INDEPENDENT EXPERT ADVISORY PANEL FOR MINING

ADVICE RE:

MOOLARBEN COAL COMPLEX

OC3 Extension Project (SSD-330833580)

Date: 17 April 2025

(Re-issued 4 June 2025)_

Report No: IEAPM 202504-01

EXECUTIVE SUMMARY

The Moolarben Coal Complex (MCC) is an open cut and underground coal mining operation located approximately 40 kilometres (km) north of Mudgee. The complex lies directly between two other mining operations, the Ulan Coal Complex to the north-west and Wilpinjong Mine to the south-east.

The existing approved MCC comprises four open cut (OC1, OC2, OC3 and OC4) and three underground mining areas (UG1, UG2 and UG4), as well other mining related infrastructure including coal processing and transport facilities. The proposed extension is immediately adjacent to the approved OC3 mining area and identified by MCC as the logical extension area. The additional open cut pits are located in proximity to the Munghorn Gap Nature Reserve and within 200 metres (m) of Moolarben Creek and Murdering Creek and are predicted to disturb 675 hectares (ha) of native vegetation. The proposed extension would provide approximately 10 years of further coal production, which would operate simultaneously with the existing operations. The extension project would not increase the mine life of the approved MCC and is intended to maintain steady production.

On 5 April 2024, the NSW Department of Planning, Housing and Infrastructure (DPHI) requested advice from the Independent Expert Advisory Panel for Mining (IEAPM – the 'Panel') in relation to MCC OC3 Extension Project (SSD-33083358). MCC is proposing to extend open cut mining operations immediately south of the approved and operational open cut pit (OC3), as well as development of four new open cut pits to the east and south-east of the approved OC3.

The Department sought advice from the Panel on:

- *The scale and likelihood of potential biodiversity impacts, including:*
  - *Advice to inform the Department's consideration of Serious and Irreversible Impacts (SAII) under the NSW Biodiversity Conservation Regulation 2017.*
  - *Advice regarding indirect impacts to biodiversity within the Munghorn Gap Nature Reserve and on SAII entities including threatened bat species and Broad-headed snake habitat.*
- *The scale and likelihood of potential water-related impacts and environmental consequences on key water features in the vicinity of the project including:*
  - *drawdown and impacts to groundwater dependent ecosystems in the Moolarben Creek alluvium and impacts to the wider Moolarben Creek catchment, having regard to the advice provided by the IESC (Independent Expert Scientific Committee) and*
  - *cumulative groundwater impacts from nearby mining activities at Ulan and Wilpinjong Coal Mines.*
- *GHG assessment including avoidance and mitigation measures proposed to minimise Scope 1 and Scope 2 emissions.*

Based on the material presented to the Panel and the supplementary information supplied by MCC, the Panel has made the following conclusions and recommendations for the Department's consideration:

Conclusions

With respect to biodiversity, the Panel concludes that:

1. The proponent has met the requirements of the *Local Land Services Act 2013* (LLS Act) and the *Biodiversity Conservation Act 2016* (BC Act) to demonstrate that large portions of the site support low conservation value grassland and are thus eligible to be mapped as Category 1 land. It is suitable and appropriate that these areas are excluded from the assessment of the impacts of any clearing of native vegetation and loss of habitat as per Section 6.8 of the BC Act.

2. To result in a SAII, it is necessary to demonstrate that any impact is likely and will contribute significantly to a species or community becoming extinct. This is a high bar and does not consider the risk that cumulative impacts and projects present to risk of extinction.
3. The project will result in impacts to both the Box Gum Woodland Critically Endangered Ecological Community (CEEC) and mapped important habitat for the Regent Honeyeater. The Panel does not view that these impacts will contribute "significantly" to the risk of extinction and the Panel concludes that the project will not result in SAII for the Box Gum Woodland CEEC or Regent Honeyeater.
4. Blasting has potential to impact on known roosting and potential breeding habitat for cave dwelling bats. Amendments to the bat monitoring program, proposed as a part of the blast management plan, are required to sufficiently address these impacts.
5. The ability to apply additional measures to avoid and minimise impacts are, in the opinion of the Panel, limited within the current design. That said, two key areas where avoidance may be feasible and warranted include areas of Stage 1 and Stage 3.

With respect to surface water/groundwater, the Panel concludes that:

6. Reductions in runoff are expected to be small during mining operations and, post mining, are not predicted to have a discernible impact on the frequency of flow events and flow volumes within Moolarben Creek downstream of the extension project.
7. Groundwater drawdown will occur in alluvial, Permian overburden and Ulan seam groundwater systems located beneath and immediately adjacent to each of the open cut pits. The Panel considers there is a moderate to high risk that shallow groundwater could be dewatered or become ephemeral in some alluvial areas along Moolarben Creek, thereby reducing the volume of groundwater available for riparian vegetation.
8. Other Groundwater-Dependent Ecosystems (GDEs) are likely to occur at slightly higher elevation at the base of the Triassic sandstone where there is a contact with the underlain Permian overburden and where groundwater is discharging as seeps and springs. This groundwater is conceptualised as being perched groundwater and unlikely to be affected by mining. This maybe the case close to the spring discharge areas but there could be hydraulic connection at distance with the deeper Permian groundwater systems. The Panel does not accept this conceptualisation without there being actual monitoring data from several sites across the ridgeline areas of the Moolarben Creek catchment.
9. The current groundwater and surface water monitoring network and data sets are not sufficient for assessing potential impacts of mining operations across and immediately adjacent to the OC3 extension area. These data gaps and assumptions have implications for the predictions made about drawdown and potential impacts on terrestrial GDEs. Additional groundwater monitoring which includes at least a 12-month period of baseline monitoring, is required to further assess the potential risk to GDEs.
10. There are no cumulative groundwater drawdown impacts predicted for either the alluvial or Ulan seam groundwater systems arising from nearby mining activities at Ulan and Wilpinjong Coal Mines that will increase the risk to groundwater receptors including GDEs.

With respect to greenhouse gas (GHG), the Panel concludes that:

11. The advice is limited to Scope 1 emissions. The great majority of these emissions are from diesel machinery (~72%). Due to the low gas content of the coal, fugitive emissions make up only ~6% of the total. Check calculations by the Panel confirmed the low level of fugitive emissions. The balance of Scope 1 emissions (23%) is attributed to oil, grease, explosives and land clearance.
12. The Environmental Impact Statement (EIS) and associated documentation satisfactorily canvas the contribution of diesel emissions associated with the extension project and the options to mitigate these emissions.

13. There is little that can be done at present to mitigate diesel GHG emissions. They are a product of combustion for which no viable technology is available or emerging to mitigate the emissions prior to their release directly to atmosphere.
14. Marginal benefits may be obtained from using higher quality fuels and additives.

With respect to geotechnical impacts as a result of blasting, the Panel concludes that:

15. An upper limit of 50 mm/s Peak Particle Velocity (PPV) in the vicinity of the rocky outcrops is reasonable, provided it is supported by an effective blast vibration and impact monitoring program.
16. Should MCO seek to increase this upper limit, the Panel considers the issue should be referred back to the Department for approval and would require such an argument to be supported by comprehensive relevant site-specific data prior to any change being approved, including further geotechnical investigations, as referenced by MCO.

Recommendations

With respect to biodiversity, the Panel recommends that:

1. The process of mapping low conservation value grassland and defining Category 1 land would benefit from clarity around key areas, including whether the process outlined in DPE (2022), of requiring a site-based assessment of CEECs, aligns with the requirements of the LLS Act that only areas mapped by the Environment Agency Head are eligible to be listed as Category 2 land.
2. DCCEEW consider whether the current SAII assessment process is achieving its aims of "protecting threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities" (DPIE 2019, p.1).
3. The Minister may wish to seek rehabilitation of 401.12 ha of Box Gum Woodland in addition to offsets required. This approach would ensure that the project does not result in a reduction in geographic range of the CEEC or the further environmental degradation or disruption of biotic processes for the CEEC. The improved management of 32.6 ha and rehabilitation of 75.5 ha of Box Gum Woodland within the Habitat Enhancement Areas should count towards this goal.
4. The Panel recommends that impacts to and offsets for the Regent Honeyeater ought to be determined based on site-based assessment rather than mapped important areas derived from less accurate regional vegetation mapping products.
5. The restoration of 134.7 ha of habitat within the Habitat Enhancement Areas be required to be completed within 5 years to ensure this contributes to the recovery of the Regent Honeyeater.
6. A TARP for blasting activities be developed, and that this includes:
    i. a performance measure to ensure no disturbance of bats occupying maternity roosts during the breeding season (if identified) or bats in torpor,
    ii. a performance indicator for this PM which is based on no bat activity recorded at the roost entrance immediately following a blast,
    iii. a process for measuring damage and behavioural disturbance at vibration levels of less than 50 mm/s to ensure impacts are managed prior to occurring,
    iv. a baseline monitoring program which includes inspections of likely habitat to identify if any additional roosts are present and determine if any roosts are being utilised as maternity roosts,
    v. monitoring of microbat activity be undertaken during blasting, accompanied by measurements of vibration at roost sites,
    vi. pre and post-blasting inspections be undertaken to confirm no damage to rocky habitat and roosts has occurred, and
    vii. adaptive management measures should either the physical damage or behavioural performance measures be exceeded.
7. The Department and/or the IPC may wish to determine whether further avoidance of impacts in Stages 1 and 3 (as shown in Figure 9) are warranted to avoid impacts to Box Gum Woodland and habitat for threatened species.

With respect to surface water/groundwater, the Panel recommends that should the project be approved, the consent conditions include provision for:

8. Ensuring that the surface water monitoring network recommended in the Surface Water Management Plan (Yancoal 2022) and the groundwater monitoring network recommended in AGE 2022 and AGE 2024 is fully operational by the end of 2025.
9. The groundwater monitoring network to be supplemented by additional nested groundwater monitoring locations within the Moolarben Creek buffer zone and ridgeline areas as recommended below:
    i. several nested monitoring (standpipe) sites that are paired with alluvial monitoring sites in the Moolarben Creek buffer zone to monitor water levels in the deeper Permian overburden (if present) and/or Ulan coal seam,
    ii. a deeper vibrating wire piezometer (VWP) sensor in the Permian overburden at two of the three Triassic sandstone monitoring sites to monitor regional groundwater depressurisation, and
    iii. monitoring of the nine 'regional groundwater features' (see section 4.2.4.2). For those features that are springs, monitoring of flow, field water quality, and the composition/health of any dependent vegetation.
10. Requiring that the water management plan (including the surface water and groundwater sub-plans) be updated within 18 months of installing the new networks, and new water level and water quality TARPs be developed for key monitoring sites.
11. Requiring an update of the groundwater model within 12 months of establishing the expanded groundwater monitoring network using site-specific data to improve groundwater drawdown predictions in the vicinity of the extension project.

Further detailed recommendations are provided in Section 4.2.8. These are mostly fine detail for MCO's consideration.

With respect to greenhouse gas, the Panel recommends that:

12. If the Expansion Project is to be approved, as a matter of consistency and to cover for any currently unforeseen changed circumstances going forward, the Department should consider including an approval condition that requires MCO to:
    i. immediately update its formal Greenhouse Gas Minimisation Plan (GHGMP).
    ii. undertake a review of the GHGMP every three years as part of a report that is peer reviewed by a party approved in writing by the Secretary and which details:
        a) the international status of technologies that provide the opportunity to reduce diesel GHG emissions at MCO; and
        b) the status of initiatives by MCO to implement technologies for avoiding fossil fuel emissions.

With respect to geotechnical impacts as a result of blasting, the Panel recommends that:

13. Should the project be approved, conditions of approval should set an upper limit of 50 mm/s PPV when blasting in the vicinity of rocky outcrops.

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1.0 SCOPE OF WORKS

1.1. PROJECT BACKGROUND

The Moolarben Coal Complex (MCC) is an open cut and underground coal mine located approximately 40 kilometres (km) north of Mudgee. The complex lies directly between two other mining operations, the Ulan Coal Complex (UCC) to the north-west and Wilpinjong Mine to the south-east (Figure 1).

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd [MCM], Yancoal Moolarben Pty Ltd [YM] and a consortium of Korean power companies). MCO, MCM and YM are wholly owned subsidiaries of Yancoal Australia Limited (Yancoal). The Moolarben Coal Complex comprises of the Moolarben Coal Project Stage 1 and the Moolarben Coal Project Stage 2. MCC operates under these two integrated Development Consents known as 'Stage 1' (05_0117) and 'Stage 2' (08_0135). Stage 1 was approved in 2007 by the then Minister for Planning under Part 3A of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and allows for the development of three open cut pits (named OC1, OC2 and OC3) and an underground mining operation (named UG4). It also allows for a range of surface infrastructure to support mining operations. Stage 2 was approved by the Planning Assessment Commission (PAC) in 2015 and allows for the development of another open cut pit (named OC4) and two underground mining areas (named UG1 and UG2).

The current project proposal seeks to extend the area of the approved OC3 open cut pit further south, as well as develop four new open cut pits to the east and south-east. The project area is within Mining Lease (ML) 1691, Exploration Licences (EL) 6288, and EL 7073. The project also seeks associated components including internal haul roads and associated creek crossings, internal access roads, mine infrastructure area, water management infrastructure (e.g. clean water diversions, mine water dams and sediment dams), waste rock emplacement areas and temporary rehabilitation and construction material stockpiles.

The project was publicly exhibited from 17 November 2022 to 14 December 2022. A total of 73 submissions from individuals, community groups and local businesses were received objecting to the proposal. There were 2 submissions in support of the project and a comment from Mid-Western Regional Council.

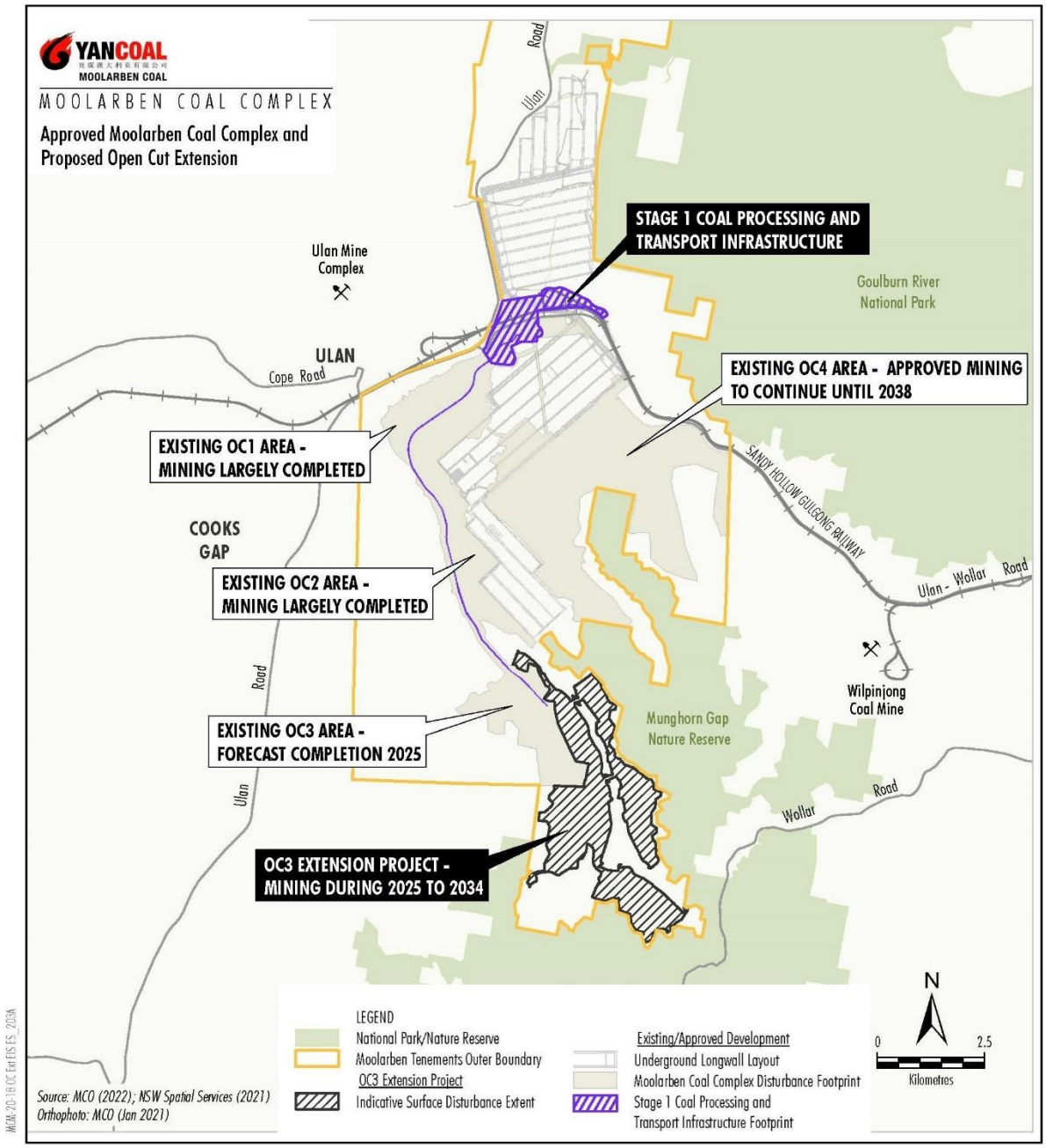

Figure 1: Existing and proposed mining area (EIS MCC, 2022)

1.2. DEPARTMENT REQUEST FOR ADVICE

The NSW Department of Planning, Housing and Infrastructure (DPHI) has established the Independent Expert Advisory Panel for Mining (IEAPM - the "Panel") to give DPHI and the Independent Planning Commission access to specialist knowledge and expert advice when assessing mining proposals under the *Environmental Planning and Assessment Act 1979*.

On 5 April 2024, The Department sought advice from the Panel on:

- *The scale and likelihood of potential biodiversity impacts, including:*
  - *Advice to inform the Department's consideration of serious and irreversible Impacts (SAII) under the NSW Biodiversity Conservation Regulation 2017.*
  - *Advice regarding indirect impacts to biodiversity within the Munghorn Gap Nature Reserve and on SAII entities including threatened bat species and Broad-headed snake habitat.*
- *The scale and likelihood of potential water-related impacts and environmental consequences on key water features in the vicinity of the project including:*
  - *drawdown and impacts to groundwater dependent ecosystems in the Moolarben Creek alluvium and impacts to the wider Moolarben Creek catchment, having regard to the advice provided by the IESC and*
  - *cumulative groundwater impacts from nearby mining activities at Ulan and Wilpinjong Coal Mines.*
- *GHG assessment including avoidance and mitigation measures proposed to minimise Scope 1 and Scope 2 emissions.*

The Chair of the Panel (Em. Professor Jim Galvin) nominated the following members of the Panel to prepare the advice on the Moolarben OC3 Extension Project, based on their nominated areas of expertise:

- Em. Professor Bruce Hebblewhite – Panel Convenor – Mining and geotechnical
- John Ross – Groundwater
- Dr Lucy Reading – Surface water and shallow groundwater
- Nathan Garvey – Biodiversity
- Dr Ray Williams – Fugitive greenhouse gas emissions.

2.0 METHOD OF OPERATION

The Panel convened by videoconference during the preparation of its advice and was administratively supported by Secretariat staff provided by the Department's Major Projects and Resource Assessments teams. The Panel also undertook a site inspection and received a briefing from MCO on 7 May 2024.

A wide range of documents was provided for review by the Panel in preparing this advice. The principal documents are summarised in Table 1.

Table 1: Key documents reviewed by the Panel

Document Reference	Document Name
Assessment documents from Moolarben	**EIS – Submitted 17 November 2022** • Environmental Impact Statement • Environmental Impact Statement – Appendix A (Groundwater Assessment_ • Environmental Impact Statement – Appendix B (Surface Water and Flooding Impact Assessment) • Environmental Impact Statement – Appendix C (Biodiversity Development Assessment Report) • Environmental Impact Statement – Appendix J (Greenhouse Gas Assessment) • Environmental Impact Statement – Appendix S (Groundwater Dependent Ecosystem Assessment **Agency Advice** • Water Group advice on EIS – dated 1 February 2023 • BCS and NPWS advice on EIS – dated 15 March 2023 • Climate and Atmospheric Science Group advice on EIS – dated 12 December 2022 • IESC Advice – dated 7 February 2023 **Submissions Report – submitted 19 March 2024** • Submissions Report **Amendment Report – submitted 15 March 2024** • Amendment Report • Amendment Report – Appendix A (Updated Project Description) • Amendment Report – Appendix B (Updated Summary of Mitigation Measures) • Amendment Report – Appendix C (Updated BDAR) • Amendment Report – Appendix D (SAII Expert Reports) • Amendment Report – Appendix F (Groundwater Review) • Amendment Report – Appendix G (Surface Water Review) • Amendment Report – Appendix J (Air Quality and GHG Addendum Report)
Information from Moolarben – dated 17 May 2024	• Letter from MCO responding to request for information from 19 April 2024
Information from Moolarben following site visit – dated 10 May 2024	• OC3 Extension Project – Panel Briefing Presentation May 2024 • Moolarben Amended OC3 Extension – Indicative Pit Naming • OC3 Extension – Box-Gum Woodland SAII Assessment (Dr Colin Driscoll) • Email correspondence MCO OC3 Extension EIS – Threatened Fauna Surveys • MCO FY 18-23 NGERs Data for RW

Information Lock the Gate - 14 January 2025	• Koala Drone Report • Letter from Lock the Gate
Agency Advice on RTS	• EPA Advice – dated 24 January 2025 • CPHR Advice – dated 12 February 2025
Additional information received 20 February 2025	• Panel Update Briefing • Attachment A - Blasting Monitoring and Bat Programme Summary • Attachment C – Niche Review • Attachment D – Colin Driscoll Review • Attachment E – PSM Blasting Review
Information from Moolarben Email dated 26 March 2025	• Response to Lock the Gate Letter – Dated 26 March • Response to CPHR and NPWS Recommendations – dated 14 March

2.1. SITE VISIT, SUBSEQUENT INFORMATION AND MEETINGS

2.1.1. Site Visit

On 7 May 2024, the Panel undertook a site inspection. The inspection involved a briefing at the MCC by the Applicant followed by inspection of the OC3 Extension location and surrounding topography. Figure 2 shows the route taken by the Panel during the site inspection over the area of the proposed OC3 Extension.

