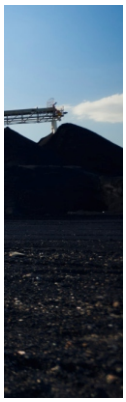


Ashton-Ravensworth Underground Mine Integration

EPBC Act Preliminary Documentation

MAIN TEXT AND ATTACHMENTS

YANCOAL
兖煤澳大利亚有限公司

TABLE OF CONTENTS

1 INTRODUCTION 1
1.1 BACKGROUND 1
1.2 APPROVALS CONTEXT 1
1.2.1 Related Approvals 3
1.3 ASSESSMENT REQUIREMENTS 3
1.4 CONSULTATION 3
2 DESCRIPTION OF THE PROPOSED ACTION 5
2.1 OVERVIEW 5
2.2 DEVELOPMENT OF NON-SUBSIDING UNDERGROUND ROADWAYS 5
2.3 UNDERGROUND LONGWALL MINING 5
2.4 CLEARING, EARTHWORKS AND CONSTRUCTION ACTIVITIES FOR THE PROPOSED ACTION 7
2.5 PHASES AND TIMING OF THE PROPOSED ACTION 8
2.6 CONSIDERATION OF ALTERNATIVES AND JUSTIFICATION OF THE PROPOSED ACTION 8
3 STRATEGIC AND STATUTORY CONTEXT 9
3.1 REGIONAL CONTEXT 9
3.2 STRATEGIC PROJECT CONTEXT 9
3.3 COMMONWEALTH LEGISLATION 11
3.3.1 Environment Protection and Biodiversity Conservation Act 1999 11
3.3.2 National Greenhouse and Energy Reporting Act 2007 11
3.4 RELEVANT NSW LEGISLATION 11
3.4.1 Environmental Planning and Assessment Act 1979 11
3.4.2 Biodiversity Conservation Act 2016 12
3.4.3 Dams Safety Act 2015 12
3.4.4 Mining Act 1992 12
3.4.5 National Parks and Wildlife Act 1974 13
3.4.6 Protection of the Environment Operations Act 1997 13
3.4.7 Water Management Act 2000 13
3.5 RELEVANT NSW PLANNING POLICIES 13
3.5.1 Strategic Statement on Coal Exploration and Mining in NSW 13
3.5.2 Aquifer Interference Policy 14
4 LISTED THREATENED SPECIES AND COMMUNITIES 15
4.1 VEGETATION WITHIN THE PROPOSED ACTION AREA 15
4.2 CENTRAL HUNTER VALLEY EUCALYPT FOREST AND WOODLAND 17
4.2.1 Presence in the Action Area and Surrounds 17
4.2.2 Direct, Indirect and Cumulative Impacts 17
4.2.3 Avoidance, Safeguards and Mitigation Measures 18
4.2.4 Conclusion/Consequential Impact 18
4.3 HUNTER VALLEY WEEPING MYALL WOODLAND 19
4.3.1 Presence in the Action Area and Surrounds 19
4.3.2 Direct, Indirect and Cumulative Impacts 19
4.3.3 Avoidance, Safeguards and Mitigation Measures 19
4.3.4 Conclusion/Consequential Impact 20
4.4 MONITORING AND MANAGEMENT 20
5 WATER RESOURCES 22
5.1 EXISTING ENVIRONMENT 22
5.2 WATER REGULATION 22
5.3 WATER USERS 23
5.4 SURFACE WATER 23
5.4.1 Direct, Indirect and Cumulative Impacts 23
5.4.2 Baseflow 24
5.4.3 Site Water Balance 24
5.4.4 Monitoring and Management 24
5.5 GROUNDWATER 28
5.5.1 Groundwater Setting 28
5.5.2 Potential Impacts on Groundwater Resources 28
5.5.3 Monitoring and Management 30
5.6 GROUNDWATER DEPENDENT ECOSYSTEMS 30
5.6.1 Potential GDEs in the Action Area and Surrounds 30
5.6.2 Site-specific Review of Potential GDEs 32
5.6.3 Potential Impacts to GDEs 32
5.6.4 Monitoring and Management 33
5.7 SIGNIFICANT IMPACT ASSESSMENT 33
5.7.1 Value of a Water Resource 33
5.7.2 Hydrology of a Water Resource 34
5.7.3 Water Quality of a Water Resource 34
5.7.4 Cumulative Impacts 35
5.7.5 Conclusion 35
6 ECONOMIC AND SOCIAL MATTERS 36
6.1 ONGOING CONSULTATION 36
7 ENVIRONMENTAL HISTORY OF REFERRING PARTY 40
8 JUSTIFICATION AND CONCLUSION 41
8.1 CONSOLIDATED SUMMARY OF IMPACT ASSESSMENT 41
8.2 JUSTIFICATION FOR THE PROPOSED ACTION 41

