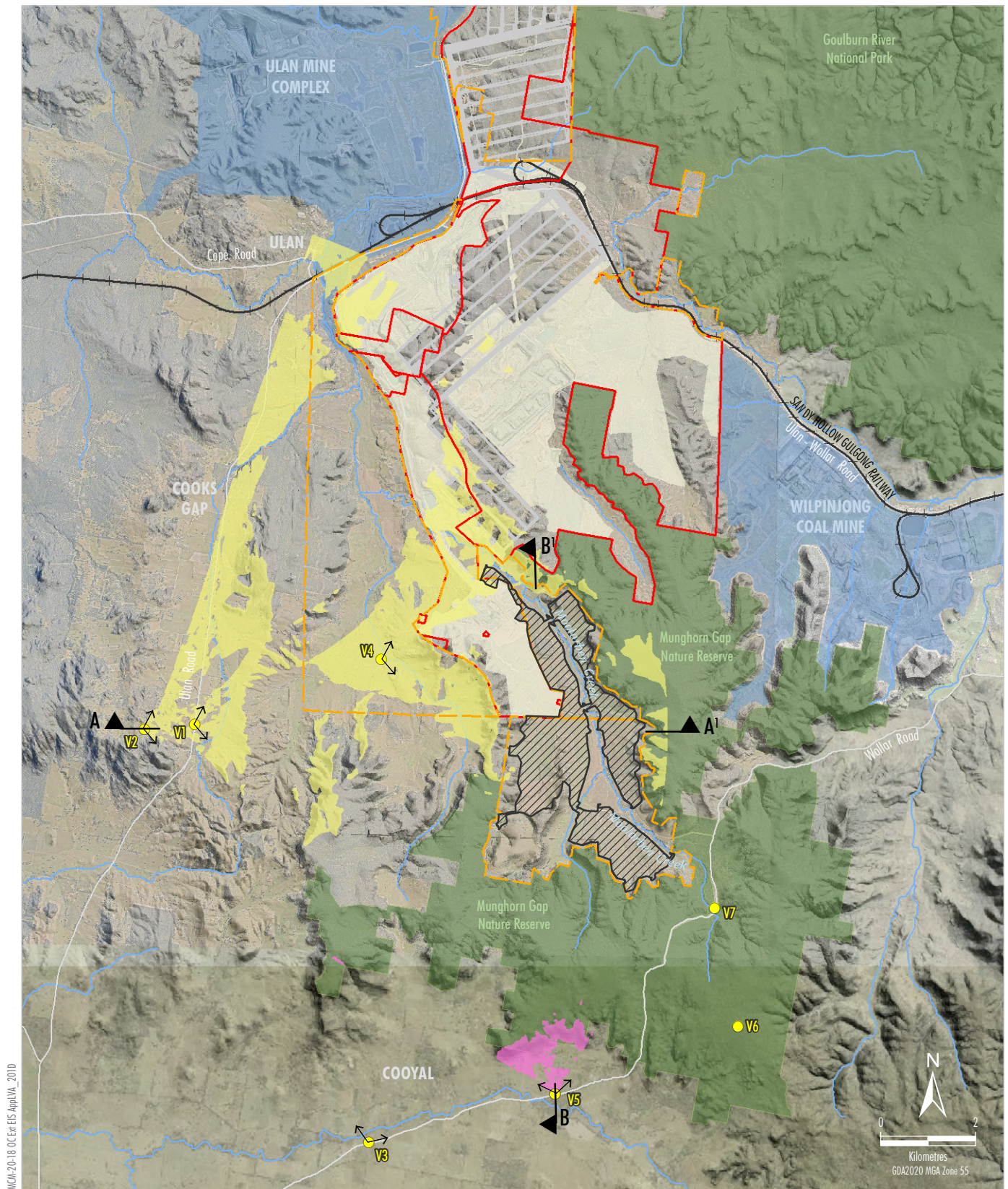
- portions of Ulan Road looking east towards the Project;
- portions of Ridge Road and western rural residences looking east towards the Project;
- Moolarben Road and a landholder to the west of the Project adjacent to the approved OC3 mining area;
- portions of Wollar Road and southern rural residences looking directly north and north-east towards the Project; and
- publicly accessible areas of the Munghorn Gap Nature Reserve including the Moolarben Picnic Area and the Castle Rocks Walking Track.