The Panel was accompanied by the Applicant and its relevant consultants, plus Department representatives, during its inspection.

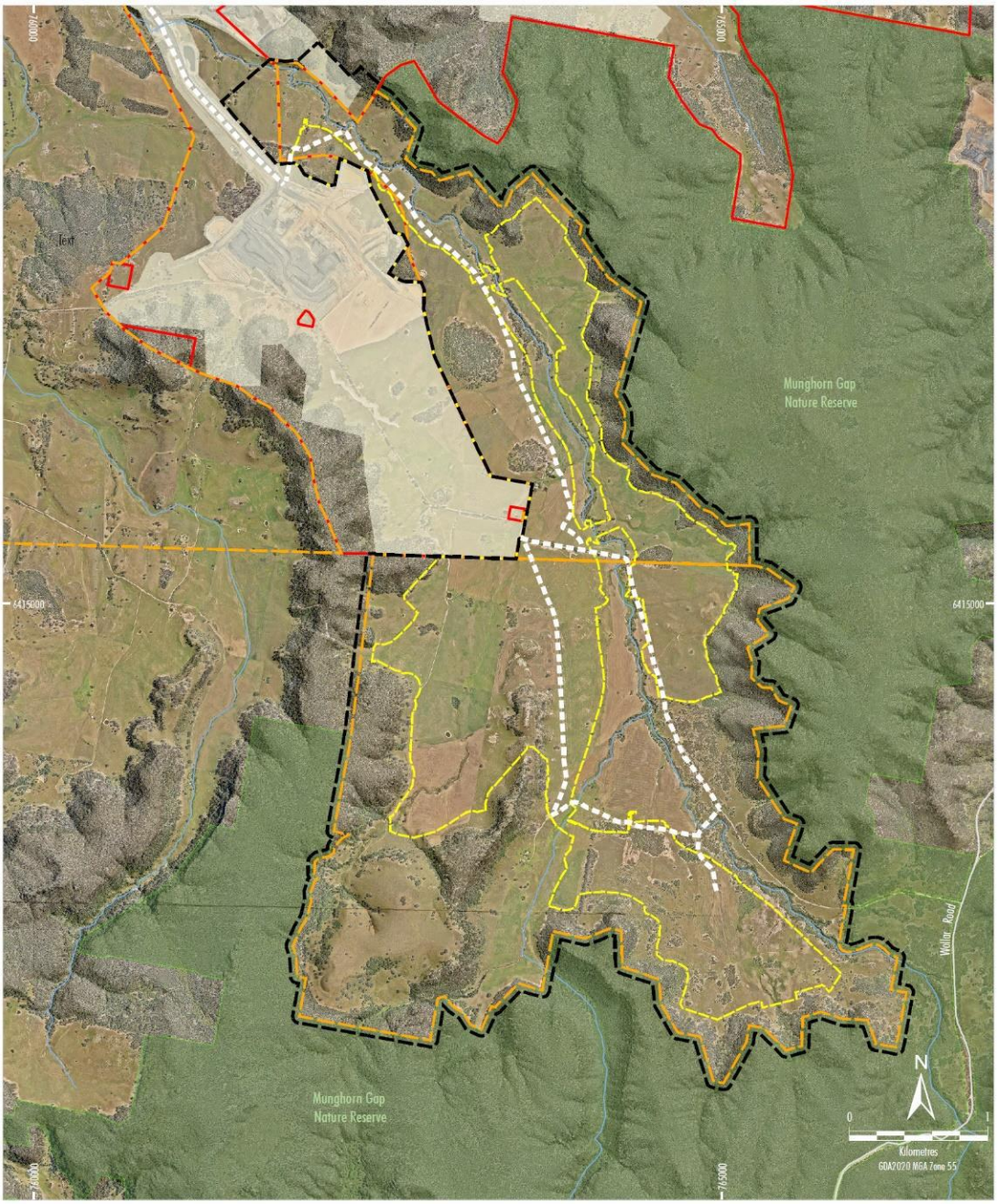

Figure 2: Site inspection Route – Moolarben OC3

2.1.2. Subsequent Information

The Panel sourced additional documentation from the Applicant, via the Department, in response to a set of questions and requests for further information. These were addressed by MCO by way of additional documentation provided on 17 May 2024. A further request for information was raised following the site inspection and a response to this was received from the Applicant on 20 February 2025. Additional information provided to the Panel is listed in Table 1.

2.1.3. Meetings

The Panel convened several times over the course of preparing its advice. Table 2 summarises in chronological order the schedule of meetings held.

Table 2: Schedule of meetings held

Meeting Date	Meeting Information
11/4/2024	Panel Briefing with Department
7/5/2024	Pre-Site Visit Meeting
22/5/2024	Panel Update (Internal)
30/5/2024	Panel Discussion
20/2/2025	Update from Yancoal to Panel
21/2/2025	Panel Discussion

3.0 PRIMARY FOCUS OF THIS ADVICE

The Panel was requested to review specific matters relating to the Moolarben OC3 Extension Project *("the Extension")*. The Extension is outlined in the Project EIS and other supporting documentation provided. Following submissions received in response to the EIS, a number of significant amendments were made to the Project which have then been described in the Moolarben OC3 Extension Project – Amendment Report. The focus of this Panel Review has therefore been directed to the Amendment Report and supporting documents. Figure 3 shows the amended mining areas of the OC3 Extension.

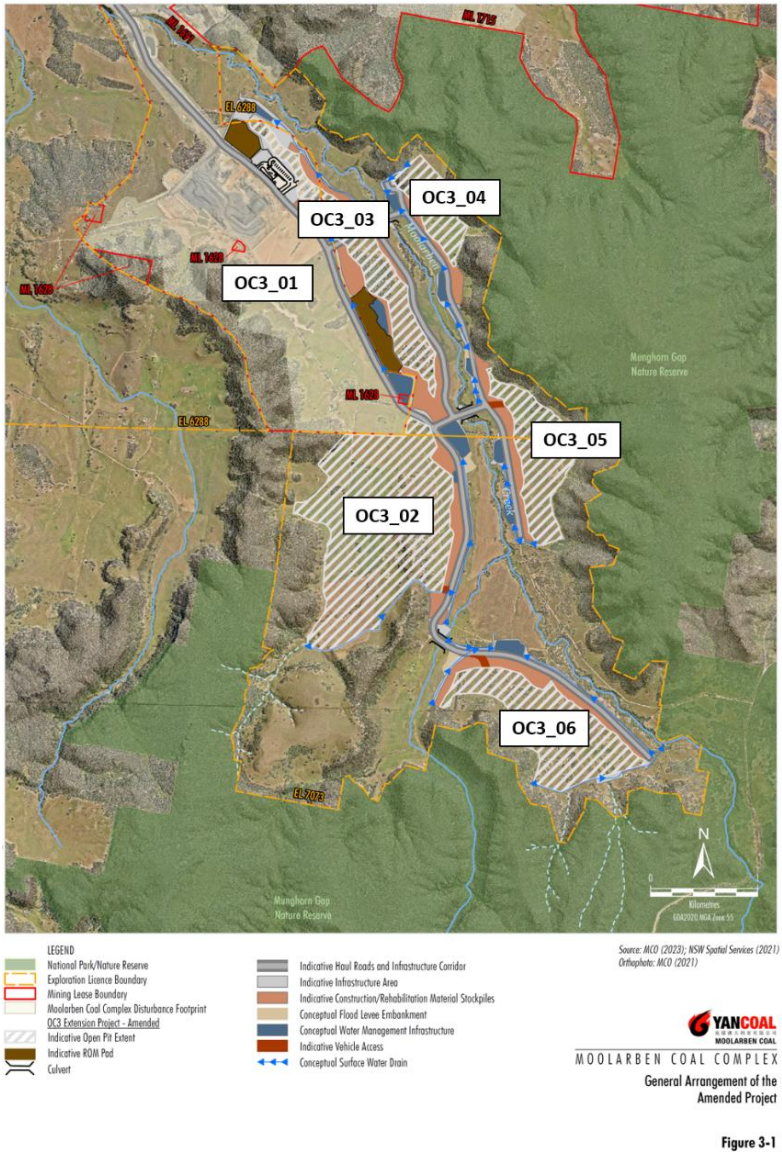

Figure 3: Amended OC3 Extension Mine Plan

In reviewing the Moolarben amended OC3 Extension Project the Panel had a particular focus on the:

- impact of blasting from the project on the stability of adjacent rocky habitats and biodiversity consequences;
- surface and groundwater interactions, especially with regard to Moolarben Creek and the surrounding alluvium, and broader groundwater impacts across the surrounding region;
- biodiversity issues across the OC3 area and adjacent rocky habitats and the neighbouring Munghorn Gap Nature Reserve; and
- fugitive greenhouse gas emissions from OC3 Extension operations.

4.0 PANEL COMMENTARY

4.1. BIODIVERSITY IMPACTS

The Biodiversity Development Report (BDAR) prepared by Niche (2024a) is supported by baseline flora surveys undertaken by EcoLogical (2024) and baseline fauna surveys undertaken by AMBS (2023). Significant work has been undertaken in preparation of these reports and, generally, these reports provide a sound basis for understanding the biodiversity values present within the study area. Data collected during these assessments has been used to determine measures to avoid and minimised impacts with residual impacts identified and offset requirements outlined.

There are some areas where the project would benefit from additional information to either support conclusions drawn or ensure outcomes and commitments are achieved. These matters are discussed below.

4.1.1. Category 1 Land Mapping

Section 6.8 of the *Biodiversity Conservation Act 2016* (BC Act) requires the Biodiversity Assessment Method (BAM [DPIE 2020]) to exclude the assessment of the impacts of any clearing of native vegetation and loss of habitat on Category 1 land, as defined under Part 5A of the *Local Land Services Act 2013* (LLS Act). Impacts to habitat of threatened entities in non-native vegetation may be assessed as prescribed impacts as per clause 6.1 of the Biodiversity Conservation Regulation 2017 (BC Regulation).

Given this is a critical step in a biodiversity assessment under the BC Act, it is concerning that this item has not been agreed and resolved between the proponent and the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) earlier, with significant dispute remaining. It appears to the Panel that this is driven by a high degree of uncertainty regarding the process for determining Category 1 land. Thus, the length of the assessment below that endeavours to clarify this situation.

Under Section 60H(2a) of the LLS Act, land is to be designated as Category 1 land if the Environment Agency Head reasonably believes that the land contains low conservation value grasslands. Section 110 of the Local Land Services Regulation 2014 (LLS Regulation) establishes the *Interim Grasslands and Other Groundcover Assessment Method* (IGGAM, OEH 2017) as the method for determining the conservation value of groundcover vegetation and states that *"land contains low conservation value grasslands . . . if the land is determined to contain low conservation value grasslands under the "Interim Grasslands and other Groundcover Assessment Method" published by the Minister for the Environment in the Gazette on 25 August 2017"*. The IGGAM (OEH 2017) is a three-stage assessment:

- Stage 1 specifies situations where it may not be appropriate to use the IIGGAM.
- Stage 2 is a simple assessment of the cover of exotic perennial species. Where more than 50% of the groundcover is comprised of exotic perennial species the groundcover is considered of low conservation value. If land meets the definition of low conservation value grassland in this stage, further assessment is not required.
- Stage 3 is a more in-depth survey of the floristic composition of the site to determine the vegetation integrity score of the vegetation, using a modified version of the vegetation integrity score used in the BAM (DPIE 2020) where benchmark values for trees and shrubs are not included in the calculation of the vegetation integrity score (OEH 2017, p.15). Where the vegetation integrity score is <15, the groundcover is considered of low conservation value.

Land cannot be eligible for designation as Category 1 land if it is eligible for designation as Category 2 land. Thus, the land categorisation process requires a proponent to determine whether their land is Category 2 land prior to looking at Category 1. The LLS Act and Regulation identify land that is to be designated Category 2 land, including under Section 60I(2m) where land is to be designated as Category 2 land if the Environment Agency Head reasonably believes that the land has been mapped by the Environment Agency Head (emphasis added) as land containing a critically endangered ecological

community (CEEC) under the BC Act. This means that if the land is mapped as a CEEC then it cannot be mapped as Category 1 land. However, if it is not mapped as a CEEC, and is not eligible to be designated as Category 2 land under other provisions of the Act and the Regulation, then the land is eligible to be assessed using the IGGAM.

The *Statewide Vegetation Type Map* (DCCEEW 2024) maps the majority of the area under consideration as Category 1 land for the Moolarben OC3 project as PCT 0 - 'Unclassified'; importantly, it does not map it as a plant community type (PCT) associated with a CEEC. The Panel is not aware of any other datasets mapping this land as a CEEC. It is the Panel's understanding that, under the Act, the land is eligible to be assessed using the IGGAM (OEH 2017), excluding any land eligible to be designated as Category 2 land under other provisions of the LLS Act or LLS Regulation.

In 2022, DCCEEW (then DPE) released guidance on *Determining native vegetation land categorisation for application in the Biodiversity Offset Scheme* (DPE 2022). This document sets out an evidence-based approach to land categorisation assessment and recommends a precautionary approach to mapping of CEECs, stating that *"The presence of CEECs . . . must be considered for site-scale refinement, regardless of published map products"* (DPE 2022, p.3). This statement would appear to be in conflict with Section 60I(2m) of the LLS Act which requires the land to be mapped by the Environment Agency Head. Regardless of this conflict, site scale mapping has been undertaken by Eco Logical (2023), refining the Statewide Vegetation Type Map produced by DCCEEW (2024).

An initial assessment of Category 1 land was undertaken by EcoLogical (2023) in December 2021 and January 2022 using a series of 20 transects/plots conducted in accordance with the IGGAM (OEH 2017). This assessment identified that greater than 50% of groundcover vegetation was exotic perennial across eight transects (GGAM4, GGAM5, GGAM8, GGAM9, GGAM10, GGAM15, GGAM16, GGAM20). None of the vegetation plots had a vegetation integrity score <15 and thus no additional plots were considered to support low conservation value groundcover under Stage 3 of the IGGAM (OEH 2017). EcoLogical (2023) appears to have incorrectly applied the IGGAM (OEH 2017) by presenting exotic perennial for each individual transect. The IGGAM (OEH 2017) requires the assessor to sum all 'hits' from each group (native and exotic perennial) and then divide the 'hits' by the total number of points to get an average percentage cover for a transect; importantly, where more than one transect is undertaken the average percentage cover is calculated across the entire vegetation zone. This information is not presented in EcoLogical (2023)[1]. However, Figure 4 of Eco Logical (2023) only shows mapping of Category 1 land in areas with transects with an exotic perennial cover of >50%, with other areas mapped as derived grassland of PCT 266. However, no evidence is presented of how this stratification occurred.

Further assessment of Category 1 land was undertaken by Niche (2024a) in 2023, with 15 additional transects conducted in accordance with the IGGAM (OEH 2017). This assessment identified that greater than 50% of groundcover vegetation was exotic perennial across four transects (KLG11, KLG12, KLG13 and KLG15); however, as in EcoLogical (2023), data is not analysed as per the requirements of IGGAM (OEH 2017) and thus it cannot be determined whether the study area supports low conservation value groundcover as per Stage 2 of the IGGAM (OEH 2017). A further 11 plots (KLG01, KLG02, KLG03, KLG04, KLG05, KLG07, KLG06, KLG08, KLG09, KLG10 and KLG14) had a vegetation integrity score of <15 and were considered to support low conservation value groundcover in accordance with Stage 3 of the IGGAM (OEH 2017)[2]. However, the transects undertaken by Niche may not have been undertaken at a time of year when native to exotic cover was at its highest and were

1 IGGAM data is presented in Appendix C of EcoLogical (2023). This states that data was provided to Resource Strategies as a separate Excel document.

2 It is important to note that due to the exclusion of benchmarks for trees and shrubs from the calculation of the vegetation integrity score under the IGGAM (OEH 2017) that the calculation of vegetation integrity score under the BAM (DPIE 2020) would result in a lower score than derived by IGGAM (OEH 2017). Under Section 9.2 of the BAM (DPIE 2020) an assessor is not required to determine an offset for ecosystem credits for a vegetation zone with a vegetation integrity score of <15 where the PCT is representative of a CEEC. Thus, any areas with a vegetation integrity score <15 under IGGAM (OEH 2017) would not require offsets under BAM (DPIE 2020).

undertaken in areas subject to livestock grazing (i.e. disrupted within six months prior to the assessment); thus, these surveys may not have met the requirements of the IGGAM (OEH 2017, see p.8-9). Based on these issues, Niche (2024a) does present sufficient evidence to support the determination of Category 1 land.

An updated Land Category Assessment was prepared by Niche (2024b) to address concerns raised by DCCEEW. This analysis, completed in accordance with the IGGAM (OEH 2017), can be used to supersede the EcoLogical (2023) and Niche (2024a) assessments of low conservation value grasslands. This assessment documents that the areas assessed support a perennial exotic groundcover of 89% and thus meet the definition of low conservation value groundcover as per Stage 2 of the IGGAM (OEH 2017).

The updated Land Category Assessment is accompanied by a report from Hunter Eco (2024a) discussing the potential for areas mapped as Category 1 land to meet the definition of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box Gum Woodland) CEEC, as determined by the *NSW Threatened Species Scientific Committee final determination* (TSSC 2020a). Hunter Eco (2024a) presents anecdotal evidence of past intensive land use (cropping, ploughing, direct drilling, pasture improvement and application of fertilisers), coupled with analysis of native species occurring in plots/transects in Category 1 land, to draw a conclusion that the grasslands mapped as Category 1 *"bears no resemblance to the DNG form of Box-Gum Woodland CEEC" and that if "the Project (were) not to proceed, current land use practises would continue with no prospect of recovery of the Box-Gum Woodland CEEC"* (Hunter Eco 2024a, p. 5).

Across ELA (2024), Niche (2024a,b) and Hunter Eco (2024a) there is no clear and logical explanation of why some areas are mapped as Category 1 land and others are not; although it appears that some level of stratification has occurred using land use data (see EcoLogical 2023, p.12-13), the process of stratification is not clearly articulated anywhere in these reports. Nor has the various plot and transect data used to support various iterations of the Category 1 land assessment been consolidated. These two factors have made assessment of this work more challenging.

In its letter to the Department, DCCEEW (2025) contends that if the CEEC, as described in the final determination (TSSC 2020a), currently persists then the precautionary principle should apply, the land should be mapped as the CEEC and the BAM (DPIE 2020) should be applied. DCCEEW's argument appears to be centred around the ability of the CEEC to be recovered. DCCEEW (2025) points to data from EcoLogical (2023) which shows that none of the transect/plot data collected by EcoLogical (2023) resulted in a vegetation integrity score below the threshold for which an assessor is not required to determine an offset for ecosystem credits (Section 9.2 of the BAM, DPIE 2020). Figure 4 shows that while there may be a relationship between exotic perennial cover and the vegetation integrity score, land considered low conservation value grassland under IGGAM (OEH 2017) does not always fall below the threshold for offsetting set out in the BAM (DPIE 2020). It is noted that plot data collected by Niche (2024a) either had a perennial exotic cover of >50% or a vegetation integrity score of <15.