8.3 ECOLOGICALLY SUSTAINABLE DEVELOPMENT CONSIDERATIONS 41
8.3.1 Background 41
8.3.2 Consideration of Ecologically Sustainable Development for the Proposed Action 42
8.4 CONCLUSION 43
9 REFERENCES 44

LIST OF FIGURES

Figure 1	Regional Location
Figure 2	General Arrangement
Figure 3	Mining Operations Surrounding the Proposed Action
Figure 4	Vegetation Communities
Figure 5	Ashton Mine Complex Surface Water and Groundwater Monitoring Sites
Figure 6	Ecohydrological Conceptual Model

LIST OF TABLES

Table 1	Mapped Vegetation Communities
Table 2	Surface Water Sampling Program
Table 3	Alluvial Groundwater Monitoring Program
Table 4	Review of Social Impact Themes Identified in Glendell Continued Operations Project Social Impact Assessment

LIST OF ATTACHMENTS

Attachment 1	Ashton Coal Operations Ravensworth Underground Mine EPBC Act Referral
Attachment 2	Cross Reference of Assessment Requirements for the Preliminary Documentation
Attachment 3	Response to Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice
Attachment 4	Conditions of Development Consent 104/96 Relevant to the Proposed Action
Attachment 5	Ashton-Ravensworth Integration Project – Groundwater Peer Review
Attachment 6	Environment and Community Relations Policy

LIST OF APPENDICES

Appendix A	Ravensworth Underground Mine Ecology Assessment
Appendix B	Ravensworth Underground Mine Subsidence Review
Appendix C	Ashton Ravensworth Integration Project Groundwater Impact Assessment
Appendix D	Ashton-Ravensworth Underground Integration Modification Site Water Balance
Appendix E	Ashton Biodiversity Management Plan
Appendix F	Ashton Water Management Plan

1 INTRODUCTION

The Proposed Action for the Ashton Coal Operations Pty Limited (ACOL)-operated portion of the Ravensworth Underground Mine (RUM) was referred under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on 24 March 2022. The Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) determined the Proposed Action to be a Controlled Action on 27 September 2022 (EPBC 2022/09208). The EPBC Referral is provided in Attachment 1.

On 29 November 2022, the Cth DCCEEW requested additional information to assess the relevant impacts of the Proposed Action in accordance with section 95A(2) of the EPBC Act. This Preliminary Documentation has been prepared to provide the requested additional information on the Proposed Action for assessment under Division 4 of the EPBC Act.

1.1 BACKGROUND

The Ravensworth Mine Complex and Ashton Mine Complex are neighbouring open cut and underground coal mining complexes, located in the Singleton Local Government Area (LGA), in the Hunter Valley region of New South Wales (NSW) (Figure 1).

The Ravensworth Mine Complex is operated by Glencore Coal Assets Australia Pty Limited (Glencore) and includes the Ravensworth Operations Project (a large open cut operation) and the RUM. The Proposed Action, that is the subject of this Preliminary Documentation, applies to the ACOL-operated portion of the RUM only.

RUM has State approval to underground longwall mine the Lemington, Pikes Gully, Liddell (Upper and Middle) and Barret Seams at a rate of up to 7 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 31 December 2032.