The Munghorn Gap Nature Reserve is available to the public from 7 am to 7 pm daily and can be accessed from the Moolarben Picnic Area and the Castle Rocks Walking Track. Whilst the Munghorn Gap Nature Reserve has open access to the public, any views of the Project from the Munghorn Gap Nature Reserve would be largely limited due to the dense vegetation and intervening elevated ridgelines.

The Goulburn River National Park is located approximately 7 km north-east of the Project. Public views of the Project from the Goulburn River National Park would also be obstructed by dense vegetation and intervening topography. On this basis, the visual impact of potential views of the Project from the Goulburn River National Park is expected to be negligible and is not considered further in this assessment.

Moolarben-owned land has not been considered in this assessment.

Seven (7) viewpoints were selected as being representative of the sensitive visual settings which may experience potential views of the Project. Viewpoints representative of the settings with potential views of the Project are shown on Figures 2 to 4 and are summarised in Table 2. Figure 5 presents cross sections from representative views from Cooks Gap (V2) and Cooyal (V5) and Figures 6 to 8 present the existing view from representative locations in Cooks Gap (V1, V2 and V4) and Cooyal (V3 and V5).



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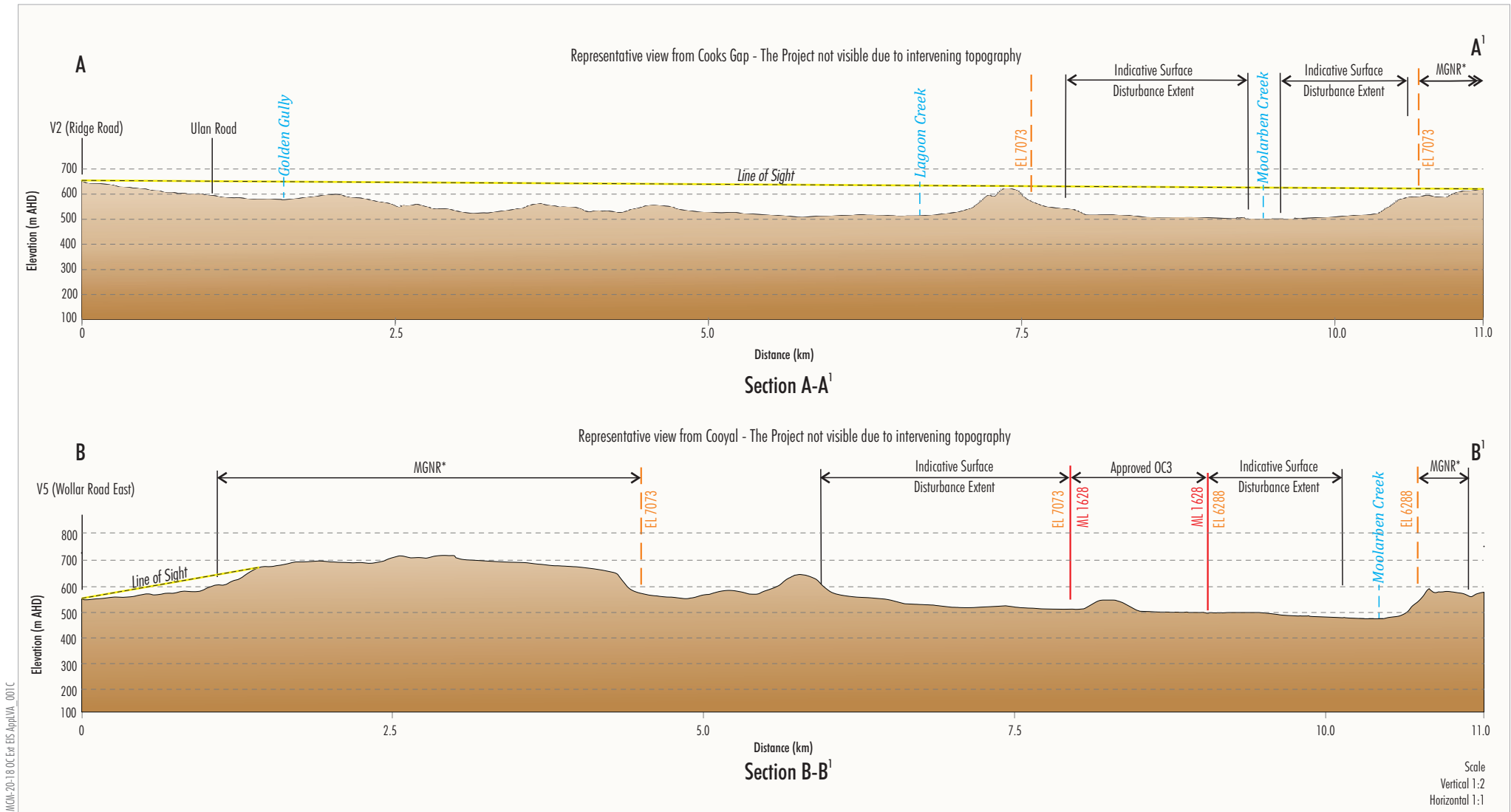
- LEGEND**
- National Park/Nature Reserve
 - Other Mining Operation
 - Exploration Licence Boundary
 - Mining Lease Boundary
 - Existing/Approved Development
 - Underground Longwall Layout
 - Moolarben Coal Complex Disturbance Footprint
 - OC3 Extension Project
 - Indicative Surface Disturbance Extent