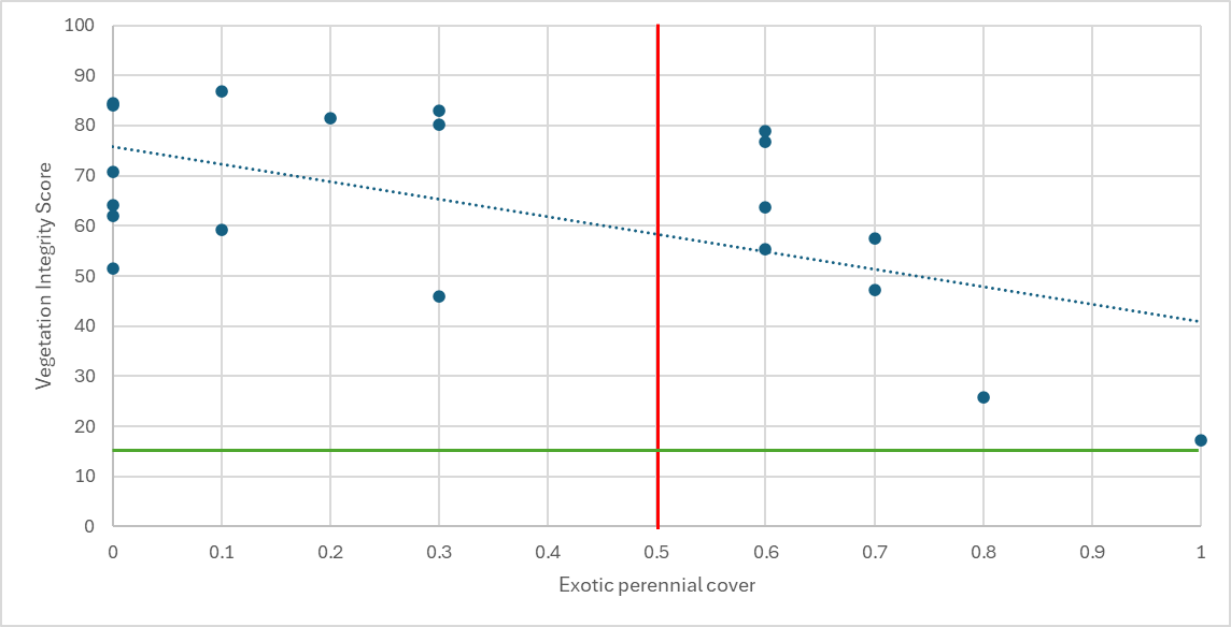

Figure 4: Transect/plot data from EcoLogical (2023) showing the relationship between exotic perennial cover (x axis) and vegetation integrity score (y axis).

Points to the right of the red line are considered low conservation value grassland and Category 1 land in accordance with IGGAM (OEH 2017). Points below the green line do not require offsetting under Section 9.2 of the BAM (DPIE 2020).

Sections 3.1.4 and 4.12 of the final determination (TSSC 2020a) discuss the recovery potential of different land uses, and conclude that areas subject to grazing *"can be at least partially restored following a cessation of grazing"* while the *"restoration of White Box – Yellow Box – Blakely's Red Gum Grassy Woodland or Derived Native Grassland following conversion to cropping is unlikely"* (TSSC 2020a, p.7) but that thresholds cannot be determined as *"recovery may be dependent on active remediation . . . [and] depend on social (collective will) and economic (cost of remediation) factors"* (p.15). Hunter Eco (2024a) concludes that there is no prospect of recovery if current land use practices continue, but also states that *"If the Project proceeds, then progressive revegetation in a separately designated Habitat Enhancement Area and rehabilitation of overburden to species characteristic of Box-Gum Woodland CEEC (the woodland form) would be carried out towards a no net loss outcome"* (Hunter Eco 2024a, p.6). If any of these Habitat Enhancement Areas overlap with land mapped as Category 1 land, then it appears restoration is feasible and that these areas could be considered to represent Box Gum Woodland. It should be noted that the Panel does not share Hunter Eco's views.

There are a few items to consider here:

- Section 60I(2m) of the LLS Act appears clear in that to be designated Category 2 land, a CEEC must have been mapped by the Environment Agency Head. There is no dataset indicating that land has been mapped as a CEEC. Whilst DCCEEW's view is consistent with their guidance (DPE 2022), their view does not appear to be consistent with the requirements of the LLS Act.
- Taking the view presented by DCCEEW (in DPE 2022) that a site-based assessment is required to determine areas of CEEC that should be mapped as Category 2 land (and therefore not Category 1 land):
    - Any areas which cannot be clearly demonstrated to have been cropped may be eligible for listing as Box Gum Woodland CEEC, as TSSC (2020a) indicates that any areas, other than those subject to cropping, could be recovered subject to collective will and cost.
    - This approach renders the IGGAM (OEH 2017) largely redundant for the assessment of low conservation grasslands in areas which may have once supported Box Gum Woodland as the TSSC (2020a) states that any area, other than those which have been cropped, could be

recovered and are thus eligible to be listed as Category 2 land in accordance with the process outlined in DPE (2022).

- Plot data collected by Niche (2024a) appears to demonstrate that these areas have a vegetation integrity score below the threshold for offsetting. Even if assessed in accordance with the BAM (DPIE 2020), as recommended by DCCEEW (2025), no ecosystem credits would be required for the areas mapped as Category 1 land if data from Niche (2024a) was used. It is unclear why there are such significant differences in the vegetation integrity score between data collected by EcoLogical (2023) and Niche (2024a); however, timing of surveys may have had an effect.
- Under Section 60F(3) of the LLS Act, an area is taken, during the transitional period (until the Native Vegetation Regulatory Map is published), to be low conservation value grasslands if it comprises only groundcover whose clearing was permitted by section 20 of the Native Vegetation Act 2003 (being the vegetation comprises less than 50% of indigenous species of vegetation3). This would provide a lower threshold for Category 1 land than applied by EcoLogical (2023) or Niche (2024a,b). To the Panel's knowledge, there is nothing preventing the proponent from applying this definition.
- The mapping of Category 1 land in Niche (2024a) is generally less extensive than shown in the draft Native Vegetation Regulatory Map, although some additional area in the south-east of the project (Figure 5).

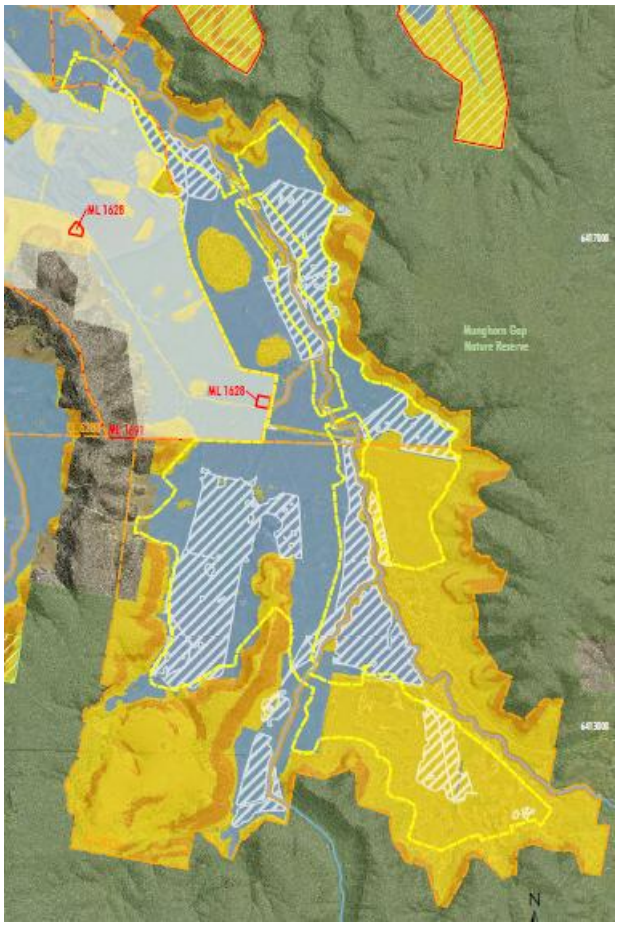

Figure 5: Category 1 land mapping from the draft Native Vegetation Regulatory Map overlain (in blue) with Category 1 land mapping by Niche (2024a) (in grey striping) as shown in Figure 2 of Hunter Eco 2024a.

3 This definition differs to the definition of low conservation value grasslands in IGGAM (OEH 2017) in that this includes all exotic species, not just perennial exotic species.

Considering all of the information outlined above, the Panel concludes that:

- The proponent has met the requirements of the LLS Act and BC Act to demonstrate that large portions of the site support low conservation value grassland and are thus eligible to be mapped as Category 1 land for the following reasons:
  - The areas are not mapped by the Environment Agency Head as a CEEC.
  - Data collected by Eco Logical (2023), although not presented in accordance with the IGGAM (OEH 2017), indicates the areas mapped meet the definition of Category 1 land.
  - Niche (2024b) has applied the IGGAM (OEH 2017) correctly.
- There is a lack of clarity as to whether the process outlined in DPE (2022), of requiring a site-based assessment of CEECs, aligns with the requirements of the LLS Act that only areas mapped by the Environment Agency Head are eligible to be listed as Category 2 land. This should be clarified and the Act and/or DPE (2022) and/or OEH (2017) amended to provide certainty.
- If the view of DCCEEW (2025) prevails, then only those areas subject to cropping could readily be mapped as Category 1 land and all other areas require assessment in accordance with the BAM (DPIE 2020).
- The question of whether detailed assessment of the presence of the CEEC in Category 1 land is required may be largely academic as:
  - The transitional arrangements set out in Section 60F(3) of the LLS Act set a lower benchmark for designation of low conservation value grasslands. It is highly likely that the Category 1 land mapped by Niche (2024a) would meet this definition.
  - The areas under question may not require offsetting under the BAM (DPIE 2020) as they have a vegetation integrity score of <15 (Niche 2024a).
  - The areas are highly degraded and do not represent a fruitful area for recovery of the CEEC. While efforts to replant overstorey species may be successful, the cost to attempt to recovery any groundcover vegetation would be prohibitive, and efforts are better placed in areas with greater recovery potential.

The manner in which the information has been presented by EcoLogical (2023) and Niche (2024a), including initial assessments not being undertaken in accordance with the IGGAM (OEH 2017), has made determining this issue more challenging than would have been required. However, the assessment undertaken by Niche (2024b) conforms with the requirements of the IGGAM (OEH 2017) and demonstrates that these areas are low conservation value grasslands.

The information above indicates that low conservation value grasslands eligible to be designated as Category 1 land have been appropriately mapped. It is suitable and appropriate that these areas are excluded from the assessment of the impacts of any clearing of native vegetation and loss of habitat as per Section 6.8 of the BC Act.

4.1.2. Serious and irreversible impacts

Serious and irreversible impacts (SAII) are impacts that are likely to contribute significantly to the risk of a threatened species or an ecological community becoming extinct. Under Section 6.5 of the BC Act, a determination of whether a Project will result in a SAII is to be made in accordance with the four principles prescribed in Section 6.7 of the BC Regulation:

- it will cause a further decline of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to be in a rapid rate of decline, or
- it will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very small population size, or
- it is an impact on the habitat of the species or ecological community that is currently observed, estimated, inferred or reasonably suspected to have a very limited geographic distribution, or
- the impacted species or ecological community is unlikely to respond to measures to improve its habitat and vegetation integrity and therefore its members are not replaceable.

These principles broadly align with the criteria established by the International Union for the Conservation of Nature (IUCN) (IUCN 2017, Keith et al. 2013) to assess the extinction risk of species and ecological communities.

The BAM (DPIE 2020) requires the BDAR to identify threatened species and communities at risk of a SAII and evaluate the extent and severity of the impact on an entity at risk of a SAII in accordance with the criteria set out in Section 9.1.1 of the BAM (DPIE 2020) for impacts on threatened communities and in Section 9.1.2 of the BAM (DPIE 2020) for impacts on threatened species. The NSW Threatened Biodiversity Data Collection (TBDC) is used by accredited assessors to determine whether a threatened species or community is at risk of SAII.

Whether a Project will result in a SAII is determined by the decision maker; not by the proponent or the accredited assessor preparing the BDAR. In considering whether a Project will result in SAII the penultimate test is established by Section 6.7(2) of the BC Regulation:

> *"it is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct . . ."*

The key terms in the penultimate test are likely, contribute and significantly and the penultimate test requires a determination of this. Oshlack v Richmond River Council (1993) 82 LGERA 222, cited in Plumb v Penrith City Council and Anor [2002] NSWLEC 223, define two of the terms:

> *. . . "likely" has been held to mean a "real chance or possibility" and "significantly" to mean "important", "notable", "weighty" or "more than ordinary" (paragraph 22).*

These definitions apply to the above test.

Under Section 7.16 of the BC Act, if the Minister decides that a Project is likely to have a SAII on biodiversity values, the Minister must take those impacts into consideration and is required to determine whether there are any additional and appropriate measures that will minimise those impacts.

For the Moolarben OC3 project, there are six entities identified as being at risk of SAII:

1. White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC
2. Broad-headed Snake *(Hoplocephalus bungaroides)*
3. Microbats which breed in caves (Large-eared Pied Bat *Chalinolobus dwyeri* and Eastern Cave Bat Vespadelus troughtonii)
4. Swift Parrot *(Lathamus discolor)*
5. Regent Honeyeater *(Anthochaera phrygia).*

DCCEEW (2025) outlines residual concerns that the project is likely to result in SAII for Box Gum Woodland and Regent Honeyeater. While DCCEEW (2025) raises concerns over impacts to rocky habitat providing habitat for the Broad-headed Snake, Large-eared Pied Bat and Eastern Cave Bat DCCEEW (2025) does not appear to raise concerns that the project will result in a SAII for these species. Impacts to rocky habitat are discussed in Section 4.1.4.

The Panel makes the following comments on the concept of and process for determining SAII:

- The penultimate test that a project *"is likely to contribute significantly to the risk of a threatened species or ecological community becoming extinct . . ."* is a very high bar. Whether a single project is likely to contribute **significantly** to the risk of extinction is open to substantial interpretation and debate. However, the cumulative impact of successive projects, particularly in a single area, very well may place a species or community at a great risk of extinction – the death by a thousand cuts.
- The fact that the process for determining SAII is so open to interpretation and debate presents significant challenges for decision makers, with substantive impacts for proponents. The process for determining SAII is often subjective and fraught.

- If a project is determined to result in SAII the Minister is *"required to take those impacts into consideration"* when determining the project and *"determine if there are any additional and appropriate measures that will minimise those impacts if consent or approval is to be granted"* (Section 6.8(3) of the BC Act). Recent applications have included measures such as rehabilitation to redress impacts. Whilst not a measure that will minimise impacts, these sorts of measures may directly address the reasons for a species or community being listed as at risk of SAII.
- Given the concept of SAII *"is fundamentally about protecting threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities"* (DPIE 2019, p.1) the Panel questions whether the current framework is achieving its aims.

The review of the SAII assessment by the Panel, presented below, is provided in this context.

4.1.2.1. White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland

Box Gum Woodland is listed as being at risk of SAII under Principles 1 (ecological community currently in a rapid rate of decline) and 2 (environmental degradation or disruption of biotic processes).

The amended project will result in impacts to 401.12 ha of Box Gum Woodland, including 34.22 ha of woodland and 366.9 ha of derived grassland[4].

Avoidance measures are set out in Sections 4, 4.2.2, 4.5, 6.1.3, and Appendix F of the BDAR (Niche 2024a). Overall, these measures result in a reduction in impacts to Box Gum Woodland of 16%, from 477.75 ha in the original proposal to 401.12 ha, with a 59.4% reduction in impacts to the higher condition woodland variant of the CEEC. The areas where impacts to the Box Gum Woodland have been further reduced are shown in Figure 6. The Panel notes that claiming a 200 m setback of open cut mining from Moolarben Creek as avoidance is somewhat misleading; clearing of Box Gum Woodland within this 200 m zone will result due to infrastructure such as haul roads, stockpiles and water management.

4 DCCEEW (2024, 2025) contends that the impact may be larger if areas mapped as Category 1 land are included. For the reasons outlined in Section 4.3.2, areas mapped as Category 1 land are not considered here.

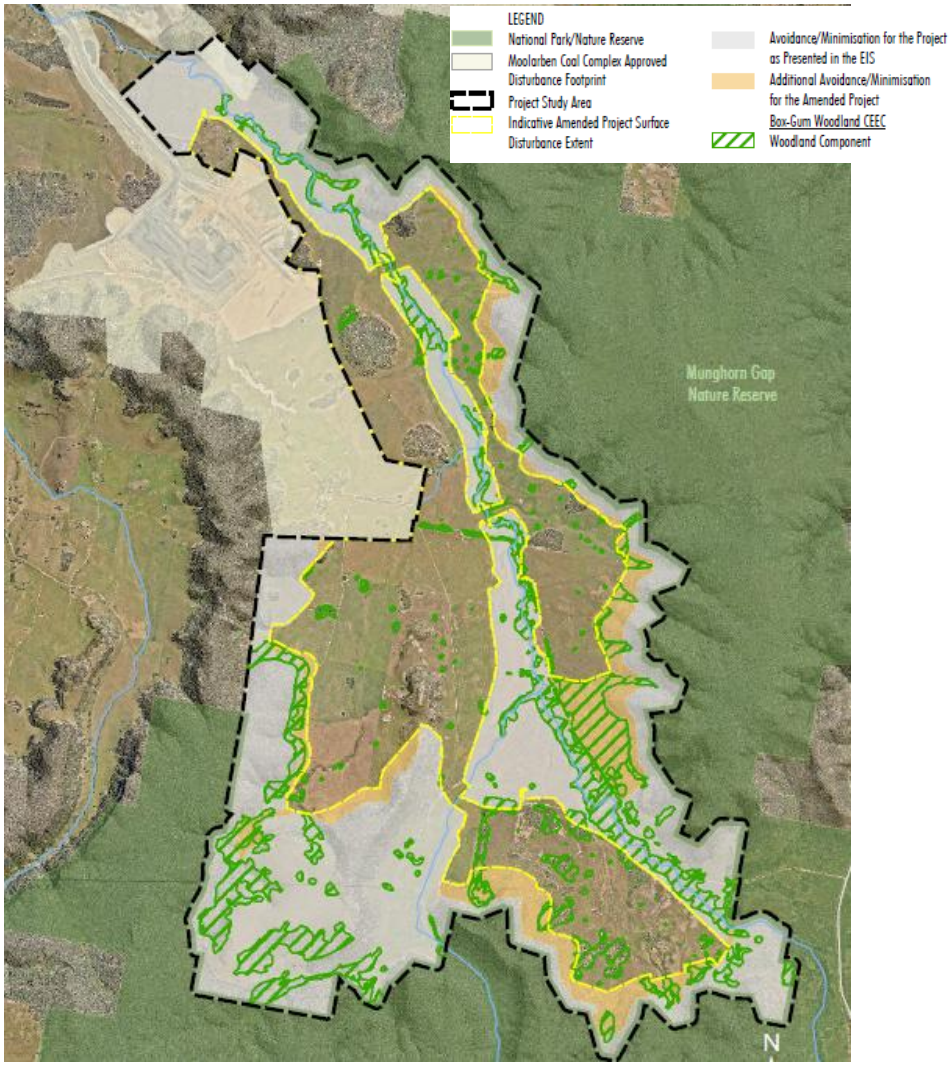

Figure 6: Avoidance of impacts to Box Gum Woodland from the Original Project (source: Figure ES-6 of Yancoal 2024c). Areas of avoidance are shown

DCCEEW (2024, 2025) believe additional measures to avoid impacts are required, particularly in the south-eastern area of the project. The south-eastern area is mostly comprised of an open pit, with a haul road and stockpiles. Without severely reducing or even removing the open pit extent, further avoidance in this area would be practically challenging.

MC proposes two measures to further mitigate or compensate for impacts to Box Gum Woodland:

- A Habitat Enhancement Area of 185.6 ha, located along the riparian zones of Moolarben and Murdering Creek. This includes improved management of 50.9 ha of existing woodland (including 32.6 ha of Box Gum Woodland) and revegetation of 134.7 ha of cleared land/derived grasslands (including 75.5 ha of Box Gum Woodland [Niche 2024a, p.180]).
- A Rehabilitation Area of 675 ha, reverting the development footprint following completion of mining to a mix of native woodland (535 ha) and agricultural pasture/scattered trees (140 ha) over a 15-year period.

Yancoal (2025b) states that that this will result in a net gain in the area of woodland of 557 ha, with a claim that *"this will contribute to the goal of no net loss in the extent and condition of the ecological community . . ."* (Niche 2024a, p.192). Whilst there may be an overall net gain in woodland following mining, the claim re: contribution to a no net loss outcome for the Box Gum Woodland CEEC is questionable:

- There is no evidence provided to demonstrate that areas disturbed through mining can be rehabilitated to a recognisable and functional form of the CEEC. Planting tree species characteristic of the CEEC does not result in a full and functional form of the CEEC, and there is no certainty that this will contribute to recovery of the CEEC.
- A portion of the Habitat Enhancement Area includes revegetation of Category 1 land. Given the mapping of these areas as Category 1 land due to a lack of recovery potential, it is counter to this argument to claim they will be rehabilitated to a functional form of Box Gum Woodland CEEC.
- There is no legal security over these areas, other than any consent conditions which could be modified.

Based on this, there would be improved management of 32.6 ha and rehabilitation of 75.5 ha of Box Gum Woodland. Whilst a positive action, this is unlikely to make a significant contribution to the goal of no net loss in the extent and condition of the ecological community, as claimed.

It is noted that there are additional areas of native vegetation and Box Gum Woodland adjacent to the proposed Habitat Enhancement Areas which are directly connected to Munghorn Gap Nature Reserve. The improved management and rehabilitation of these areas, either through inclusion in the Habitat Enhancement Area or within a Biodiversity Stewardship Site, could contribute to a better outcome for the CEEC in the local area. Rehabilitation of these areas would also directly address the principles for which Box Gum Woodland is listed as being at risk of SAII.