However, the RUM has been in care and maintenance since October 2014 following the completion of Longwalls 1 to 9 (of 16) in the Pikes Gully Seam. No further longwall extraction has occurred since.

The Ashton Mine Complex is operated by ACOL, a wholly owned subsidiary of Yancoal Australia Limited (Yancoal), and includes the completed North East Open Cut (NEOC) and the Ashton Underground Mine. Ashton Underground Mine is a multi-seam longwall operation that began operating in 2004 and remains in operation today.

In 2020, an opportunity was identified for ACOL to access and extract some of the RUM's remaining (approved but unmined) metallurgical quality coal resources (i.e. semi soft coking coal) via the adjacent Ashton Underground Mine.

On 6 July 2022, State approval was granted (via parallel modifications to the existing development consents) to enable ACOL to operate a portion of the RUM. The modifications included:

- RUM Development Consent DA 104/96 Modification 10; and
- Ashton Coal Complex Development Consent DA 309-11-2001-i Modification 11.

A description of the Modification is provided in the *Ashton-Ravensworth Underground Mine Integration Modification – Ravensworth Underground Mine Modification Report* (the Modification Report) (ACOL, 2021a).

The Proposed Action includes a subset of the activities approved under Development Consent DA 104/96 Modification 10.

1.2 APPROVALS CONTEXT

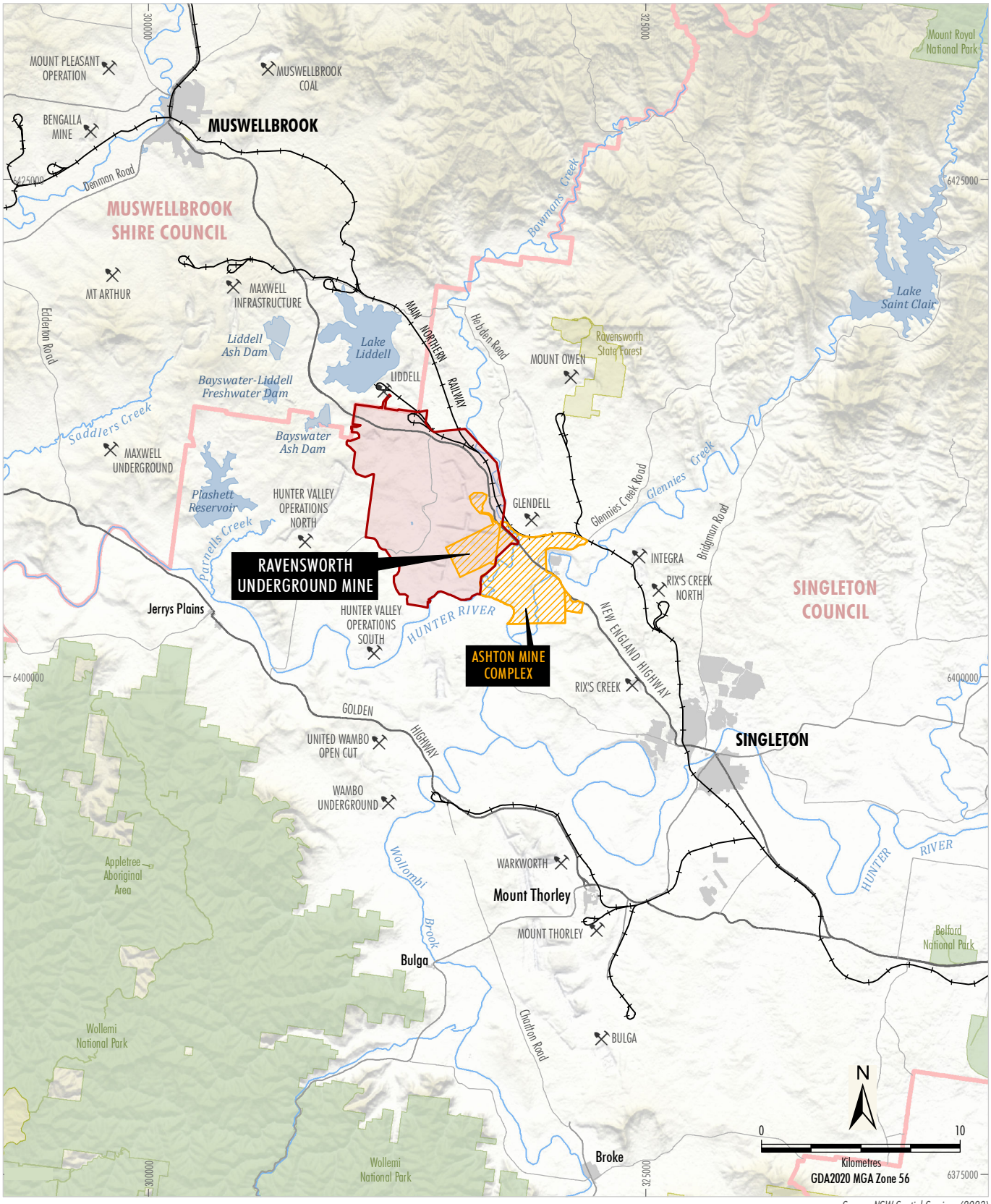
State approval of the RUM (formerly Nardell Underground Coal Mine) was originally granted under NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 20 November 1996 (Development Consent DA 104/96). This approval pre-dated the commencement of the EPBC Act (i.e. 16 July 2000).