- Viewpoints and Viewshed Analysis**
- Viewpoints
 - Photograph Orientation
 - Cross Section
 - V2 Viewshed Analysis
 - V5 Viewshed Analysis

Source: MCO (2022); NSW Spatial Services (2021)
Orthophoto: MCO (Jan 2021)


MOOLARBEN COAL COMPLEX
Viewpoints and Viewshed Analysis Locations

Figure 4



* MGNR - Munghorn Gap Nature Reserve



MOOLARBEN COAL COMPLEX
 Viewshed Analysis Cross Sections

Figure 5



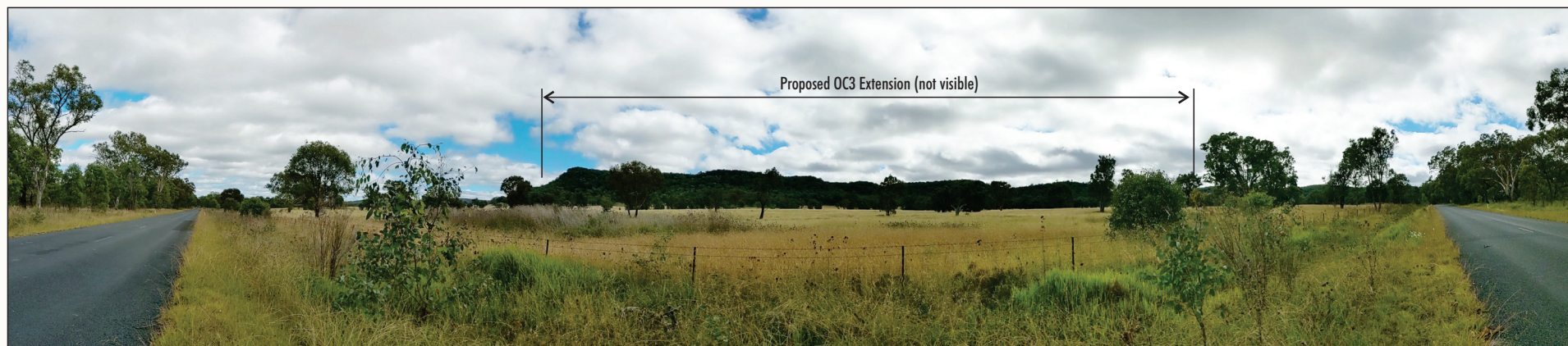
V1 (Ulan Road)