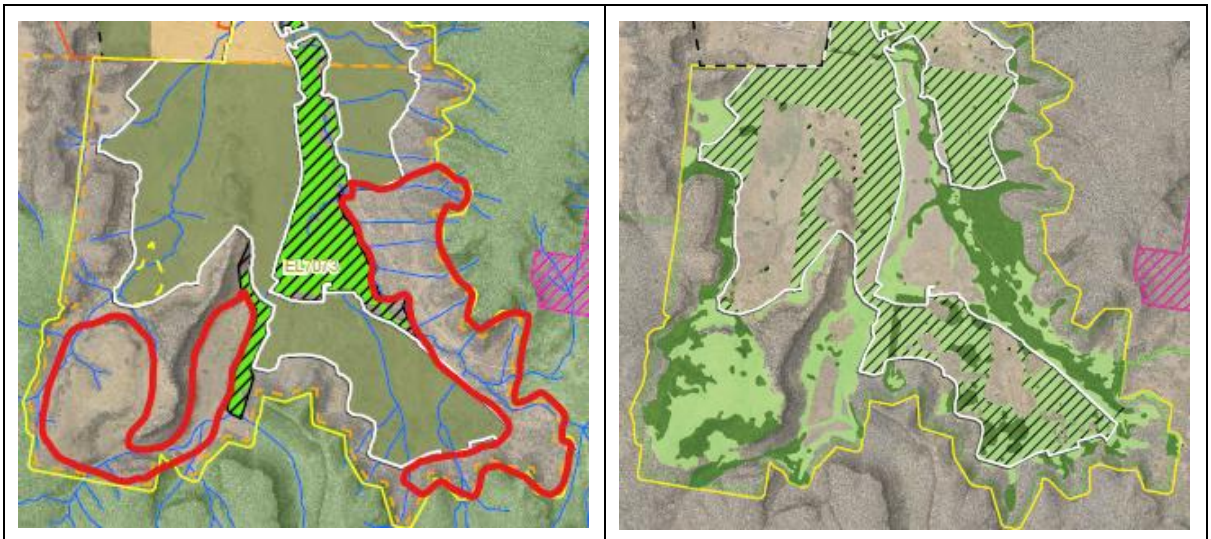

Figure 7: Potential additional areas for inclusion in the Habitat Enhancement Areas (shown in red on the left) resulting in improved management and revegetation of large areas of Box Gum Woodland (shown on the right)

The SAII assessment against the criteria set out in Section 9.1.1 of the BAM (DPIE 2020) is presented in Appendix F of Niche (2024a), and this assessment was reviewed by Hunter Eco (2024b). This assessment states:

- The loss of 401.12 ha of Box Gum Woodland will:
  - result in a reduction in the current geographic extent of the CEEC of 0.0012%,
  - result in a reduction in the AOO of 0.0025-0.0027%, and
  - not affect the extent of occurrence (EOO).
- The project will not result in any isolation of remaining areas of the CEEC and there will be no impacts on connectivity or fragmentation.
- The condition of the CEEC, as represented by the vegetation integrity score, ranges from 32.7-39.8 for derived grasslands, to 67.2-90.4 for scattered trees and remnant woodland areas. This indicates that the derived grassland areas are in low to moderate condition while woodland areas are in good condition.

The Panel has reviewed Niche (2024a) and Hunter Eco (2024b) and generally agrees with these statements, excepting that while the project will not result in complete fragmentation of areas of Box Gum Woodland, it will certainly result in some degree of fragmentation of patches of Box Gum Woodland from other patches of the CEEC and is likely to increase edge effects on Box Gum Woodland along Murdering Creek and Moolarben Creek (noting some of these areas will be managed as a part of the Habitat Enhancement Areas).

DCCEEW (2024) has undertaken its own assessment of whether the project will result in a SAII to Box Gum Woodland in accordance with Section 3.2 of DPIE (2019). It is noted by the Panel that this method of assessment differs from that required by the BAM (DPIE 2020), thus making comparison difficult. DCCEEW's (2024) assessment states:

- the proposal will remove 30.2% of intact Box Gum Woodland within a 5km radius, and
- the proposal will further fragment Box Gum Woodland CEEC within the landscape, contributing to loss of connectivity that could place component species at risk of local extinction.

The DCCEEW (2024) assessment appears to focus on the risk to the local extent/population of the CEEC.

The guidance to decisions makers (DPIE 2019) recommends that *"In forming an opinion on the proposed impact, the decision-maker should remember the context of listing a species at risk of a SAII. The principles in the BC Regulation broadly align with the IUCN (IUCN 2017; Keith et al. 2013) requirements to list a species or ecological community as critically endangered"* and makes reference to Appendix A of DPIE (2019). It is noted by the Panel that the penultimate test for determining whether a Project will result in SAII is whether it will *"contribute significantly to the risk of a threatened species or ecological community becoming extinct"* (Section 6.7(2) of the BC Regulation).

On this basis, the Panel draws the following conclusions:

- The Box Gum Woodland CEEC has undergone a very large reduction in geographic distribution with the CEEC reduced to less than 10% of the CEEC's pre-1750 distribution (TSSC 2020a) and an estimated percentage cleared of 93% (TSSC 2020b).
- With regards to Principle 1 of the SAII assessment, the project will:
  - result in a reduction in the current geographic extent of the CEEC of 0.0012%,
  - result in a reduction in the AOO of 0.0025-0.0027%, and
  - not affect the extent of occurrence (EOO).
- With regards to Principle 2 of the SAII assessment, the project will:
  - result in some isolation of patches of Box Gum Woodland from other patches of the CEEC, noting these patches will remain connected to other area of remnant woodland,
  - increase edge effects for the Box Gum Woodland CEEC, particularly along Murdering Creek and Moolarben Creek, noting management of these areas within the Habitat Enhancement Areas, and
  - the management of retained areas of Box Gum Woodland outside of the Habitat Enhancement Areas is uncertain and undefined.
- The DCCEEW (2024) assessment appears to focus on impacts to the local extent of the community but does not clearly demonstrate how the project will contribute significantly to the risk of the CEEC becoming extinct across NSW, as required.
- The ability to apply additional measures to avoid and minimise impacts are, in the opinion of the Panel, limited within the current design due to the fragmented nature of patches which have not been avoided (i.e. they are isolated from other patches of the CEEC) and the location of the resource.
- The Minister may wish to determine whether removal of the open pit extent in the south-eastern portion of the project area (Stage 3) is considered an appropriate measure to meet the requirements of Section 7.16 of the BC Act.

To make a meaningful contribution to recovery of the community, the Minister may wish to seek rehabilitation of 401.12 ha of Box Gum Woodland in addition to offsets required. This approach

- would ensure that the project does not result in a reduction in geographic range of the CEEC or the further environmental degradation or disruption of biotic processes for the CEEC.
- The improved management of 32.6 ha and rehabilitation of 75.5 ha of Box Gum Woodland within the Habitat Enhancement Areas should count towards this goal.
- The residual could very likely be partially or even fully acquitted by the inclusion of the areas shown in Figure 7 within the Habitat Enhancement Areas.
- Whilst an admirable goal, there is no certainty that the proposed rehabilitation of mined areas to woodland using species characteristic of the Box Gum Woodland CEEC will result in a functional and self-sustaining form of the CEEC.
- Whilst the project will result in impacts which contribute to the loss of the community (i.e. it is "likely to contribute") these losses are negligible (<0.01%) when considered in the context of the community as a whole. Thus, these impacts do not meet the definition of "significantly" as per the definition provided above. The Panel concludes that the impacts to Box Gum Woodland do not pass the penultimate test for SAII and that the project will not result in SAII for the Box Gum Woodland CEEC.

4.1.2.2. Regent Honeyeater

The Regent Honeyeater is listed as being at risk of SAII under Principles 1 (species currently in a rapid rate of decline) and 2 (species with a very small population size).

The amended project will result in impacts to 80.5 ha of mapped important habitat for the Regent Honeyeater. However, it is noted that around 10 ha of the mapped important habitat consist of derived grassland (Niche 2024a, p.194) while other areas of suitable habitat, as mapped by Niche, are not included in the important habitat mapping. Using the vegetation mapping from Niche (2024a) and Eco Logical (2024) impacts to woodland PCTs associated with the species in the TBDC equate to 76.3 ha. The BDAR (Niche 2024a) does not provide any discussion on the density of key nectar producing feed trees.

Surveys were undertaken by AMBS (2023), and Niche (2024a) reports that the species was not recorded. However, the species occurs in NSW in very low numbers, populations fluctuate greatly year-on-year and the absence of the species from areas of suitable habitat is not unusual. Further, the species has been recorded in close proximity in the past (Debus, 2024) and the surveys by AMBS (2023) were not undertaken during the breeding season when the species is more likely to be detectable if present (Debus 2024).

Avoidance measures are set out in Sections 4, 4.2.2, 4.6, 6.1.3, and Appendix F of the BDAR (Niche 2024a) resulting in a 56% reduction in impacts to Regent Honeyeater mapped important habitat, from the 184.41 ha of impact in the original proposal to 80.5 ha. Residual areas are made up of fragmented patches and edges of extensive areas of habitat within Munghorn Gap Nature Reserve. This latter impact could open up areas of habitat to invasion by Noisy Miners. The BDAR (Niche 2024a) also claims that the area of woodland habitat impacted has been reduced to 34.22 ha. Whilst this may be correct for Box Gum Woodland, there will be impacts to more than 105 ha of woodland and forests arising from the project including 76.3 ha of woodland habitat in PCTs associated with the species.

Due to the fragmented nature of mapped important habitat for the Regent Honeyeater, the ability to further avoid and minimise impacts is minimal without removing areas of open pit. The south-eastern area (Stage 3) provides patches of mapped important habitat between more intact areas of habitat to the east and south outside of the development footprint. However, further avoidance in this area would impact on project design.

MC proposes two measures to further mitigate or compensate for impacts to habitat for the Regent Honeyeater:

- A Habitat Enhancement Area of 185.6 ha, located along the riparian zones of Moolarben and Murdering Creek. This includes improved management of 50.9 ha of existing woodland and revegetation of 134.7 ha of cleared land/derived grasslands [Niche 2024a, p.180]). The Habitat Enhancement Areas support 52 ha of mapped important habitat for the Regent Honeyeater.
- A Rehabilitation Area of 675 ha, reverting the development footprint following completion of mining to a mix of native woodland (535 ha) and agricultural pasture/scattered trees (140 ha) over a 15-year period.

Improved management of existing habitat is likely to provide minimal additional benefit for the Regent Honeyeater. However, in contrast to Box Gum Woodland, the restoration of 134.7 ha of habitat in the Habitat Enhancement Areas and planting of 535 ha of native woodland in the rehabilitation areas could result in a benefit for the Regent Honeyeater and result in a net benefit of 589.2 ha of habitat. It is noted that the outcomes here would be dependent on successful rehabilitation and evidence of these areas providing feed resources for the Regent Honeyeater; the BDAR (Niche 2024a) does not provide any information on species mix for these areas and inclusion of key nectar producing feed tree species will be important to achieving outcomes for the Regent Honeyeater. The National Recovery Plan for the Regent Honeyeater notes *"enhancement and expansion of remnant vegetation . . . is preferable to the undertaking of new planting programs"*; however, *"planting of the regent honeyeater's preferred foraging species to enhance the structural and species diversity of woodlands on private land is also beneficial"* (DoE 2016, p.27). Heinsohn et al. (2022) also note that increased rates of habitat restoration in the next five years will be critical to the recovery of the species. To be of benefit to the recovery of the species, the restoration of 134.7 ha of woodland habitat within the Habitat Enhancement Areas needs to occur over five years (Heinsohn et al. 2022).

It is noted that there are additional areas of native vegetation (and Box Gum Woodland) adjacent to the proposed Habitat Enhancement Areas which are directly connected to Munghorn Gap Nature Reserve. As outlined above, the improved management and rehabilitation of these areas, could contribute to a better outcome for the CEEC and the Regent Honeyeater in the local area.

The SAII assessment is presented in Appendix F of Niche (2024a) against the criteria set out in Section 9.1.1 of the BAM (DPIE 2020), and this assessment was reviewed by Debus (2024). This assessment states:

- No individuals are known to inhabit the site (noting targeted surveys were not undertaken at an appropriate time of year). Under the current population trajectory where the species will contract to known breeding locations, there is *"a low likelihood that any of the total NSW population would be lost as a result of the Project"* (Debus 2024, p.16).
- The loss of 80.5 ha of mapped important habitat for the Regent Honeyeater to be impacted:
  - equates to 0.01% of the 556,841 ha of mapped important habitat,
  - would have no impact on the 340,000 km2 EOO, and
  - would affect approximately 0.3% of the 300 km2 AOO.
- The project will impact habitat but is unlikely to impacts on individuals.
- The proposal would not fragment habitat.
- The project would increase edge effects on retained mapped important habitat, facilitating invasion by Noisy Miners. It is proposed that this will be managed through a Noisy Miner Management Plan.

The Panel has reviewed Niche (2024a) and Debus (2024) and generally agrees with these statements. However, Debus (2024, p.16) notes that *"if the population improves, then it is more likely that Regent Honeyeater individuals would once again visit the locality"*, indicating that mapped important habitat within the project area could be important in the species recovery in future.

DCCEEW (2024) has undertaken their own assessment of whether the project will result in a SAII to the Regent Honeyeater in accordance with Section 3.2 of DPIE (2019). It is noted by the Panel that this method of assessment differs from that required by the BAM (DPIE 2020) making comparison difficult. The DCCEEW (2024) assessment states that SAII is likely but does not outline how this conclusion was reached with regards to the factors required to be considered under the BAM (DPIE 2020).

DCCEEW (2025) appears to indicate the conclusion re: SAII is due to loss of 80.5 ha of mapped important habitat and that the precautionary principle should apply to impacts of Regent Honeyeater habitat.

The guidance to decisions makers (DPIE 2019) recommends that *"In forming an opinion on the proposed impact, the decision-maker should remember the context of listing a species at risk of a SAII. The principles in the BC Regulation broadly align with the IUCN (IUCN 2017; Keith et al. 2013) requirements to list a species or ecological community as critically endangered"* and makes reference to Appendix A of DPIE (2019). It is noted by the Panel that the penultimate test for determining whether a Project will result in SAII is whether it will *"contribute significantly to the risk of a threatened species or ecological community becoming extinct"* (Section 6.7(2) of the BC Regulation).

On this basis, the Panel draws the following conclusions:

- The Regent Honeyeater has undergone a rapid decline, both in terms of overall population size and geographic distribution and now has a small population size.
- With regards to Principle 1 of the SAII assessment, the project will:
  - result in a reduction in the mapped important habitat for the species of 0.01%
  - result in a reduction in the AOO of 0.3%,
  - have no impact on the EOO,
  - not further fragment existing habitat, and
  - will increase edge effects and facilitate invasion by Noisy Miners.
- With regards to Principle 2 of the SAII assessment, the project will impact on habitat but is unlikely to impact individuals.
- The DCCEEW (2024, 2025) assessment appears to conclude that the project will result in a SAII based on impacts to the 80.5 ha of habitat. No conclusions with regards to the principles and criteria to be addressed is provided. This highlights the challenge in assessing whether a project will result in SAII.
- The Panel recommends that impacts to and offsets for the Regent Honeyeater ought to be determined based on site-based assessment rather than much less accurate regional vegetation mapping products. Based on mapping by Niche (2024a) the project will result in impacts to 76.3 ha of woodland habitat for the Regent Honeyeater.
- Measures to avoid impacts undertaken are substantive, with a reduction of 56% from 184.41 ha to 80.5 ha.
- The ability to apply additional measures to avoid and minimise impacts are, in the opinion of the Panel, limited within the current design.
- The removal of the open pit extent in the south-eastern portion of the project area (Stage 3), recommended for consideration for Box Gum Woodland above, would provide benefits for the Regent Honeyeater.
- The restoration of 134.7 ha of habitat within the Habitat Enhancement Areas can provide a benefit for the Regent Honeyeater. However, to be effective in contributing to the recovery of the species:
  - there is a benefit to this occurring within five years rather than over 10 years as proposed, and
  - restoration needs to include details on planting of key nectar producing feed tree species.
- The additional rehabilitation of 535 ha of mined land to native woodland can provide an additional benefit for the species. However, the outcomes of this in terms of providing feed resources for the Regent Honeyeater are less certain.
- Whilst the project will result in impacts to mapped important habitat for the species there is no evidence to indicate that this habitat is occupied or important for the species and thus that any impacts would be "likely to contribute" to the risk of extinction. However, in lieu of robust survey data it must be assumed this is the case. The impacts are small in nature but will result in increased edge effects and potential for invasion by Noisy Miners. These impacts will be mitigated by restoration of 134.7 ha of habitat in the Habitat Enhancement Areas and a Noisy Miner management plan, resulting in a net increase in habitat and management of what is likely an existing issue in the fragmented areas of mapped important habitat. In this context, impacts are not considered to contribute "significantly" to the risk of extinction. The Panel concludes that the

impacts to Regent Honeyeater do not pass the penultimate test for SAII and that the project will not result in SAII for the Regent Honeyeater.

4.1.3. The impacts of blasting on biodiversity

The AMBS (2023) and Niche (2024a) identify substantial areas of rocky habitats providing habitat for a range of species, including habitat for the Broad-headed Snake and roosting habitat for microbats (Large-eared Pied Bat and Eastern Cave Bat). One lactating female and two juvenile Large-eared Pied Bats and one post-lactating female and three juvenile Eastern Cave Bats were recorded by AMBS (2023) indicating breeding is occurring in the local area. Searches of the rocky habitats by AMBS (2023) and Biodiversity Monitoring Services (2024) have identified seven bat roosts (Figure 8).

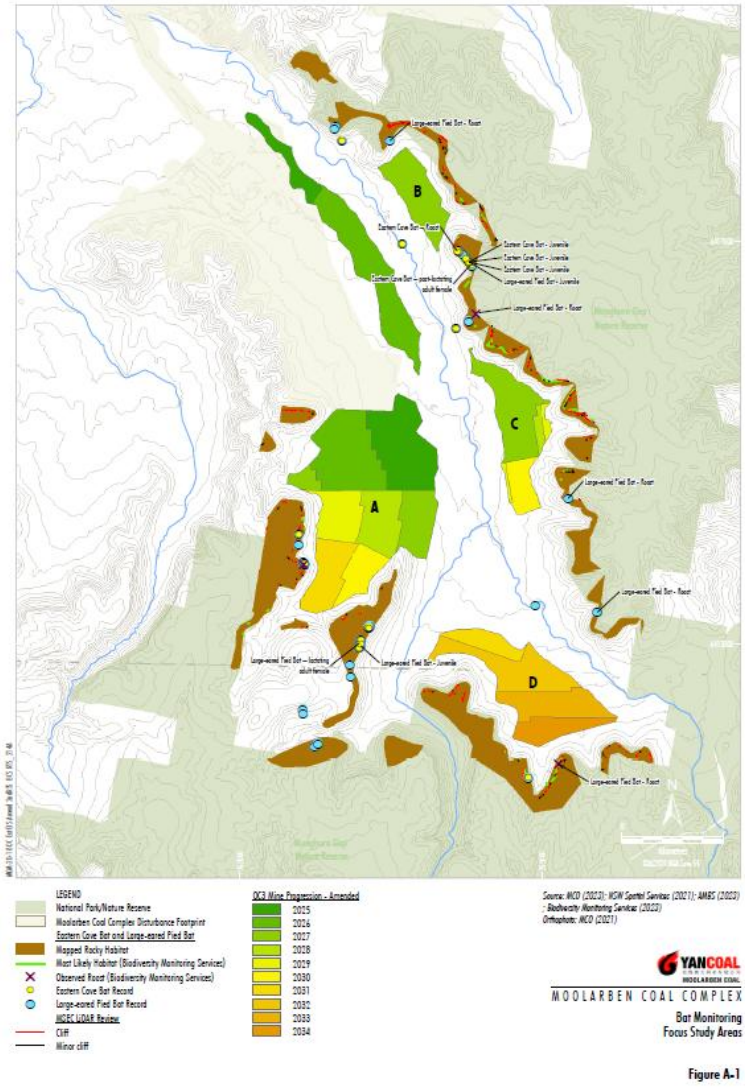

Figure 8: Bat roosts adjacent to the development footprint (source: Figure A-1 of Attachment A of Yancoal 2025b)

Measures to avoid and minimise impacts to these rocky habitat areas are outlined in Sections 4, 4.2, 4.2.1, 4.6, 6.4, 6.5 and 6.6 of the BDAR (Niche 2024a) with key measures outlined in Section 4.4.1. Amendments to the project have resulted in avoidance of all direct impacts to rocky habitats, including

the 100 m buffer identifying breeding habitat. Indirect impacts to rocky habitats may arise from blasting and vibration impacts, with potential for disturbance, disruption of roosts or even collapse.

To manage this, MC proposes to implement a blast management plan, to be developed post-approval. Attachment A of Yancoal (2025b) provides a summary of the proposed blasting monitoring and bat survey programme. Yancoal proposes a performance measure of "*no damage that is distinguishable from natural processes"*. To achieve this, an upper blasting limit of 50 mm/s at the nearest rocky habitat is proposed. This limit is based on a review of case studies and damage to the landscape observed during blasting (Yancoal 2024d) which indicates that a no or insignificant damage was observed at a PPV of less than 50 mm/s.