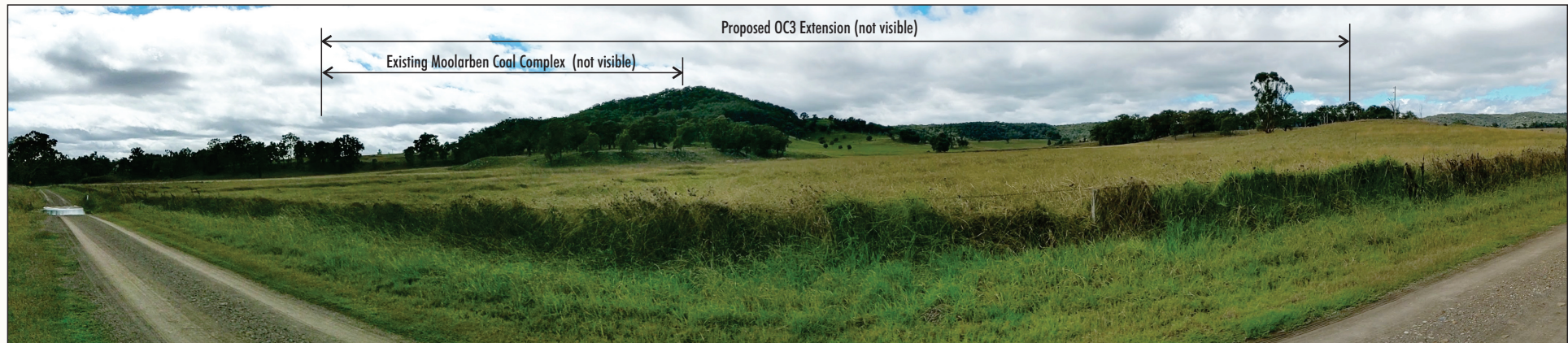
V2 (Ridge Road)



V3 (Wollar Road West)



V5 (Wollar Road East)



V4 (Moolarben Road)



MOOLARBEN COAL COMPLEX
Existing View
V4 (Moolarben Road)

Figure 8

Table 2
Location of Viewpoints

Viewpoint	Easting	Northing	Description	Visual Setting ¹	Potential View of Project
V1 (Ulan Road)	755825	6415167	Representative of potential views experienced by people travelling north and south along a main road.	Regional (6.6 km west of Project)	No views of the Project would be available due to the elevation of intervening topography and existing vegetation (Figure 6).
V2 (Ridge Road)	754768	6415071	Representative of potential views from private residences in Cooks Gap, primarily along Ridge Road.	Regional (9.0 km west of the Project)	No views of the Project would be available due to the intervening topography and existing vegetation of the Munghorn Gap Nature Reserve (Figure 5 and Figure 6).
V3 (Wollar Road West)	759491	6406366	Representative of potential views from private residences in Cooyal along Wollar Road.	Regional (6.2 km south of the Project)	No views of the Project would be available due to the intervening topography and existing vegetation of the Munghorn Gap Nature Reserve (Figure 7).
V4 (Moolarben Road)	759756	6416542	Representative of possible views experienced by people travelling along Moolarben Road to the west of the Project area and potential views from existing rural landholdings.	Sub-regional (3.5 km west of the Project)	No views of the Project would be available due to the intervening topography and existing vegetation of the Munghorn Gap Nature Reserve (Figure 8).
V5 (Wollar Road East)	763421	6407377	Representative of potential views from private residences in Cooyal and along Wollar Road.	Sub-regional (4.5 km south-east of the Project)	No views of the Project would be available due to intervening topography and existing vegetation associated with the Munghorn Gap Nature Reserve (Figure 5 and 7).
V6 (Castle Rocks Walking Track)	767291	6408800	Representative of potential views from a publicly accessible recreation area within the Munghorn Gap Nature Reserve.	Sub-regional (2 km south of the Project)	No views of the Project would be available due to intervening topography and existing vegetation of the Munghorn Gap Nature Reserve (Figure 4).
V7 (Moolarben Picnic Area)	766784	6411289	Representative of potential views from a publicly accessible recreation area within the Munghorn Gap Nature Reserve.	Local (1 km south-east of the Project)	No views of the Project would be available due to the intervening topography and existing vegetation of the Munghorn Gap Nature Reserve (Figure 4).

¹ Based on distance from the viewpoints to the Project area.

5.3 VISUAL IMPACT ASSESSMENT

This section assesses potential visual impacts that are expected to arise as a result of the Project based on the methodology described in Section 5.1. The location of viewpoints are shown on Figure 4.

5.3.1 Regional Setting (> 5 km)

There are three viewpoints located within the regional setting. The potential visual impacts of the Project on the regional setting are described below.

Ulan Road

Viewpoint V1 (Ulan Road) is representative of potential visual impacts for people travelling on Ulan Road in the regional setting.

Visual Sensitivity

The visual sensitivity of main and local roads within the regional setting (e.g. Ulan Road [V1]) is considered to be low as public road networks are not reliant on the surrounding environment for aesthetic value and are therefore less susceptible to change landscape (Section 5.1.1).

Visual Magnitude

Distant views of the existing Moolarben Coal Complex landforms such as OC1 and OC2 infrastructure and emplacement areas are visible from sections of Ulan Road, however, the Project would progressively move further south and south-east down the Moolarben Valley, and as such no views of the Project from Ulan Road (V1) would be available (Figure 6).

Therefore, the visual magnitude of the Project for Ulan Road (V1) would be negligible.

Visual Impact

The low level of visual sensitivity and negligible level of visual magnitude for people travelling along Ulan Road (V1) indicates a negligible level of visual impact for the duration of the Project operations (Table 3).

Ridge Road and Western Rural Residences (Cooks Gap)

Ridge Road (V2) is representative of potential visual impacts for private residences in Cooks Gap in the regional setting.

Visual Sensitivity

The visual sensitivity of private residences along Ridge Road (V2) and surrounds would be high due to the association of the amenity of the surrounding visual landscape (Section 5.1.1).

Visual Magnitude

Views of the Project from private residences in Cooks Gap, represented by Ridge Road (V2) would not be available due to intervening topography and existing vegetation. This is supported by the viewshed analysis of the Project from the west, as shown on Figure 4 (refer to the absence of yellow shading in the Project area, indicating views are not available). The cross-section on Figure 5 further shows that no views are available due to the intervening topography of the ridgelines surrounding Moolarben Valley.

Therefore, the visual magnitude of the Project for private residences in Cooks Gap (represented by Ridge Road) would be negligible.

Visual Impact

The high level of visual sensitivity and negligible level of visual magnitude in represented areas of Ridge Road (V2) indicates a negligible level of visual impact for the duration of Project operations (Table 3).

Wollar Road

Viewpoint V3 (Wollar Road West) is representative of potential visual impacts for private residences in Cooyal in the regional setting.

Visual Sensitivity

The visual sensitivity of private residences along Wollar Road (V3) in the regional setting would be high due to the association of the amenity of the surrounding visual landscape (Section 5.1.1).

Visual Magnitude

Wollar Road generally runs south-east to south-west of the Project and is bordered by intermittent patches of vegetation as well as the Munghorn Gap Nature Reserve. Views of the approved OC3 mining area and the Project from V3 (Wollar Road West) would not be available due to the intervening topography and existing vegetation associated with the Munghorn Gap Nature Reserve (Figure 7).

Therefore, the visual magnitude of the Project for Wollar Road and residences in Cooyal in the regional setting would be negligible.

Visual Impact

Although Wollar Road is considered to have a high visual sensitivity, the negligible level of visual magnitude indicates a negligible level of visual impact for the duration of Project operations (Table 3).

5.3.2 Sub-regional Setting (1 to 5 km)

Three viewpoints are located within the sub-regional setting. The potential visual impacts of the Project on the sub-regional setting are described below.

Moolarben Road and Western Rural Landholding

Moolarben Road (V4) is representative of potential visual impacts for private road users of Moolarben Road as well as private landholders to the west of the Project in the sub-regional setting.

Moolarben Road (V4) is located approximately 3.5 km from the Project and is directly adjacent to the only privately-owned landholding in the sub-regional setting of the Project. No current pending or approved development application to construct a dwelling exists for this rural landholding. Notwithstanding, potential visual impacts at this location have been included in this assessment where relevant.

Moolarben Road (V4) is also directly west of the approved OC3 mining area. A vegetated ridgeline intercepts views of OC2 and the approved OC3 mining area from V4 (Figure 8).