Of particular concern to the Panel are the seven bat roosts identified in Figure 8. The performance measure outlined above aims to avoid physical damage to rocky habitats, and this is critical for any breeding roosts given the irreplaceable nature of such habitats. However, there is potential for blasting to result in behavioural impacts to microbats. The Panel is not aware of any studies on the behaviour of microbats in relation to blasting other than Martin (2015) which documented no disturbance of bats in a maternity roost at vibration levels of 12 mm/s; however, this is well below the 50 mm/ss proposed. Of particular concern would be disturbance to breeding roosts during the breeding season and other roosts when the species are in torpor. Biodiversity Monitoring Services (2024) states that blasting has potential to lead to reduced use of roost sites, but that any impacts would be temporary.

The bat monitoring program proposed in the summary of the proposed blast management plan (Attachment A of Yancoal 2025b) outlines a broad concept for monitoring program, but this program lacks any detail on proposed monitoring type and locations. The Panel is of the view that a trigger action response plan (TARP) for blasting activities should be developed and should include triggers for both physical damage to rocky habitat as well as triggers for behavioural impact to microbats.

- The proposed performance measure of "no damage that is distinguishable from natural processes" is suitable for physical damage to roosts. However, additional performance measures are required to ensure no behavioural disturbance of bats occupying maternity roosts during the breeding season (if identified) or bats in torpor.
- The performance indicator for this should be based on no bat activity recorded at the roost entrance immediately following a blast (as per Martin 2015).
- The TARP should set out a process for measuring damage and behavioural disturbance at vibration levels of less than 50 mm/s to ensure impacts are managed prior to occurring. Likewise, if the TARP process does not result in an exceedance of a performance measure at 50 mm/s then this could be used to justify an increase in vibration levels, subject to a review process.
- Baseline monitoring should include inspections of likely habitat to identify if any additional roosts are present and determine if any roosts are being utilised as maternity roosts or over-wintering roosts.
- Monitoring of microbat activity should be undertaken during blasting. This can be achieved through a design similar to Martin (2015) which measured bat activity at the roost during blasting. As blasting will most likely be conducted during daylight hours, it can be expected that bats are dormant and thus any activity recorded is indicative of disturbance.
- Monitoring should be accompanied by measurements of vibration at roost sites.
- Pre- and post-blasting inspections should be undertaken to confirm no damage to rocky habitat and roosts has occurred.
- The TARP should outline adaptive management measures should either the physical damage or behavioural performance measures be exceeded.

4.1.4. Adequacy of measures to avoid or minimise impacts

Measures to avoid and minimise impacts are a key part of the mitigation hierarchy. Recent amendments to the BC Act have resulted in this hierarchy being embedded within the Act itself. Prior to these amendments, avoid and minimise has been a key part of the BAM (DPIE 2020). However, little

guidance is available on what level of avoidance is required. This makes striking the balance of ecologically sustainable development, an object of the EP&A Act, challenging for all.

Whilst acknowledging the reduction in footprint, DCCEEW (2025) state that additional measures to avoid and minimise impacts to high biodiversity values is required and references their earlier response (DCCEEW 2024). Key measures recommended by DCCEEW (2024) to avoid and minimise impacts include:

- Consideration of other areas within the mine lease which could be extracted with a lower level of impacts to biodiversity.
- Whether amendments to the design could relocate elements of the project to areas of non-native vegetation and/or areas of lower quality.
- Whether impacts to SAII entities (Box Gum Woodland, Regent Honeyeater, Large-eared Pied-Bat, Eastern Cave Bat and Broad-headed Snake) and threatened species such as the Koala and Squirrel Glider be further avoided.
- A greater setback from Munghorn Gap Nature Reserve, with minimum of 500 m recommended.

A key area of focus for DCCEEW (2024) appears to be the south-eastern portion of the development footprint, in Stage 3, which includes patches of Box Gum Woodland (woodland form) and habitat for the Regent Honeyeater, Swift Parrot, Koala and Squirrel Glider.

The amended project has adopted many of DCCEEW's (2024) recommendations with substantial reductions in impacts to key values such as Box Gum Woodland, mapped important habitat for the Regent Honeyeater, threatened species habitat and avoidance of all direct impacts to rocky habitats. In the opinion of the Panel, the ability to apply additional measures to avoid and minimise impacts are limited within the current design (see Section 4.1.2 above). Any further efforts to avoid and minimise impacts may result in the loss of entire stages.

That said, two key areas where avoidance may be feasible and warranted are shown in Figure 9 below:

- Avoidance of the additional areas of Stage 1 shown in Figure 9 would avoid impacts to Box Gum Woodland in DNG condition, PCT 1610 in High and Regenerating condition, along with habitat for the Pink-tailed Legless Lizard, Swift Parrot, Regent Honeyeater, Koala, Squirrel Glider, Large-eared Pied Bat (foraging) and Eastern Cave Bat (foraging).
- Avoidance of the additional areas of Stage 3 shown in Figure 9 would avoid impacts to Box Gum Woodland in High and DNG condition, PCT 1610 in High and Regenerating condition, PCT 1711 in High condition, along with habitat for the Pink-tailed Legless Lizard, Swift Parrot, Regent Honeyeater, Koala, Squirrel Glider, Large-eared Pied Bat (foraging) and Eastern Cave Bat (foraging).
    - This could be compensated for by extending the layout into the areas shown in green in Figure 9, subject to the suitability of the coal resource in this area.

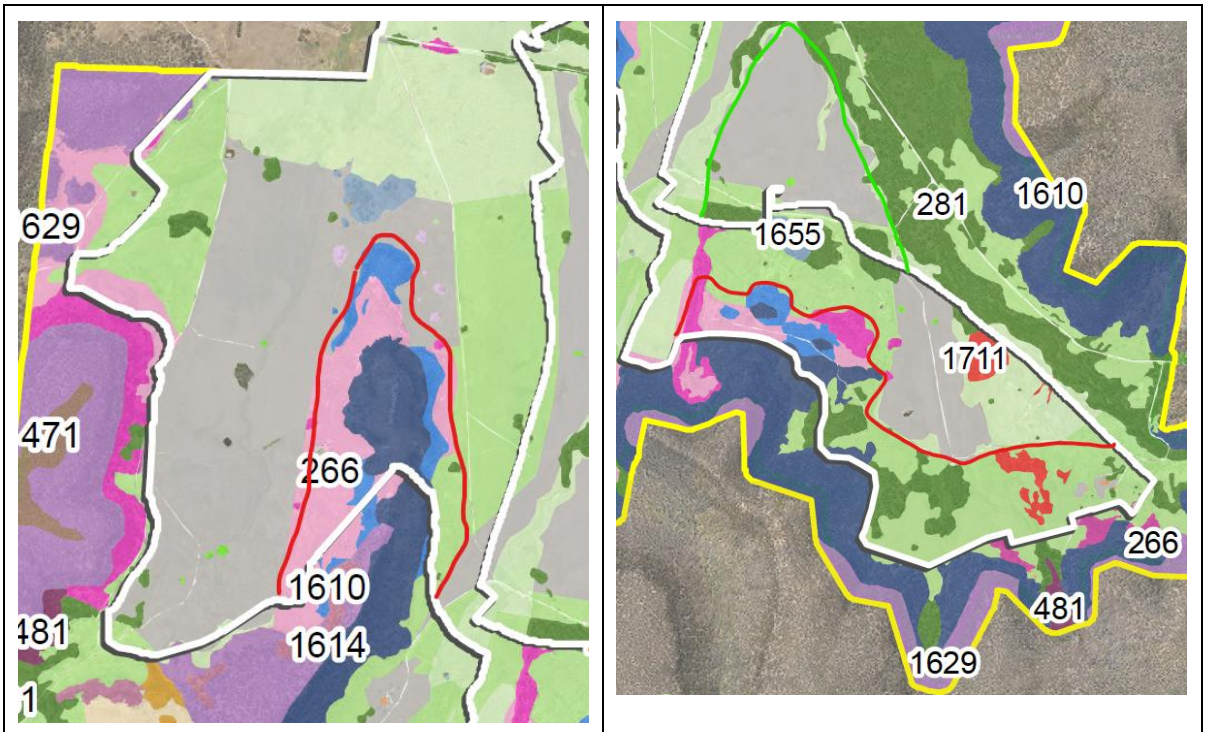

Figure 9: Potential avoidance measures in Stage 1 (left) and Stage 3 (right)

However, it is acknowledged that mine planning is a complex issue and measures to avoid and minimise impacts for biodiversity may have adverse impacts on other values and may not be feasible for resource projects due to location of resources. The significant work undertaken by the proponent in avoiding and minimising impacts between the original EIS and the Amended Project must be acknowledged.

4.1.5. Biodiversity Impact Conclusions

- The proponent has met the requirements of the *Local Land Services Act 2013* (LLS Act) and the *Biodiversity Conservation Act 2016* (BC Act) to demonstrate that large portions of the site support low conservation value grassland and are thus eligible to be mapped as Category 1 land. It is suitable and appropriate that these areas are excluded from the assessment of the impacts of any clearing of native vegetation and loss of habitat as per Section 6.8 of the BC Act.
- To result in a SAII, it is necessary to demonstrate that any impact is likely and will contribute significantly to a species or community becoming extinct. This is a high bar and does not consider the risk that cumulative impacts and projects present to risk of extinction.
- The project will result in impacts to both the Box Gum Woodland Critically Endangered Ecological Community (CEEC) and mapped important habitat for the Regent Honeyeater. The Panel does not view that these impacts will contribute "significantly" to the risk of extinction and the Panel concludes that the project will not result in SAII for the Box Gum Woodland CEEC or Regent Honeyeater.
- Blasting has potential to impact on known roosting and potential breeding habitat for cave dwelling bats. Amendments to the bat monitoring program, proposed as a part of the blast management plan, are required to sufficiently address these impacts.
- The ability to apply additional measures to avoid and minimise impacts are, in the opinion of the Panel, limited within the current design. That said, two key areas where avoidance may be feasible and warranted include areas of Stage 1 and Stage 3.

4.1.6. Biodiversity Recommendations

The Panel recommends:

- The process of mapping low conservation value grassland and defining Category 1 land would benefit from clarity around key areas, including whether the process outlined in DPE (2022), of requiring a site-based assessment of CEECs, aligns with the requirements of the LLS Act that only areas mapped by the Environment Agency Head are eligible to be listed as Category 2 land.
- DCCEEW consider whether the current SAII assessment process is achieving its aims of *"protecting threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities"* (DPIE 2019, p.1).
- The Minister may wish to seek rehabilitation of 401.12 ha of Box Gum Woodland in addition to offsets required. This approach would ensure that the project does not result in a reduction in geographic range of the CEEC or the further environmental degradation or disruption of biotic processes for the CEEC. The improved management of 32.6 ha and rehabilitation of 75.5 ha of Box Gum Woodland within the Habitat Enhancement Areas should count towards this goal.
- The Panel recommends that impacts to and offsets for the Regent Honeyeater ought to be determined based on site-based assessment rather than mapped important areas derived from less accurate regional vegetation mapping products.
- The restoration of 134.7 ha of habitat within the Habitat Enhancement Areas be required to be completed within 5 years to ensure this contributes to the recovery of the Regent Honeyeater.
- A TARP for blasting activities be developed, and that this includes:
    - a performance measure to ensure no disturbance of bats occupying maternity roosts during the breeding season (if identified) or bats in torpor,
    - a performance indicator for this PM which is based on no bat activity recorded at the roost entrance immediately following a blast,
    - a process for measuring damage and behavioural disturbance at vibration levels of less than 50 mm/s to ensure impacts are managed prior to occurring,
    - a baseline monitoring program which includes inspections of likely habitat to identify if any additional roosts are present and determine if any roosts are being utilised as maternity roosts,
    - monitoring of microbat activity be undertaken during blasting, accompanied by measurements of vibration at roost sites,
    - pre and post-blasting inspections be undertaken to confirm no damage to rocky habitat and roosts has occurred, and
    - adaptive management measures should either the physical damage or behavioural performance measures be exceeded.
- The Department and/or the IPC may wish to determine whether further avoidance of impacts in Stages 1 and 3 (as shown in Figure 9) are warranted to avoid impacts to Box Gum Woodland and habitat for threatened species.

4.2. SURFACE AND GROUNDWATER IMPACTS

4.2.1. Physical Setting

The Moolarben OC3 extension project area is located south of the existing Moolarben open cut areas OC1, OC2 and OC3. The project is located in the upper catchment of Moolarben Creek, where this part of the catchment is characterised by steep, heavily forested slopes draining into a cleared and relatively flat floodplain (WRM 2022). Murdering Creek is a minor tributary of the upper Moolarben Creek. Both creeks are ephemeral. The total catchment area of Moolarben Creek (including Murdering Creek) is 126 km^2 to the Ulan-Cassilis Road (WRM 2022).

MCO has committed to 200 m setbacks from creeks for Moolarben Creek and Murdering Creek (Moolarben Coal Operations, 2024 – amendment report, appendix A, updated project description). These setbacks are consistent with the minimal impact criteria of the "NSW Aquifer Interference Policy" (DPI OoW 2012).

The proposed open cut pits occupy the floor of these catchments (excluding the buffer zone of 200 m surrounding Moolarben Creek) where the Permian coal seams are near surface. The depth of cover ranges from less than 10 m to more than 70 m.

The extension project area is underlain by:

- Quaternary/Tertiary alluvial sediments associated with the current creek systems (including a palaeochannel area adjacent to the intermediate section of Moolarben Creek).
- Permian overburden (interbedded claystones, siltstones and sandstones).
- Permian Ulan Coal Seam (near the base of the Illawarra Coal Measures.

The ridgeline areas of the Moolarben Creek catchment are underlain by:

- Tertiary basalt plugs and caps.
- Triassic sandstone (Wollar Sandstone).
- Permian Illawarra Coal Measures at depth.

The Permian and Triassic strata gently dip to the north north-east at 1 to 2 degrees. No major geological structural features are known across the project area (AGE 2022).

There are three groundwater systems across the project area, some of which will be impacted by the extension project. These systems are:

- Shallow groundwater in the alluvium (including the palaeochannel area).
- Perched groundwater in the Triassic sandstone (ridgeline) strata/Tertiary basalt caps.
- Regional groundwater in the Permian overburden sediments and in the Ulan coal seam.

The local characteristics of the shallow groundwater in the alluvium is discussed in Section 4.2.3. The characteristics of the perched and regional groundwater systems are discussed in Section 4.2.4.

4.2.2. Surface Water

4.2.2.1. Predicted Impacts

Rainfall and runoff within the mine pit areas will be collected and stored and not discharged within the catchment during mining operations. Clean water will be diverted around the proposed OC3 open cut pits. The residual Moolarben Creek and Murdering Creek catchment areas will be slightly smaller with 11% and 6% excised respectively, thereby reducing runoff from the extension project site for a period of around 10 years. Post mining, the full catchment area is restored as the final rehabilitated landform for the extension area is designed to be free draining. However, rehabilitated land is expected to have higher infiltration rates and therefore lower runoff volumes could be expected longer term from these small areas.

Given the small size of upper catchment and the affected mine area, the reductions in runoff are small during mining operations and, post mining, are not predicted to have a discernible impact on the frequency of flow events and flow volumes within Moolarben Creek downstream of the extension project (WRM 2024). The Panel agrees with this assessment.

4.2.2.2. Monitoring

The current surface water monitoring program is shown in Figure 10. There are two surface water monitoring sites along Moolarben Creek (SW08 and SW09) both of which are quality monitoring sites, not flow gauging sites (WRM 2022). Murdering Creek is also an ephemeral creek and does not have any flow gauging infrastructure (AGE 2022). There is no existing or planned surface water flow monitoring in the extension project area. The closest gauging station is SW01, on the Goulburn River, which is operated by Ulan Coal. The Panel considers the lack of flow gauging infrastructure is a non-

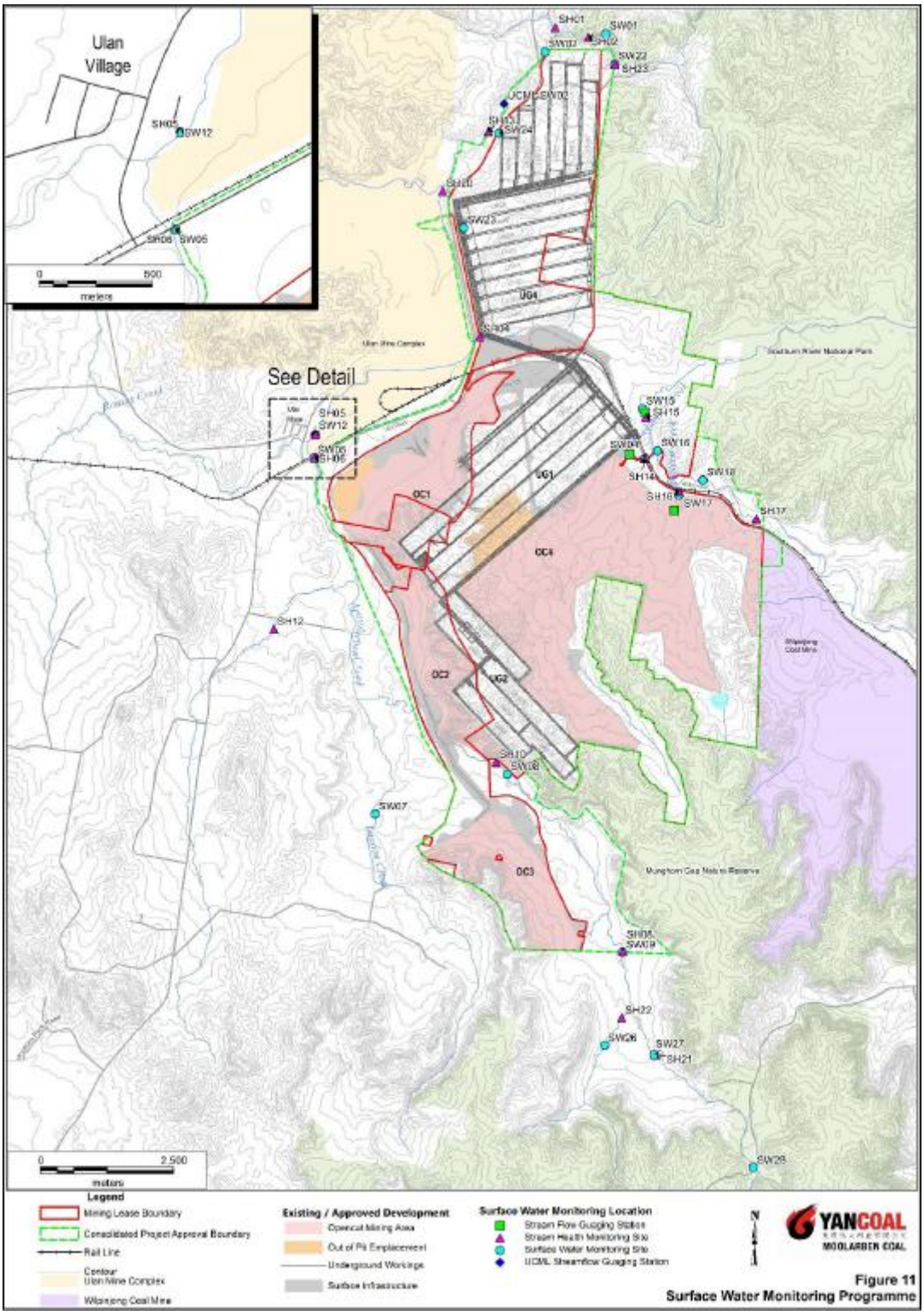

Figure 10: Surface Monitoring Network (Figure 11 from Yancoal 2022)

issue given that Moolarben and Murdering Creek are both ephemeral, creeks only flow during medium to high rainfall events, and downstream flow impacts are predicted to be minimal.

Monitoring of surface water quality and assessing any mining induced impacts to streamflow is more important. Surface water quality monitoring location, SW08, is located at the outlet from the project area while surface water quality monitoring location SW09 is located in the centre of the project area. Three additional surface water quality monitoring locations are proposed, two on Moolarben Creek and

one on Murdering Creek. In addition, there are three stream health monitoring locations proposed within the project area.
The Panel concludes that the number of surface water monitoring sites and the planned water quality and aquatic health monitoring at these sites is appropriate for assessing potential impacts on surface water quality and biodiversity health.

4.2.3. Localised Alluvial Groundwater

4.2.3.1. Occurrence

In places along the valley floor, the coal measures have been eroded and Tertiary aged palaeochannel sediments, predominantly comprised of alluvium (AGE 2022) have been deposited. The palaeochannel deposits have since been eroded and covered by more recent weathering and Quaternary sediments associated with the current drainage lines of Moolarben Creek and Murdering Creek. The Quaternary alluvium comprises of soil, silt, clay, sand and gravel (AGE 2022). The Tertiary palaeochannel deposits consist of poorly sorted quartzose sands and gravels, semi-consolidated in a clayey matrix.

An aerial electromagnetic geophysical (AEM) survey across the project area suggested a maximum thickness of palaeochannel sediments of approximately 30 m. From information available to the Panel, the palaeochannel profile, lateral extent and sediment depth have not been confirmed by drilling. Also, the degree of saturation and temporal variation within the alluvium and palaeochannel is not well known but conditions appear quite variable (Yancoal 2024a). At the one established monitoring bore (PZ058A) the saturated thickness varies from 8 to 10 m while at other sites where monitoring bores were not established, the alluvium was either unsaturated or only saturated for short periods (Yancoal 2024a). Additional monitoring bores are required to confirm the geology and hydrogeology of the palaeochannel area.