Visual Sensitivity

The visual sensitivity for Moolarben Road and the rural landholding in the sub-regional setting would be moderate due to the private use of the road and rural landholding (Section 5.1.1).

Level of Visual Magnitude

While views of the existing Moolarben Coal Complex may be visible from Moolarben Road, the Project would progressively move further south and south-east down the Moolarben Valley, and as such would result in a negligible visual magnitude.

Visual Impact

The moderate level of visual sensitivity and negligible level of visual magnitude for Moolarben Road (V4) indicates a negligible level of visual impact for the duration of Project operations (Table 3).

Wollar Road and Southern Rural Residences (Cooyal)

Wollar Road (East) (V5) is representative of potential visual impacts for private residences in Cooyal in the sub-regional setting.

Visual Sensitivity

The visual sensitivity for rural residences to the south of the Project in the sub-regional setting would be high due to the association of the amenity of the surrounding visual landscape (Section 5.1.1).

Visual Magnitude

Views of the Project from V5 (Wollar Road East) and southern rural residences would not be available due to intervening topography and existing vegetation as a result of the Munghorn Gap Nature Reserve. This is supported by the viewshed analysis on Figure 4 (shown by the absence of pink shading), as well as the cross-section on Figure 5.

Therefore, the visual magnitude of the Project for Wollar Road and southern rural residences in the sub-regional setting would be negligible.

Visual Impact

The high level of visual sensitivity and negligible level of visual magnitude for Wollar Road (East) and private residences in Cooyal indicates a negligible level of visual impact for the duration of Project operations (Table 3).

Natural Area – Recreation

Castle Rocks Walking Track (V6) is representative of potential visual impacts from a publicly accessible recreation area within the Munghorn Gap Nature Reserve in the sub-regional setting.

Visual Sensitivity

The visual sensitivity for the Castle Rocks Walking Track within the Munghorn Gap Nature Reserve is considered to be highly sensitive to the surrounding environment due to the association of the amenity to the surrounding visual landscape (Section 5.1.1).

Visual Magnitude

The Castle Rocks Walking Track is approximately 2 km south-east of the Project at its closest point. The Castle Rocks Walking Track is an 8.5 km return track which runs to the south-east and is a recreational destination used for social activities such as bushwalking and can be accessed from Wollar Road (Figure 4).

Viewpoint V6 is located at the highest elevated point along Castle Rocks Walking Track. The Castle Rocks Walking Track is located within the dense vegetation of the Munghorn Gap Nature Reserve and does not overlook the Project area. Due to the large intervening topography and existing vegetation of the Munghorn Gap Nature Reserve, there would be no views available of the Project from the Castle Rocks Walking Track (V6).

Therefore, the visual magnitude of the Project for the Castle Rocks Walking Track and Munghorn Gap Nature Reserve in the sub-regional setting would be negligible.

Visual Impact

The high level of visual sensitivity and negligible level of visual magnitude for the Castle Rocks Walking Track indicates a negligible level of visual impact for the duration of Project operations (Table 3).

5.3.3 Local Setting (< 1km)

One viewpoint is located within the local setting. The potential visual impacts of the Project on the local setting are detailed below.

Natural Area – Recreation

The Moolarben Picnic Area (V7) is representative of potential visual impacts from a publicly accessible recreation area within the Munghorn Gap Nature Reserve in the local setting.

Visual Sensitivity

The visual sensitivity for the Moolarben Picnic Area and Munghorn Gap Nature Reserve in the local setting is considered to be high, as the amenity is associated with the surrounding visual landscape (Section 5.1.1).

Visual Magnitude

The Moolarben Picnic Area, located approximately 1 km south-east of the Project, is a recreational destination used for social activities by the local community and can be accessed from Wollar Road (Figure 4). The Moolarben Picnic Area is located within the Munghorn Gap Nature Reserve, surrounded by existing dense vegetation and does not overlook the Project area. Due to the intervening topography of the Munghorn Gap Nature Reserve and existing vegetation, there would be no views of the Project available from the Moolarben Picnic Area (V7).

Therefore, the Project would result in a negligible visual magnitude for the Moolarben Picnic Area and Munghorn Gap Nature Reserve in the local setting.