The Quaternary alluvium is connected to Moolarben Creek and the Tertiary palaeochannel deposits occur adjacent to the Quaternary alluvium. The connectivity between these two alluvial units is not known.

4.2.3.2. Surface water/alluvial groundwater connectivity

Conceptualisation of groundwater-surface water interactions was based on very limited monitoring data. No flow gauging data is available within the extension project area for Moolarben Creek or Murdering Creek, to inform assessments of groundwater-surface water connectivity. Rainfall and periodic medium to high stream flows recharge and maintain the shallow groundwater in the alluvium. Baseflow contributions from the alluvium back to the stream are expected to increase during wetter years as the alluvium is replenished (AGE 2022). However, the level and variation of saturation within the alluvium is unknown due to a lack of groundwater monitoring within the alluvium.

4.2.3.3. GDEs

Large areas of high potential terrestrial GDEs have been mapped along Moolarben Creek, in the BOM GDE Atlas. Areas of these mapped potential GDEs fall within the predicted 2 m drawdown zone (AGE 2022, AGE 2024) and hence are at risk if there is an actual decline or loss of the local water table in the alluvial and palaeochannel deposits. There is currently insufficient local groundwater monitoring in the immediate project area to determine how the predicted drawdown compares to the natural variations in groundwater levels. The Panel considers there is a moderate to high risk that shallow groundwater will be dewatered or become ephemeral in some areas along Moolarben Creek, reducing the volume of groundwater available for riparian vegetation.
The Panel supports MCO's offer to *"accept an approval condition to monitor and manage areas of potential terrestrial GDEs outside of the disturbance extent and within the Project Area."* however this should be supported by an appropriate alluvial groundwater monitoring network that provides early warning of declining water levels (see Section 4.2.4.2).

4.2.4. Regional Groundwater

4.2.4.1. Occurrence

Perched groundwater in the Triassic sandstones and basalt caps occurs high in the landscape beneath the ridgelines of the Moolarben and Murdering Creek catchments. Beneath narrow ridgelines where there is only a narrow expanse and thin sequence of sandstone, perched groundwater is likely to be ephemeral and drain quickly after a rainfall recharge event. Beneath the more extensive sandstone areas (such at the Munghorn Gap Nature Reserve to the north and south), there is likely to be a semi-permanent perched water table in the immediate ridgeline/cliff areas which migrates into a permanent perched or regional water table in the more extensive (down dip) plateau areas. This groundwater system (where present) is conceptualised by AGE 2022 and Yancoal 2025a as being disconnected from the deeper Permian groundwater system with perched water typically discharging at the break of slope or near the interface with the underlying Permian overburden. There is no monitoring data to confirm this broad conceptualisation and whether these two groundwater systems are in fact connected or disconnected at distance.

Perched groundwater discharging as seeps or springs from the sandstone or as soaks at the edges of basalt caps are potential terrestrial GDE areas. They are unlikely to be impacted by open cut mining at lower elevation if these systems are naturally disconnected from the Permian groundwater system. However, if the systems are hydraulically connected, then depressurisation of the Permian strata could induce vertical leakage of groundwater from the Triassic sandstone causing a decline in the regional water table and a potential loss of water to the GDEs that ring the catchment. Groundwater monitoring in ridgeline areas, together with monitoring of seeps/springs and any associated GDEs at lower elevation is required to confirm this conceptualisation.

The current regional water table (pre-mining) mostly occurs in the Permian overburden in the close vicinity of the OC3 extension project area. The Permian strata have been depressurised and dewatered extensively due to the mining operations to the north, hence the regional water table mostly sits at the base of the Ulan coal seam in these areas. The Panel believes the regional water table in areas located away from the Moolarben mine beneath the plateau areas of the Munghorn Gap Nature Reserve is likely to occur in the Permian overburden or the lower portion of the Triassic sandstone. Drawdown in deep water table levels at distance due to the extension project is not expected to impact terrestrial vegetation within the Munghorn Gap Nature Reserve.

4.2.4.2. Monitoring Program

Currently there is a very limited groundwater monitoring network across the extension project area; the network comprises three standpipes targeting the Ulan coal seam and one standpipe targeting the northern end of the alluvial palaeochannel. Existing and proposed monitoring locations are shown on Figure 11 (Figure 25 from AGE 2024).

There is no current monitoring of the Permian overburden across the valley floor in the extension project area, that ideally would include nested sites to monitor the connectivity between the Quaternary/Tertiary alluvial and Permian groundwater systems, and there is no monitoring of the Triassic groundwater system across the ridgeline areas.

The proponent committed to the installation of new monitoring bores in 2024 (Yancoal 2024a) however the Panel understands that no new monitoring bores have been installed as at the date of this advice. The proposed sites are shown on Figure 11 and described in Section 8.2 and Table 8.1 of AGE 2022 and include:

- 8 alluvial standpipes to monitor water levels and water quality in the alluvium/palaeochannel,
- 4 standpipes to monitor water levels and water quality in spoil emplacement areas, and
- 3 shallow VWPs into the Triassic sandstone.

The Panel believes that those standpipes located along the valley floor are the priority for water levels, water quality and terrestrial GDE monitoring. The Panel understands that the construction of the three VWPs in the ridgeline areas to the south-west and south are problematic due to access constraints. Alternative sites should be investigated if access is not possible.

The Panel agrees that, for the purpose of improved groundwater model calibration and validation, and TARP compliance, the proposed monitoring network in AGE 2022 will provide improved spatial coverage. Nevertheless, the program would also benefit from:

- Several nested monitoring (standpipe) sites that are paired with alluvial monitoring sites in the Moolarben Creek buffer zone to monitor water levels in the deeper Permian overburden (if present) and/or Ulan coal seam.
- A deeper VWP sensor in the Permian overburden at two of the three Triassic sandstone monitoring sites to monitor regional groundwater depressurisation.
- Monitoring of the nine 'regional groundwater features' shown Figure 11. For those features that are springs, monitoring of flow, field water quality, and the composition/health of any dependent vegetation is recommended.

It is important to understand the natural seasonal variation in water levels and water quality, particularly the shallow alluvial groundwater systems that support creek baseflow/sub-surface flow and dependent ecosystems such as riparian vegetation.

It is critical that the installation of new monitoring bores to collect baseline data occurs prior to the commencement of the first open cut pit in Stage 1. The Panel recommends that all new monitoring sites be installed at least 12 months in advance of the commencement of mining in the Stage 1 area to capture sufficient baseline information.

In regard to groundwater management, the Panel notes that DPE Water (DPE Water 2023) stated "*that the proponent develop a water management plan (WMP) including the construction & placement of new monitoring sites, frequency of monitoring, water quality analyte suites and trigger action response plan*" as a post-approval requirement. This requirement is at odds with the Aquifer Interference Policy (AIP) (DPI OoW 2012) recommendation to use project specific baseline data collected well in advance of project approval for numerical modelling predictions. The Panel supports the early construction of new groundwater monitoring bores as baseline data is critical to assess future shallow groundwater and GDE impacts.

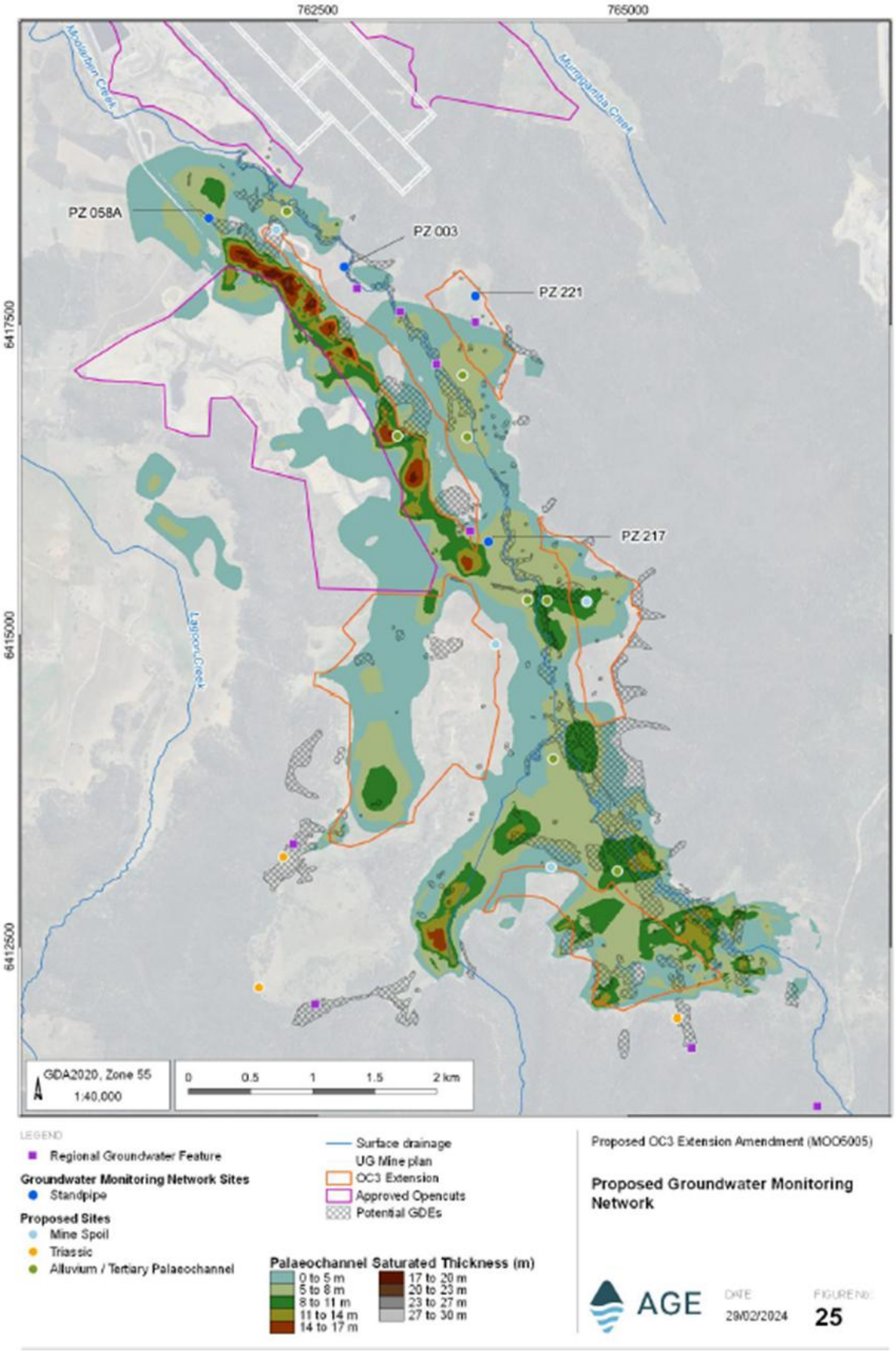

Figure 11: Groundwater Monitoring Network (Figure 25 from AGE 2024)

4.2.5. Numerical Modelling (project only and cumulative)

The AIP (DPI-OoW 2012) recommends impact assessment models be *"calibrated and validated against available baseline data that has been collected at an appropriate frequency and scale and over a sufficient period of time to incorporate typical temporal variations"* and for activities where more than minimal harm is expected, at least 24 months of baseline data is required. The Panel recommends in this instance that a minimum 12 months of baseline groundwater data is available given that the risk to GDEs and occasional stream baseflow (the only groundwater receptors within the extension project area) is unknown.

4.2.5.1. Calibration

The Panel notes there are minimal historical data sets available for model calibration in the extension project area and the existing monitoring sites may be influenced by recent mining activities in areas OC2 and OC3, although no discernible trends are evident (Yancoal 2024a). There are no monitoring locations beyond the southern boundary of the current OC3 mine area. The existing sites (as shown on Figure 11) are:

- One alluvial monitoring bore (PZ058A) located at the very northern end of the extension project area. This site does have continuous water level data since 2017 and was used for model calibration purposes.
- Three Ulan coal seam monitoring bores (PZ003, PZ217 and PZ221) located east of the current OC3 mine area. These sites have continuous water level data since 2005, 2018 and 2018 respectively.
- One discontinued nested site (PZ072a and PZ072c) (alluvium and Ulan Seam). Baseline water level data is available from 2006 to 2013.

Data from these sites is at best useful for assessing the depressurisation impacts of the current mining activities, however the data set does not provide sufficient spatial coverage to assess local groundwater impacts in the southern portion of the OC3 extension project area.

4.2.5.2. Predicted baseflow reductions

Peak modelled baseflow reductions at the end of mining range for Moolarben Creek, range from 0.7 ML/year to 8 ML/year (AGE 2024). However, the Panel's confidence in these predictions is low due to the regional scale of the conceptualisation and the lack of measured hydraulic and hydrologic data within the project area. The uncertainty analysis for baseflow predictions tests five scenarios which include the impacts of varied palaeochannel hydraulic conductivity, varied spoil hydraulic conductivity, increased recharge rates to the spoil plus one climate change scenario for drier climatic conditions. The tested range of palaeochannel hydraulic conductivity does not cover the full measured range of hydraulic conductivity. These uncertainty scenarios do not account for the uncertainty in the conceptualisation, groundwater saturation in the alluvium, recharge rates to the alluvium or the hydraulic properties of the alluvium.

The Panel recommends that the numerical model be updated once new aquifer parameter data is available from the enhanced groundwater monitoring network.

4.2.5.3. Drawdown Predictions

The amended project-only and cumulative drawdown contours (maximum predicted drawdown at the end of mining) for:

- The alluvial groundwater system (Figure 5 in AGE 2024) appears reasonable in extent and magnitude but there is no baseline data to verify the predictions. Given the localised extent of this groundwater system, there is no difference between project only and cumulative predicted drawdowns.

- Predicted drawdown of up to 5 m would effectively dewater the thin saturated zone in alluvium except potentially in the palaeochannel area where thicker sequences of saturated alluvium are known or expected.
- MCO maintains there will be no drawdown in the Triassic sandstone groundwater system as this system is perched everywhere across the model domain (Yancoal 2024b).
- The Panel does not accept this conceptualisation without there being actual monitoring data from several sites across the ridgeline areas of the Moolarben Creek catchment.
- The Ulan Seam – lower portion of the Permian groundwater system (Figure 7 in AGE 2024) appears unreliable at a local-scale as the predictions suggest no or negligible drawdown across the southern pits OC3_02, OC3_05 and OC3_06.

In the cumulative drawdown plot, the lack of historical drawdown shown for the Ulan seam in OC1, OC2 and OC3 areas is concerning. The Panel believes that the predicted cumulative drawdowns for the Ulan seam are probably underestimated for the OC3 expansion area. Even though drawdowns may be underestimated across this area there are negligible environmental consequences as there are no water supply bores or GDEs tapping this deeper groundwater system.

Regional cumulative impact predictions that account for nearby mining activities at Ulan and Wilpinjong Coal Mines have been taken into account and at a broad regional scale, the drawdown contours for the Ulan seam depressurisation appear reasonable and acceptable in the vicinity of the extension project area. No drawdown contours are presented for the Triassic sandstone groundwater system as it is considered perched and disconnected everywhere. This conceptualisation should be revisited once the Triassic sandstone monitoring locations are established, and impacts modelled and water level changes predicted, if there is likely hydraulic connectivity at distance.

To conclude, the Panel would agree with IESC advice that states:

> *8. The potential impacts to the groundwater resources occur at two scales: regional and local. The groundwater model selected is appropriate for understanding impacts at the regional scale, and cumulative impacts of multiple mine operations. At this scale, the assumptions adopted are reasonable and commensurate with the likely severity of potential impacts, and the model is capable of assessing the potential impact pathway of depressurisation through the coal seams.*
>
> *9. The groundwater model is not sufficient to make predictions at the local scale due to inadequate hydrogeological characterisation and deficiencies in the regional groundwater model. Due in part to a lack of reporting on the modelling calibration within the project area, confidence is limited in the model's ability to make meaningful predictions, including worst-case impacts on groundwater resources along the alluvium beneath Moolarben Creek.*

The Panel recommends a condition requiring revised numerical modelling within 12 months of the installation of new groundwater monitoring sites be included in the consent conditions.

4.2.6. Water Management Plan

The Moolarben Water Management Plan (WMP) applies to all MCO operations and is updated periodically as explained in Section 4.2 of Yancoal 2023. There are three primary appendices to the WMP; the site water balance, the surface water management plan and the groundwater management plan. The Panel has no comments on the site water balance.

4.2.6.1. Surface Water

The surface water management plan (SWMP) (Yancoal 2022) was updated in December 2022. Key objectives of the SWMP relate to: segregating clean water runoff, sediment water runoff, mine water and brine; minimising the volume of water generated; preferentially reusing mine and brine water; providing on-site storage to avoid unapproved discharges of water; treating of water for on-site use and discharging water in accordance with the Environmental Protection Licence (EPL) 12932.

The surface water TARPs described in the SWMP address performance criteria for: surface water quality monitoring, stream health monitoring, discharges outside of approved conditions and unauthorised water releases. The proposed trigger levels for water quality investigations are based on baseline water quality data for selected sites that are located to the north, downstream of the extension project area. There is some available water quality monitoring data for SW08 and SW09, which are both located within the extension project area, but the data from these sites is currently being compared to trigger levels for SW05, which is located north of OC1.

It is recommended that surface water TARPs are developed that specifically relate to the surface water monitoring planned in the vicinity of OC3. The Panel recommends that the SWMP is updated after 18 months of baseline data is collected at SW08 and SW09 so that recent data can be used to inform trigger levels for these surface water TARPs. This will allow investigations to be triggered when the surface water quality downstream of OC3 exceeds appropriate trigger levels.

4.2.6.2. Groundwater

The groundwater management plan (GMP) (Yancoal 2020) was last updated in 2020 with a minor review in November 2021. There are groundwater quality and groundwater level performance indicators and triggers listed in Section 8.1 of the GMP. These relate to the need for further investigation and response actions for potential impacts to quality and levels in the alluvial and Triassic sandstone aquifers across the site. It is these aquifers that sustain environmental assets. There are no triggers for the deeper groundwater systems.

For the current OC3 mine area, immediately to the north of the OC3 extension project, there is just the one alluvial monitoring site (PZ058A) with investigation trigger levels being:

- Salinity (EC) trigger level of 14765 µS/cm, and pH trigger outside of the range pH 2.8-4.7, and
- Low water level of 11.7 mbgl (RL 466.4mAHD).

Historic water levels have approached the low water level trigger in recent years (see Figure 12).

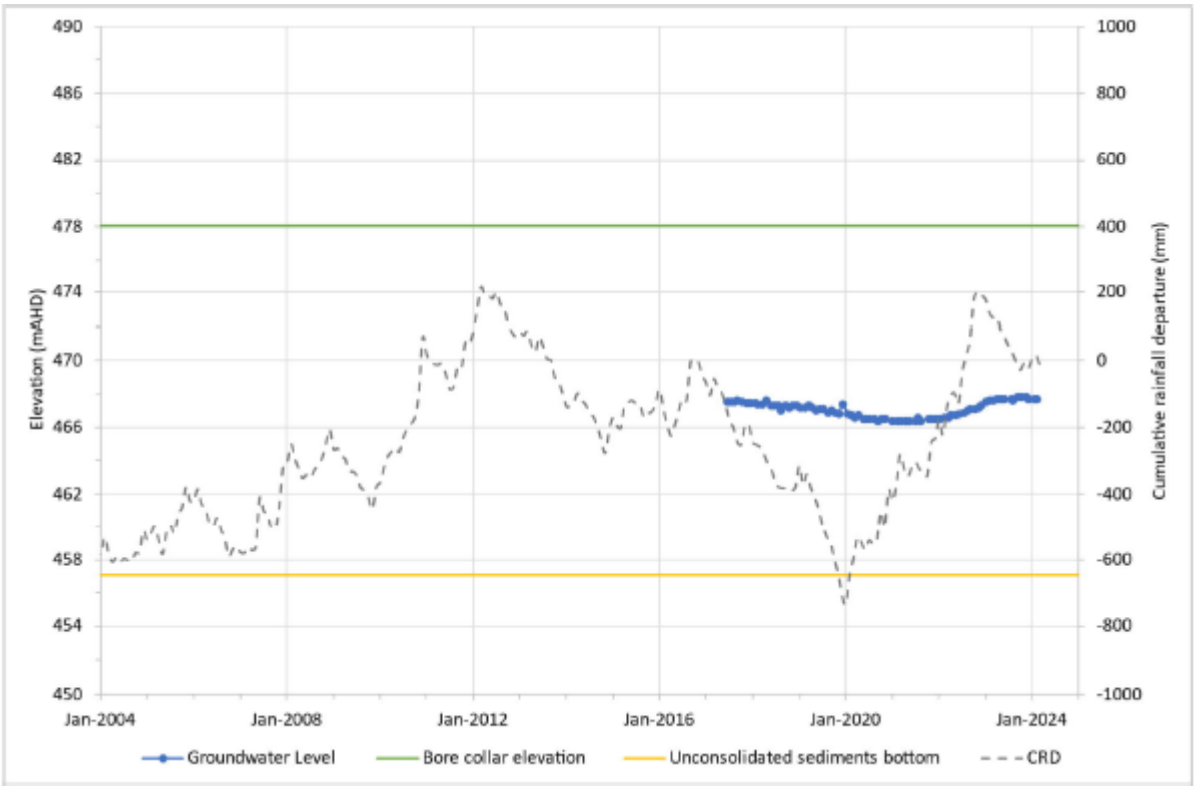

Figure 12: Hydrograph for alluvial monitoring bore PZ058A

This site and these triggers are of no use in protecting the (groundwater dependent) riparian terrestrial vegetation along Moolarben Creek. Additional alluvial standpipe locations need to be nominated as trigger locations and new TARPs for both water levels and water quality determined once sufficient baseline data is available to ensure there is sufficient saturation in the buffer zone areas of the creek alluvium and the palaeochannel area to sustain these GDEs. The Panel recommends that the GMP is updated after 18 months of baseline data is collected and available from the expanded alluvial monitoring bore network.