Visual Impact

The high level of visual sensitivity and negligible level of visual magnitude for the Moolarben Picnic Area (V7) indicates a negligible level of visual impact for the duration of Project operations (Table 3).

Rural Residences and Landholdings

There are no private rural residences or landholdings within the local setting of the Project area. On this basis, visual impacts on rural residences and landholdings within the local setting are not assessed further.

Public Roads

Moolarben Road is closed for public access across the existing OC3 mining area and the Project area. There are no other public roads within the Project area and therefore there would be no direct interaction with the public road network.

On this basis, the visual impact on public roads in the local setting of the Project area is not considered further in this assessment.

5.4 OTHER VISUAL IMPACT CONSIDERATIONS

Direct Night–Lighting

Night-lighting would be primarily concentrated in infrastructure areas, access roads and within open cut pits due to the truck and shovel nature of the operations. Truck movements at night with associated headlight and warning lights have the potential to cause visual impacts as the light source may be flashing or moving. Other light sources from the Project could include stationary work lights, fixed/permanent lights and vehicle-mounted lights.

Due to the location of the Project within a valley surrounded by elevated areas of the Munghorn Gap Nature Reserve, it is not expected there would be any direct views of Project lighting sources from public roads and residential areas.

Measures to mitigate potential impacts from direct night-lighting are discussed in Section 6.3.

Indirect Night–Lighting

The glow in the sky on overcast nights, commonly referred to as sky glow, is a common element in the night environment at coal mines, including the approved Moolarben Coal Complex. Sky glow from the Project has the potential to occur as a result of vehicle lights and stationary work lights. During times of high cloud cover, some reflection off the cloud base could result in further sky glow from the Project.

Lighting of night-time works is essential for the safety of personnel operating at the Project. The intensity, nature and degree of night-lighting for the Project would be similar to the existing night-lighting at the approved Moolarben Coal Complex, as well as the other surrounding mining operations.

Existing control measures and lighting requirements are in place at the approved Moolarben Coal Complex, and would be applied to the Project to manage any potential sky glow as a result of operations.

Siding Springs Observatory

The Siding Springs Observatory is located approximately 135 km north-west of the Project. On this basis, the Project is within the Dark Sky Region as defined by the *Dark Sky Planning Guideline* (DPE, 2016). There are a number of light sources and cities/towns (e.g. Coonabarabran and Dubbo) between the Project and the Siding Springs Observatory, which may contribute to sky glow at the Siding Springs Observatory.

Any potential impact associated with the night-lighting required for the Project (i.e. for safety reasons) would be similar to the approved Moolarben Coal Complex and other surrounding mining operations. This would be minimised as far as practicable through the mitigation measures described in Section 6.3, which include the implementation of ‘good lighting principles’ provided by the *Dark Sky Planning Guideline* (DPE, 2016) where practicable and without compromising operational safety.

Dust and Fume

Dust emissions (and any potential impacts associated with visible dust) would be mitigated through the implementation of dust management practices as a component of the approved Moolarben Coal Complex Air Quality Management Plan.

Potential impacts associated with blast fumes would be mitigated through the implementation of management practices as a component of the approved Moolarben Coal Complex Blast Management Plan, in accordance with the Australian Explosives Industry and Safety Group Inc’s (AEISG Inc. 2011) *Code of Practice – Prevention and Management of Blast Generated NOx Gases in Surface Blasting* (AEISG Inc. 2011).

5.5 SUMMARY OF IMPACTS

Overall, the Project is expected to result in negligible levels of potential visual impacts at relevant sensitive receivers (Section 5.3).

A summary of the potential visual impacts discussed in Sections 5.3 and 5.4 is shown in Table 3.

Table 3
Summary of Visual Assessment

Location	Visual Sensitivity	Visual Magnitude	Potential Impact*
V1 (Ulan Road)	L	N	N
V2 (Ridge Road)	H	N	N
V3 (Wollar Road West)	H	N	N
V4 (Moolarben Road)	M	N	N
V5 (Wollar Road East)	H	N	N
V6 (Castle Rocks Walking Track)	H	N	N
V7 (Moolarben Picnic Area)	H	N	N

* Methodology described in Section 5.1.