The potential for leachate discharges from the adjacent mine spoil areas also has the potential to impact alluvial groundwater levels, quality and the groundwater dependent ecosystems. Water quality TARPs are required for each of the spoil emplacement standpipes.

4.2.7. Surface Water and Groundwater Conclusions

The Panel agrees with the surface water assessments that reductions in runoff are expected to be small during mining operations and, post mining, are not predicted to have a discernible impact on the frequency of flow events and flow volumes within Moolarben Creek downstream of the extension project.

Rainfall and periodic medium to high stream flows within Moolarben Creek and Murdering Creek recharge and maintain the shallow groundwater in the alluvium. It is this shallow groundwater system that sustains riparian vegetation along the valley floor, primarily within the 200m buffer area surrounding Moolarben Creek.

Groundwater drawdown will occur in alluvial, Permian overburden and Ulan seam groundwater systems located beneath and immediately adjacent to each of the open cut pits. The Panel considers there is a moderate to high risk that shallow groundwater could be dewatered or become ephemeral in some alluvial areas along Moolarben Creek, thereby reducing the volume of groundwater available for riparian vegetation.

Other GDEs are likely to occur at slightly higher elevation at the base of the Triassic sandstone where there is a contact with the underlain Permian overburden and where groundwater is discharging as seeps and springs. This groundwater is conceptualised as being perched groundwater and unlikely to be affected by mining. This maybe the case close to the spring discharge areas but there could be hydraulic connection at distance with the deeper Permian groundwater systems. The Panel does not accept this conceptualisation without there being actual monitoring data from several sites across the ridgeline areas of the Moolarben Creek catchment.

The current groundwater and surface water monitoring network and data sets are not sufficient for assessing potential impacts of mining operations across and immediately adjacent to the OC3 extension area. The gaps in water monitoring data have led to assumptions being made for the conceptual and numerical models which cannot be fully supported by the Panel at this time. These data gaps and assumptions have implications for the predictions made about drawdown and potential impacts on terrestrial GDEs. Additional groundwater monitoring which includes at least a 12-month period of baseline monitoring, is required to further assess the potential risk to GDEs. This should be conditioned in the consent conditions if the extension project is approved.

There are no cumulative groundwater drawdown impacts predicted for either the alluvial or Ulan seam groundwater systems arising from nearby mining activities at Ulan and Wilpinjong Coal Mines that will increase the risk to groundwater receptors including GDEs.

4.2.8. Surface Water and Groundwater Recommendations

The Panel recommends that MCO:

Geology and hydrogeological conceptualisation

- Investigate alternative monitoring bore sites in the Triassic sandstone ridgeline areas to the south-west and south of the extension area if access is problematic due to access difficulties.
- Confirm the palaeochannel profile, lateral extent and alluvial sediment depth in the extension area by drilling or surface geophysics, and establish extra monitoring bores.
- Update the hydrogeological conceptualisations presented in Yancoal 2025a once new monitoring locations are installed to provide accurate (rather than estimated) representations of all groundwater systems (including perched groundwater) in the extension project area.
- Prepare a detailed schematic of surface water and groundwater connectivity in the vicinity of Moolarben Creek, the palaeochannel and the local alluvial groundwater areas once new site data is available.

Numerical modelling

- Update and recalibrate the groundwater model within 18 months of site-specific data being available for the extension project area.
- Provide predicted drawdown impacts for the Triassic sandstone groundwater system.

Water monitoring networks and plans

- Establish the new proposed surface water monitoring sites (as recommended in Yancoal 2022) as soon as practicable in 2025. This will include:
    - one new site on Murdering Creek upstream of the extension project area,
    - relocation of existing site SW09 further upstream on Moolarben Creek as mining progresses,
    - monthly observations of flow in SW08 and SW09, and
    - monitoring of licensed discharge sites and major water storages within the extension area.
- Develop water quality TARPs for the surface water monitoring sites located within Moolarben Creek and Murdering Creek.
- Install the proposed groundwater monitoring network (as presented in AGE 2022 and AGE 2024) in the coming months and so as to be fully operational as early as practicable in 2025. Sites to include:
    - 8 alluvial standpipes to monitor water levels and water quality in the alluvium/palaeochannel,
    - 4 standpipes to monitor water levels and water quality in spoil emplacement areas, and
    - 3 shallow VWPs into the Triassic sandstone.
- Install additional groundwater monitoring bores in combination with the proposed groundwater monitoring network for improved conceptualisation and a better understanding of the connectivity of the different groundwater systems and surface water flows. Additional sites to include:
    - Several nested monitoring (standpipe) sites that are paired with alluvial monitoring sites in the Moolarben Creek buffer zone to monitor water levels in the deeper Permian overburden (if present) and/or Ulan coal seam,
    - A deeper VWP sensor in the Permian overburden at two of the three Triassic sandstone monitoring sites to monitor regional groundwater depressurisation, and
    - Monitoring of the nine 'regional groundwater features' shown Figure 11. For those features that are springs, monitoring of flow, field water quality, and the composition/health of any dependent vegetation.
- Update the groundwater management sub-plan within 18 months of the installation of the new monitoring bores, and include:
    - at least two of the new alluvial monitoring locations as water level and water quality trigger locations, and use baseline monitoring data from the first 12 months to determine new trigger water levels and water quality thresholds, and

- at least one of the standpipes in one of the soil emplacement areas as a water level and water quality trigger location with appropriate triggers to protect baseflow/sub-surface flow and quality from poor waste rock leachate discharges.

The Panel recommends that should the project be approved, the consent conditions include provision for:

- Ensuring that the surface water monitoring network recommended in the Surface Water Management Plan (Yancoal 2022) and the groundwater monitoring network recommended in AGE 2022 and AGE 2024 is fully operational by the end of 2025.
- The groundwater monitoring network to be supplemented by additional nested groundwater monitoring locations within the Moolarben Creek buffer zone and ridgeline areas as recommended above.
- Requiring that the water management plan (including the surface water and groundwater sub-plans) be updated within 18 months of installing the new networks, and new water level and water quality TARPs be developed for key monitoring sites.
- Ensuring that the nine 'regional groundwater features' identified in AGE 2022 are included as part of the GDE monitoring program.
- Requiring an update of the groundwater model within 12 months of establishing the expanded groundwater monitoring network using site specific data to improve groundwater drawdown predictions in the vicinity of the extension project.

4.3. GREENHOUSE GAS EMISSIONS

4.3.1. Basis of Advice

The Department requested advice from the Panel in relation to the OC3 extension project (SSD 33083358). For the GHG component it requested advice on "GHG assessment including avoidance and mitigation measures proposed to minimise Scope 1 and Scope 2 emissions".

Scope 2 emissions relate to electrical power consumption for the coal handling and preparation plant. The Panel understands that there will be no significant increase in production for the OC3 extension project over current production, and Scope 2 emissions are not projected to increase above current levels. This advice is therefore limited to Scope 1 emissions (fugitive and diesel).

From the original GHG assessment in the EIS (2022) and in response to submissions arising from exhibition of the project, the mine footprint and ROM tonnage was revised downward (from approximately 40 Mt to 30 Mt), and accordingly the GHG emission estimates were reduced.

The total Scope 1 emissions over the life of the amended project are estimated to be 0.49 Mt CO2-e which is an average of 0.047 Mt CO2-e per year (from Table 4, Appendix J of the Amendment Report, November 2023). This equates to an emissions intensity of 0.0158 t CO2-e/t ROM coal.

The great majority of estimated Scope 1 emissions are from diesel machinery (~72%) with fugitive emissions being relatively minor, at ~6% (see Table 3). The balance of emissions (attributed to oil, grease, explosives, land clearance) account for 23%.

Table 3. Scope 1 Estimated Emissions for the Project
(source: Table 5, Appendix J of the Amendment Report, November 23)

CO2-e Emissions for Amended Project (kt CO2-e)				
Year	**Mt ROM Coal**	**Fugitive**	**Diesel**	**Other***
2025	2.9	2.6	33.1	10.7
2026	5.0	4.5	54.2	11.5

2027	8.5	7.6	89.7	12.7
2028	1.5	1.4	19.2	10.2
2029	1.9	1.7	23.1	10.3
2030	1.8	1.6	21.7	10.3
2031	2.2	1.9	25.4	10.5
2032	2.2	2.0	25.7	10.5
2033	2.2	2.0	25.9	10.5
2034	1.6	1.4	19.4	10.2
Em. Intensity (t CO2-e/t ROM coal)		***0.0009***	***0.011***	

* Oil, grease, explosives, land clearance

The fugitive and diesel emissions are directly proportional to ROM coal tonnage.

Todoroski Air Services (TAS) undertook the amended calculations in Appendix J of the Amendment Report (2023) using the same methodology in their Greenhouse Gas Report (Appendix J, EIS 2022) of the EIS.

4.3.2. Fugitive Emissions

4.3.2.1. Underpinning Information

Australia has been estimating and reporting fugitive Greenhouse Gas (GHG) emissions from its open cut coal mines since the early 1990's, first utilising tiered CO_2 equivalent (CO_2-e) emissions factors at global, country, state and basin levels assigned to coal production tonnages. Although the emissions factors by state were continually updated, the variability in gas contents *in-situ* within basins and between coalfields, mining leases and coal seams prompted a move towards measurement and determination to develop gas-in-place models to inform estimated emissions against production on an annual basis. The *National Greenhouse and Energy Reporting (NGER) (Measurement) Determination 2008* was designed to report within the context of the *National Greenhouse and Energy Reporting Act* 2007, and it has been updated annually to reflect updates to emissions factors, improvements to estimation methods and responses to consultation feedback[5]. The administration of the NGER falls under the Australian Government Clean Energy Regulator (CER).

Companies are still permitted to utilise a state-based emission factor for methane (Section 3.2 of the NGER Measurement Determination) multiplied by the annual production tonnes, but MCC has elected to report against in-situ estimations. This approach is based on in-situ gas modelling. The Panel concurs that this is the more appropriate methodology for the given circumstances,

Typical reporting activities based on CER 2024 guidelines for site specific in-situ gas modelling are[6]:

- Run-of-Mine (ROM) coal production,
- Gas volumes in mined areas that intersect gas bearing strata with a density of ≤1.95 g/cm^3 (or t/m^3) which is based on in-situ gas sampling and gas modelling, and
- An estimation of uncertainty on parameters.

Good practice NGER reporting in coal mining has the following guiding principles:

[5] (https://cer.gov.au/schemes/national-greenhouse-and-energy-reporting-scheme/report-emissions-and-energy/amendments).
[6] For NGER Methods 2 and 3

- Transparency
- Comparability
- Accuracy
- Completeness.

Evaluation against NGER must cover the following requirements:

1. Assessment of data for completeness, representation and lack of bias. It is stipulated that there needs to be at least 3 boreholes in each domain covering the range of overlying gas bearing strata and below the seam floor to 20 m;
2. Errors must be avoided in gas sampling and testing, e.g. equipment leakage or heat affected areas;
3. There should be elimination of any "false" or contaminated data sets;
4. The determination of gas domains uses all data (historical and NGER specific);
5. Assessment of volumes should take a modelling approach, which is unbiased and well documented with a full geological model, even for unmineable seams- i.e. assignment of gas to all strata ≤1.95 g/cm^3;
6. Estimates must include pit floor gas assessment (but this is only estimated in the year of production and excluded from the next cut);
7. When applicable, establishment of "low gas zones" as per section 3.25C of NGER. This needs to be fully explained and justified with substantial information around how it was assigned and modelled;
8. The competency of the estimator needs to be established.

4.3.2.2. Seams and Depth of Cover

Gas bearing strata for the purposes of NGER are primarily confined to the Ulan seam. Coal reserves within the project area are confined to the Ulan seam[7]. Overlying seams (Moolarben, Glen Davis, Irondale Lower) are poorly developed and excluded. The Ulan seam typically ranges from 2.5 to 7.5m in thickness (EIS 2022). The mined coal excludes a "waste" section near the top of the seam (see Figure 13 – Ulan Seam Mined). There are no gas sources below the pit floor.

[7] Attachment 12 JORC Summary, EIS 2022

Depth of cover for the Ulan Seam varies from 10 m to 70 m in the OC3 Project proposed mining area.

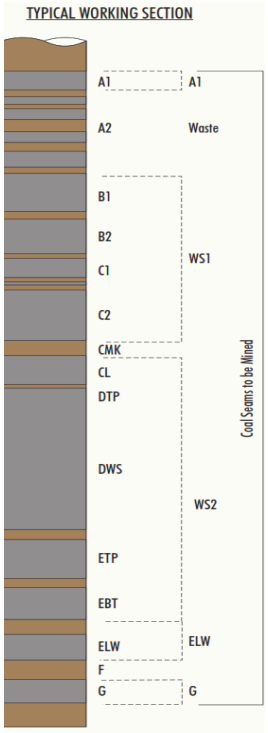

Figure 13: Ulan Seam Mined Sections

4.3.2.3 Emission Calculations

TAS state[8] they have undertaken emissions calculations in accordance with Method 2 of the NGER. No details are provided of the calculation or input data, in particular, gas content and composition.

Incomplete report data provided by MCC shows some analysis of gas content and composition[9]. Two methods of gas content testing were used – the fast desorption and the slow desorption method[10]. They produced similar results for gas content and composition, provided the latter is calculated on an air and N_2 free basis[11].

The Panel back calculated the gas content based on the emission data in Table 3. Using a CH_4 concentration of 1.5%, balance CO_2 and making an allowance of 10% for coal (waste) additional to the ROM tonnage, a gas content of ~0.5 m^3/t matched the TAS emission calculations. This value is close to the mean for the actual gas content tests as tabulated in information provided by MCC.

Gas content measurement is difficult at the low gas contents reported by MCC. The Panel's experience from low gas content testing elsewhere is they are most likely over-estimated -– i.e. it is likely the reported emissions are conservative possibly by as much as 100%.

Given the back calculation provides a plausible gas content value (both for MCC and regionally), the fugitive emission estimates appear to have been adequately carried out, albeit without sufficient detail provided to confirm they were calculated in accordance with NGER.

[8] Report "Greenhouse Gas Calculations" October 2022 attached to Appendix J of the EIS
[9] Actual gas content test reports have not been provided to the Panel
[10] The fast method produces a result in ~1.5 hours while the slow method can take up to three months to obtain a result
[11] The slow desorption method showed a high proportion of N_2 which is almost certainly an artifact of the test.

4.3.3. Diesel Emissions

The Panel notes the diesel emission data provided by MCC in Table 1. Diesel consumption is reported to account for 72% of Scope 1 emissions (Table 3) associated with the Moolarben OC3 Extension Project. MCO's assessment of diesel GHG emissions in the EIS is supported by a GHG calculations report by TAS (2022), a peer review undertaken by GHD (Blyth 2022) and calculations for the Amendment Report (TAS 2023). The Panel considers that the content of these three documents satisfactorily canvases the contribution of diesel emissions associated with the extension project and the options to mitigate these emissions.

The Panel concurs with the conclusions that:

1. The shallow depth of cover and the low overburden stripping ratio result in a low diesel GHG emissions factor by surface coal mining industry standards.

2. There are few options currently available to mitigate diesel GHG emissions other than:
    - to optimise mine plans and schedules to minimise haul distances and re-handle,
    - maximising equipment utilisation/productivity and mining yields,
    - maintaining or improving equipment to maximise fuel efficiency and consideration of fuel efficiency when procuring new or replacement equipment, and
    - undertaking monthly monitoring of fuel consumption.

The Panel notes that these mitigation measures are already in place in efficient mining operations as they are motivated by minimising production costs. MCO reports that '*it would consider updating these measures where necessary, in particular maximising the fuel emissions in mobile fleet items to reduce emissions from diesel usage*.' It also states that it *'would investigate the potential to replace standard diesel fuel with biodiesel fuel subject to ensuring that engine warranties, efficiencies or maintenance requirements are not compromised*'.

The peer reviewer (Blyth 2022) has advised that *'due to the proposed life of the project being only 10 years (from about 2025 to 2034) the option for electrification of the mine fleet is not considered feasible due to the lack of battery electric mobile equipment currently available at the required scale plus the short project life available for a return on capital'*. In the fluid and variable working environments associated with surface coal mining, it is widely considered that hybrid battery/diesel power sources currently offer the greatest potential to reduce GHG emissions from mobile mining fleets. This technology has yet to reach proof of concept stage, and it is likely to be some years before it is technologically and commercially ready for implementation. Hence, the Panel concurs with the peer reviewer's assessment as to the availability of equipment. However, if the equipment subsequently finds application at other internal or external sites after the cessation on mining in OC3, then the return on capital may not prove to be such a constraint.

4.3.4. Mitigation

For fugitive emissions, the very low gas environment negates any ability for mitigation.

In relation to any potential mitigation measures against diesel emissions, the Panel has been advised that the OC3 Extension Project is effectively a continuation of the current mining operations. As a result, the mine has no plans for any major new capital investment in replacement equipment or technology with regard to the haul fleet. Consequently, it is the Panel's view that there are no significant or practical mitigation measures available to the Project through investment in any new or emerging haulage technologies.

The mine's greenhouse gas emissions intensity is among the lowest in the coal mining industry. It is well below the industry average and will generate Safeguard Mechanism Credits for most of the project life.

4.3.5. Greenhouse Gas Minimisation Plan

The greenhouse gas minimisation plan (GHGMP) was last updated in November 2021 (according to data provided and the downloadable plan on MCO's website). It was created prior to the OC3 extension submissions and is confined to underground mining.

The GHGMP needs to be updated and extended to include both underground and open cut mining with an assessment covering the life of mine, including the OC3 extension to 2034.

Given the low gas content of the coal (~0.5 m^3/t), the shallow overburden depth (<70 m) and relatively short life of mine (2034), the Panel agrees with the view that there are unlikely to emerge any material improvements to the emission projections over the project lifetime.

The plan should include:

1. MCC's projected emissions intensity (EI) against the Safeguard mechanism baseline. For the duration of the project, the EI falls below the industry average, but with the earned Safeguard Mechanism Credits progressively reducing as MCC's EI is increased by including a greater proportion of industry average EI over time (Figure 14 - MCC presentation document to IEAPM 9/5/24). The GHGMP should take into account during review periods, any effect on MCC through potential changes in the Safeguard baseline due to legislation and the industry average EI performance over time.

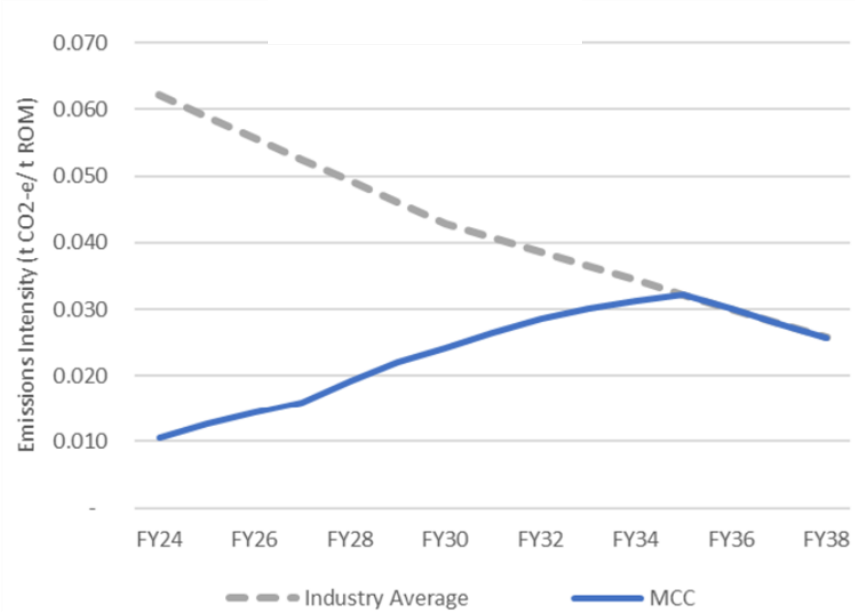

Figure 14: Effect of the Industry Safeguard Mechanism Baseline on MCC Emissions Intensity

2. Monitoring and reporting of the GHG emission breakdown. This especially applies to diesel emissions, the category with the largest proportion of Scope 1 emissions (refer items in section 4.3.1).
3. Review the potential for reduction in GHG emission in any of these categories with a view to implementation if feasible.