Note: H = High, M = Moderate, L = Low, N = Negligible

5.6 CUMULATIVE IMPACTS

The assessment of potential cumulative visual impacts considers the combined effects of the Project with the effects of the approved Moolarben Coal Complex as well as the Ulan Mine Complex and Wilpinjong Coal Mine.

The Project is an extension of approved open cut and underground mining operations (i.e. Moolarben Coal Complex), which includes significant existing surface infrastructure and disturbance areas. The Project and the Moolarben Coal Complex are also located in an existing mining precinct with the Ulan Mine Complex and Wilpinjong Coal Mine. Therefore, the Project locality has already been subject to considerable modification due to these existing mining operations.

The night-time setting is also currently subject to the effects of lighting from the existing Moolarben Coal Complex and other mining operations.

Due to the location of the Project within a valley surrounded by elevated areas within the Munghorn Gap Nature Reserve, as well as other intervening topographical features in the wider landscape, the Project would not incrementally increase cumulative visual impacts at sensitive receivers.

Therefore, it is expected that the cumulative visual impacts of the Project would be negligible.

6 MITIGATION MEASURES AND MANAGEMENT

The mitigation and management measures that would be implemented for the maintenance of visual amenity at the Project are described below.

6.1 PROGRESSIVE REHABILITATION AND REVEGETATION

Waste rock would largely be emplaced within open cut pits reducing potential visibility. MCO would undertake progressive rehabilitation and landform shaping to assist in reducing the contrast between waste rock emplacements and the surrounding environment. Rehabilitation and landform shaping would be conducted consistent with existing operations and the Moolarben Coal Complex Rehabilitation Management Plan, and Annual Rehabilitation Report and Forward Plan.

6.2 VISUAL SCREENING

Existing vegetative screening along main and local roads within the vicinity of the Project aids in reducing any potential views of the Project.

The Munghorn Gap Nature Reserve and other ridgelines to the west of the Project act as significant vegetation screening and topographic barriers for any views of the Project. Therefore, establishing additional visual screening is not proposed for the Project.

6.3 NIGHT-LIGHTING CONTROLS

Measures to mitigate potential impacts from night-lighting (including sky glow) could include one or more of the following, where practicable and without compromising operational safety:

- All external lighting associated with the Project would comply with Australian Standard 4282:1997 – *Control of the Obtrusive Effects of Outdoor Lighting*, including minimisation of light spill through the following;
 - Adequate aiming of lights.
 - Use of shielded fittings where practicable.
- Implementation of 'good lighting principles' provided by the *Dark Sky Planning Guideline* (DPE, 2016), such as:
 - Use of warm white coloured bulbs on fixed lighting, with an objective of maintaining colour temperature below 3,500 Kelvin, where appropriate.
 - Use of asymmetric beams on fixed lighting, where appropriate.
 - Night-lighting would be restricted to the minimum required for operations and safety requirements so as to avoid over-lighting.
 - Appropriate positioning and orientation of lights.

7 CONCLUSION

Seven (7) viewpoints were selected as representative of sensitive visual settings which may experience potential views of the Project. Potential impacts at these viewpoints were assessed in consideration of the sensitivity of the viewpoint and visual magnitude of the Project.

The Project is an extension of approved open cut and underground mining operations (i.e. the Moolarben Coal Complex), which includes significant existing surface infrastructure and disturbance areas. The Project and the Moolarben Coal Complex are also located in an existing mining precinct with the Ulan Mine Complex and Wilpinjong Coal Mine. Therefore, the Project locality has already been subject to considerable modification due to these existing mining operations.

Due to the location of the Project within a valley surrounded by elevated areas within the Munghorn Gap Nature Reserve, as well as other intervening topographical features in the wider landscape, the Project is expected to result in negligible levels of potential visual impacts at relevant sensitive receivers and would not incrementally increase cumulative visual impacts at sensitive receivers.

Mitigation and management strategies implemented for the existing Moolarben Coal Complex would also be applied for the Project, including progressive rehabilitation and revegetation and night-lighting controls (where practicable and without compromising operational safety).

8 REFERENCES

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