4.3.6. GHG Conclusions - Fugitive Greenhouse Gas Emissions

- The advice is limited to Scope 1 emissions. The great majority of these emissions are from diesel machinery (~72%). Due to the low gas content of the coal, fugitive emissions make up only ~6%

of the total. Check calculations by the Panel confirmed the low level of fugitive emissions. The balance of Scope 1 emissions (23%) is attributed to oil, grease, explosives and land clearance.
- The EIS and associated documentation satisfactorily canvas the contribution of diesel emissions associated with the extension project and the options to mitigate these emissions.
- There is little that can be done at present to mitigate diesel GHG emissions. They are a product of combustion for which no viable technology is available or emerging to mitigate the emissions prior to their release directly to atmosphere.
- Marginal benefits may be obtained from using higher quality fuels and additives.

4.3.7. GHG Recommendations

- If the Expansion Project is to be approved, as a matter of consistency and to cover for any currently unforeseen changed circumstances going forward, the Department should consider including an approval condition that requires MCO to:
    - Immediately update its formal Greenhouse Gas Minimisation Plan (GHGMP), and
    - Undertake a review of the GHGMP every three years as part of a report that is peer reviewed by a party approved in writing by the Secretary and which details:
        - the international status of technologies that provide the opportunity to reduce diesel GHG emissions at MCO, and
        - the status of initiatives by MCO to implement technologies for avoiding fossil fuel emissions.

4.4. BLAST VIBRATION – GEOTECHNICAL IMPACTS

The Panel has considered the impact of blasting in the proposed OC3 Extension mining areas, in particular with respect to the potential impact of blasting and blast vibration on surrounding sensitive geological features (including mapped rocky habitat areas).

The Panel notes that MCO has undertaken a number of studies in relation to this issue and these are summarised in Appendix H (Noise and Blast Impact Review) and Appendix I (Blast Vibration Impact Assessment) of the OC3 Extension Project Amendment Report. This work has included a LiDAR survey of the surrounding rocky outcrops around much of the perimeter of the mining areas; together with a geotechnical stability assessment of cliffs and rocky outcrops and overhangs; and an assessment of potential blast vibration impacts on such geological structures.

Arising from these studies, MCO has concluded that they will adopt an upper limit of 50 mm/s PPV for blast vibration in the vicinity of the rocky outcrops that represent known or potential habitat areas. MCO notes the following points:

> *"MCO would prepare an updated or new Blast Management Plan detailing planned implementation of appropriate mitigation and management measures to comply with the conservative vibration upper limit of 50 mm/s PPV (unless further geotechnical investigation supports a higher value)".*

The Panel supports this approach of adopting an upper limit of 50 mm/s PPV in the vicinity of the rocky outcrops and has requested further information on the nature and extent of the proposed blast vibration monitoring program in order to ensure that the 50mm/s limit is not exceeded in any critical rock formations or habitat areas; and to ensure that there is no negative impact on these geological structures as a result of blast vibrations.

4.4.1. Blast Vibration – Geotechnical Impacts Conclusions

An upper limit of 50 mm/s PPV in the vicinity of the rocky outcrops is considered by the Panel to be reasonable, provided it is supported by an effective blast vibration and impact monitoring program. The

Panel believes a cautious approach should be taken to any consideration to increase this upper limit based on further geotechnical investigations, as referenced by MCO. Should MCO proceed down this investigation route to justify an increased upper limit then the Panel believes that the issue should be referred back to the Department for approval and would require such an argument to be supported by comprehensive relevant site-specific data. Prior to any change being approved to the 50 mm/s upper limit.

4.4.2. Blast Vibration – Geotechnical Impacts Recommendations

Should the project be approved, conditions of approval should set an upper limit of 50 mm/s PPV when blasting in the vicinity of rocky outcrops.

5.0 SUMMARY CONCLUSIONS

5.1. BIODIVERSITY IMPACTS

- The proponent has met the requirements of the LLS Act and BC Act to demonstrate that large portions of the site support low conservation value grassland and are thus eligible to be mapped as Category 1 land. It is suitable and appropriate that these areas are excluded from the assessment of the impacts of any clearing of native vegetation and loss of habitat as per Section 6.8 of the BC Act.
- To result in a SAII, it is necessary to demonstrate that any impact is likely and will contribute significantly to a species or community becoming extinct. This is a high bar and does not consider the risk cumulative impacts and projects present to risk of extinction. Given the concept of SAII *"is fundamentally about protecting threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities"* (DPIE 2019, p.1) the Panel questions whether the current framework is achieving its aims.
- The project will result in impacts to both the Box Gum Woodland CEEC and mapped important habitat for the Regent Honeyeater. The Panel does not view that these impacts will contribute "significantly" to the risk of extinction and the Panel concludes that the project will not result in SAII for the Box Gum Woodland CEEC or Regent Honeyeater.
- Blasting has potential to impact on known roosting and potential breeding habitat for cave dwelling bats. Amendments to the bat monitoring program, proposed as a part of the blast management pan, are required to sufficiently address these impacts.
- The ability to apply additional measures to avoid and minimise impacts are, in the opinion of the Panel, limited within the current design. That said, two key areas where avoidance may be feasible and warranted include areas of Stage 1 and Stage 3.

5.2. SURFACE/GROUNDWATER ISSUES

- Reductions in runoff are expected to be small during mining operations and, post mining, are not predicted to have a discernible impact on the frequency of flow events and flow volumes within Moolarben Creek downstream of the extension project.
- Groundwater drawdown will occur in alluvial, Permian overburden and Ulan seam groundwater systems located beneath and immediately adjacent to each of the open cut pits. The Panel considers there is a moderate to high risk that shallow groundwater could be dewatered or become ephemeral in some alluvial areas along Moolarben Creek, thereby reducing the volume of groundwater available for riparian vegetation.
- Other GDEs are likely to occur at slightly higher elevation at the base of the Triassic sandstone where there is a contact with the underlain Permian overburden and where groundwater is discharging as seeps and springs. This groundwater is conceptualised as being perched groundwater and unlikely to be affected by mining. This maybe the case close to the spring discharge areas but there could be hydraulic connection at distance with the deeper Permian groundwater systems. The Panel does not accept this conceptualisation without there being actual monitoring data from several sites across the ridgeline areas of the Moolarben Creek catchment.
- The current groundwater and surface water monitoring network and data sets are not sufficient for assessing potential impacts of mining operations across and immediately adjacent to the OC3 extension area. These data gaps and assumptions have implications for the predictions made about drawdown and potential impacts on terrestrial GDEs. Additional groundwater monitoring which includes at least a 12-month period of baseline monitoring, is required to further assess the potential risk to GDEs.
- There are no cumulative groundwater drawdown impacts predicted for either the alluvial or Ulan seam groundwater systems arising from nearby mining activities at Ulan and Wilpinjong Coal Mines that will increase the risk to groundwater receptors including GDEs.

5.3. FUGITIVE GREENHOUSE GAS EMISSIONS ISSUES

- The advice is limited to Scope 1 emissions. The great majority of these emissions are from diesel machinery (~72%). Due to the low gas content of the coal, fugitive emissions make up only ~6%

of the total. Check calculations by the Panel confirmed the low level of fugitive emissions. The balance of Scope 1 emissions (23%) is attributed to oil, grease, explosives and land clearance.

- The EIS and associated documentation satisfactorily canvas the contribution of diesel emissions associated with the extension project and the options to mitigate these emissions.
- There is little that can be done at present to mitigate diesel GHG emissions. They are a product of combustion for which no viable technology is available or emerging to mitigate the emissions prior to their release directly to atmosphere.
- Marginal benefits may be obtained from using higher quality fuels and additives.

5.4. BLAST VIBRATION - GEOTECHNICAL IMPACTS

- An upper limit of 50 mm/s Peak Particle Velocity (PPV) in the vicinity of the rocky outcrops is reasonable, provided it is supported by an effective blast vibration and impact monitoring program.
- Should MCO seek to increase this upper limit, the Panel considers the issue should be referred back to the Department for approval and would require such an argument to be supported by comprehensive relevant site-specific data prior to any change being approved, including further geotechnical investigations, as referenced by MCO.

6.0 SUMMARY RECOMMENDATIONS

6.1. BIODIVERSITY IMPACTS

- The process of mapping low conservation value grassland and defining these areas a Category 1 land would benefit from clarity around key areas, including whether the process outlined in DPE (2022), of requiring a site-based assessment of CEECs, aligns with the requirements of the LLS Act that only areas mapped by the Environment Agency Head are eligible to be listed as Category 2 land.
- DCCEEW consider whether the current SAII assessment process is achieving its aims of "protecting threatened species and threatened ecological communities that are most at risk of extinction from potential development impacts or activities" (DPIE 2019, p.1).
- The Minister may wish to seek rehabilitation of 401.12 ha of Box Gum Woodland in addition to offsets required. This approach would ensure that the project does not result in a reduction in geographic range of the CEEC or the further environmental degradation or disruption of biotic processes for the CEEC. The improved management of 32.6 ha and rehabilitation of 75.5 ha of Box Gum Woodland within the Habitat Enhancement Areas should count towards this goal.
- The Panel recommends that impacts to and offsets for the Regent Honeyeater ought to be determined based on site-based assessment rather than mapped important areas derived from less accurate regional vegetation mapping products.
- The restoration of 134.7 ha of habitat within the Habitat Enhancement Areas be required to be completed within 5 years to ensure this contributes to the recovery of the Regent Honeyeater.
- A TARP for blasting activities be developed, and that this includes:
    - a performance measure to ensure no disturbance of bats occupying maternity roosts during the breeding season (if identified) or bats in torpor,
    - a performance indicator for this PM which is based on no bat activity recorded at the roost entrance immediately following a blast,
    - a process for measuring damage and behavioural disturbance at vibration levels of less than 50 mm/s to ensure impacts are managed prior to occurring,
    - a baseline monitoring program which includes inspections of likely habitat to identify if any additional roosts are present and determine if any roosts are being utilised as maternity roosts,
    - monitoring of microbat activity be undertaken during blasting, accompanied by measurements of vibration at roost sites,
    - pre and post-blasting inspections be undertaken to confirm no damage to rocky habitat and roosts has occurred, and
    - adaptive management measures should either the physical damage or behavioural performance measures be exceeded.
- The Department and/or the Independent Planning Commission (IPC) may wish to determine whether further avoidance of impacts in Stages 1 and 3 are warranted to avoid impacts to Box Gum Woodland and habitat for threatened species.

6.2. SURFACE/GROUNDWATER ISSUES

Should the project be approved, the Panel recommends that the consent conditions should include provision for:

- Ensuring that the surface water monitoring network recommended in the Surface Water Management Plan (Yancoal 2022) and the groundwater monitoring network recommended in AGE 2022 and AGE 2024 is fully operational by the end of 2025.
- The groundwater monitoring network to be supplemented by additional nested groundwater monitoring locations within the Moolarben Creek buffer zone and ridgeline areas as recommended below:
    - several nested monitoring (standpipe) sites that are paired with alluvial monitoring sites in the Moolarben Creek buffer zone to monitor water levels in the deeper Permian overburden (if present) and/or Ulan coal seam,

    - a deeper VWP sensor in the Permian overburden at two of the three Triassic sandstone monitoring sites to monitor regional groundwater depressurisation, and
    - monitoring of the nine 'regional groundwater features' shown Figure 25 of AGE 2024. For those features that are springs, monitoring of flow, field water quality, and the composition/health of any dependent vegetation.
- Requiring that the water management plan (including the surface water and groundwater sub-plans) be updated within 18 months of installing the new networks, and new water level and water quality TARPs be developed for key monitoring sites.
- Requiring an update of the groundwater model within 12 months of establishing the expanded groundwater monitoring network using site-specific data to improve groundwater drawdown predictions in the vicinity of the extension project.

Further detailed recommendations are provided in Section 4.2.8. These are mostly fine detail for MCO's consideration.

6.3. FUGITIVE GREENHOUSE GAS EMISSIONS ISSUES

If the Expansion Project is to be approved, as a matter of consistency and to cover for any currently unforeseen changed circumstances going forward, the Department should consider including an approval condition that requires MCO to:

- immediately update its formal Greenhouse Gas Minimisation Plan (GHGMP).
- undertake a review of the GHGMP every three years as part of a report that is peer reviewed by a party approved in writing by the Secretary and which details:
    - the international status of technologies that provide the opportunity to reduce diesel GHG emissions at MCO, and
    - the status of initiatives by MCO to implement technologies for avoiding fossil fuel emissions.

6.4. BLAST VIBRATION – GEOTECHNICAL IMPACTS

Should the project be approved, conditions of approval should set an upper limit of 50 mm/s PPV when blasting in the vicinity of rocky outcrops.

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APPENDIX A – DPHI REQUEST FOR PANEL ADVICE

Department of Planning, Housing and Infrastructure

Emeritus Professor Jim Galvin
Chair - Independent Expert Panel for Mining

By email: j.galvin@bigpond.net.au

Dear Prof Galvin

Request for Advice

Moolarben OC3 Extension Project SSD 33083358

I am writing to you to request advice from the *Independent Expert Panel for Mining* (the Panel) in relation to the Moolarben OC3 Extension Project SSD 33083358 (the project). The Department is currently undertaking a detailed assessment of the project, in consultation with other key government agencies and in consideration of advice received from the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC).

To assist in the assessment of the project, the Department requests advice from the Panel on the scale, likelihood, and consequences of biodiversity, surface water, groundwater and greenhouse gas impacts.

Moolarben Coal Operations Pty Ltd (MCO) is proposing 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 tenements.

MCO submitted an environmental impact statement (EIS) in late 2022. The application was placed on public exhibition in November 2022 and referred to the IESC in December 2022. The Department received advice from all relevant government agencies and the IESC.

In response to issues and advice received during the exhibition of the project and from the IESC, MCO have amended the project primarily to reduce the surface disturbance footprint compared to the original project. The changes as well as other responses to issues and advice are documented in an Amendment Report and Submissions Report, which were lodged in March 2024.

A copy of the EIS, Submissions Report, Amendment Report and relevant background documents are provided as attachments to this letter and available on the department's website.

The extended and new open cut pits are located in proximity to the Munghorn Gap Nature Reserve and within 200 metres of Moolarben Creek and Murdering Creek. The amended project comprises a surface disturbance footprint of approximately 675 hectares (ha) including approximately 480 ha of native vegetation which includes Box-Gum Woodland Critically Endangered Ecological Community (CEEC) and Regent Honeyeater habitat.

In this context, the Department requests that the Panel provide advice targeting the following:

- The scale and likelihood of potential biodiversity impacts, including:
  - Advice to inform the Department's consideration of serious and irreversible Impacts (SAII) under the *NSW Biodiversity Conservation Regulation 2017*.

- Advice regarding indirect impacts to biodiversity within the Munghorn Gap Nature Reserve and on SAII entities including threatened bat species and Broad-headed snake habitat.

- The scale and likelihood of potential water-related impacts and environmental consequences on key water features in the vicinity of the project including:
  - drawdown and impacts to groundwater dependent ecosystems in the Moolarben Creek alluvium and impacts to the wider Moolarben Creek catchment, having regard to the advice provided by the IESC and
  - cumulative groundwater impacts from nearby mining activities at Ulan and Wilpinjong Coal Mines.
- GHG assessment including avoidance and mitigation measures proposed to minimise Scope 1 and Scope 2 emissions.

It would be appreciated if the Panel can provide its advice by 24 May 2024, subject to any additional information requirements that may be requested by the Panel.

The Department can arrange a briefing for the Panel as soon as practicable and to provide any further information or assistance required by the Panel. The Department can also arrange a briefing with MCO and its consultants, or a site visit if this assists in the review. Please contact Jack Turner on 9995 5387 or at jack.turner@planning.nsw.gov.au

Yours sincerely,

5/04/2024

Steve O'Donoghue
Director Resource Assessments

Attachments:

Environmental Impact Statement

1. Environmental Impact Statement
2. Environmental Impact Statement – Appendix A (Groundwater Assessment)
3. Environmental Impact Statement – Appendix B (Surface Water and Flooding Impact Assessment)
4. Environmental Impact Statement – Appendix C (Biodiversity Development Assessment Report)
5. Environmental Impact Statement – Appendix J (Greenhouse Gas Assessment)
6. Environmental Impact Statement – Appendix S (Groundwater Dependent Ecosystem Assessment)

Agency advice

7. Water Group advice on EIS
8. Biodiversity, Conservation and Science Directorate and National Parks and Wildlife Service advice on EIS
9. Climate and Atmospheric Science Group advice on EIS
10. IESC Advice

Submissions Report

11. Submissions Report

Amendment Report

12. Amendment Report
13. Amendment Report – Appendix A (Updated Project Description)
14. Amendment Report – Appendix B (Updated Summary of Mitigation Measures)
15. Amendment Report – Appendix C (Updated BDAR)
16. Amendment Report – Appendix D (SAII Expert Reports)
17. Amendment Report – Appendix F (Groundwater Review)
18. Amendment Report – Appendix G (Surface Water Review)
19. Amendment Report – Appendix J (Air Quality and GHG Addendum Report)

All documentation is available on the Department's website at:
https://www.planningportal.nsw.gov.au/major-projects/projects/moolarben-oc3-extension-project

APPENDIX B – PANEL BIOGRAPHY

Emeritus Professor Bruce Hebblewhite (Moolarben OC3 Extension Panel Chair)

Bruce Hebblewhite is an Emeritus Professor and was formerly the Professor of Mining Engineering at the University of New South Wales (UNSW) until his retirement from UNSW in 2020. He has over 45 years of international mining experience, specialising in the fields of underground mining systems, geomechanics, mine safety and risk management. He has held senior positions with Australian Coal Industry Research Laboratories (ACIRL Ltd), has served 25 years at the UNSW including 12 years as the Head of Mining Engineering, and was also the Secretary General of the international Society of Mining Professors. He was also the Chair of the NSW Independent Panel for the Southern Coalfield Inquiry (2008).

Mr John Ross

John Ross is a Senior Principal Hydrogeologist with over 40 years' experience specialising in water resource, site contamination, infrastructure, mining and natural resource impact assessment and management. His specialty is sedimentary basin hydrogeology, particularly the Great Artesian Basin, Sydney-Gunnedah and Gloucester basins here in NSW. John has held specialist management roles in public and private corporations and environmental consultancies. He has a Bachelor of Science (Geology) and a Certificate in Engineering Hydrology and Groundwater Hydrology.

John provides technical hydrogeological expertise and advice across the spectrum of water resource development, environmental/water planning, assessment and management projects, including environmental impact assessments, environmental audits and technical peer reviews, monitoring programs, remedial action plans, modelling and groundwater licensing matters. John also has extensive experience in community and regulatory consultation across the eastern seaboard.

Associate Professor Lucy Reading

Lucy Reading is an Associate Professor of Hydrogeology at the Queensland University of Technology (QUT). She has completed a Bachelor of Applied Science (Honours) at QUT and a Doctor of Philosophy in Environmental Engineering at the University of Queensland. Dr Reading now specialises in setting up groundwater monitoring networks with communities, assessing groundwater and surface water resources (quantity and quality) and assessing impacts of mining activities on groundwater. Lucy has over 20 years of experience in groundwater investigations, including roles with the University of Queensland and the Queensland Government.

Nathan Garvey FEIANZ

Nathan is an experienced ecologist with over 20 years' practice in biodiversity assessment and approvals across eastern Australia. Nathan holds a Bachelor of Science and Graduate Diploma in Biological Science from the University of NSW. Nathan is also a Fellow of the Environment Institute of Australian and New Zealand (EIANZ) for his contribution to the field of environmental science and management. Nathan has experience across a diverse range of sectors including mining, oil and gas, linear infrastructure, renewable energy and residential development, including biodiversity assessment for major projects, offsetting and *Environment Protection and Biodiversity Conservation Act* referrals. He has strong expertise and experience in the assessment of impacts to biodiversity arising from subsidence, as well as impacts to groundwater dependent ecosystems arising from groundwater drawdown. He is one of NSW's leading experts in biodiversity approvals and offsetting.

Dr Ray Williams

Dr Williams is a coal mine gas management and coal seam gas utilisation expert. He has extensive experience in coal seam gas related work spanning over 49 years, which included founding GeoGAS consulting and laboratory services for the underground coal mining and coal seam gas industry. Dr Williams completed a Bachelor of Science and Doctor of Philosophy in Geology from the University of Newcastle. His experience in the industry includes gas reservoir definition, gas production assessment and modelling for coal mine gas management and coal seam methane production, laboratory gas testing, gas emission assessment for coal mine gas management and gas outburst assessment and management. Dr Williams has been appointed to the panel to provide advice on greenhouse gas matters.

Emeritus Professor Jim Galvin (IEAPM Chair) – Ex-officio

Professor Galvin is an Emeritus Professor (University of New South Wales) in Mining Engineering and former member of the NSW Planning Assessment Commission. He has professional qualifications in science, engineering and mine management and extensive international experience in mining and geotechnical engineering, risk management and workplace health and safety. Professor Galvin is one of the world's foremost experts on underground coal mining and ground subsidence. He was a member of the Independent Panel for the Southern Coalfield Inquiry (2008), several subsequent reviews of mining projects in the Southern Coalfield and most recently, Chair of the Independent Expert Panel on Mining in the Catchment.