Subsequent modifications to DA 104/96 (Modifications 1 to 9) were not referred to the Commonwealth for assessment under the EPBC Act because they either:

- continued to rely on prior authorisation under section 43A or continuation of use under section 43B of the EPBC Act; or
- were not considered to have a significant impact on matters of national environmental significance (MNES).

These modifications also pre-dated the introduction of the "Water Trigger" as an MNES (i.e. 20 June 2013).

The most recent modification, Modification 10, is generally the subject of this Proposed Action.



Source: NSW Spatial Services (2023)

LEGEND

- Mining Operation
- Local Government Area
- State Forest
- National Parks and Wildlife Estate
- Ravensworth Mine Complex
- Ashton Mine Complex - Mining and Exploration Tenement Area

YANCOAL 兖煤澳大利亚有限公司

RAVENSWORTH UNDERGROUND MINE
PRELIMINARY DOCUMENTATION

Regional Location

Figure 1

ACO-18-03A EPBC PrelimDoc_203C

The Proposed Action was referred to the Commonwealth on 24 March 2022, and was subsequently determined to be a Controlled Action on 27 September 2022 (EPBC 2022/09208). The relevant controlling provisions of the Proposed Action are:

- listed threatened species and communities (sections 18 & 18A); and
- a water resource, in relation to coal seam gas development and large coal mining development (section 24D & 24E).

1.2.1 Related Approvals

The overlapping Ravensworth Operations Project was referred under the EPBC Act on 5 March 2010 and included a project area of approximately 5,590 hectares (ha) for its existing and proposed open cut mining operations.

The Assistant Secretary of the then Department of Sustainability, Environment, Water, Population and Communities approved the Controlled Action on 8 April 2011 (EPBC Approval 2010/5389). EPBC Approval 2010/5389 has been varied on seven occasions, most recently on 10 November 2016.

The EPBC Approval 2010/5389 includes open cut mining and rehabilitation activities located within the Proposed Action area.

The Ashton Coal Complex (Development Consent DA 309-11-2001-i) was referred under the EPBC Act on 10 December 2001. The Ashton Coal Complex comprised three integrated components including a small open cut mine (the NEOC), surface facilities and the Ashton Underground Mine.

The Assistant Secretary of the then Environment Australia determined this project to be Not a Controlled Action on 4 January 2002 (Referral Decision EPBC 2001/524).

The South East Open Cut (SEOC) Project was also referred under the EPBC Act on 17 December 2009, which included the development of open cut operations over an area of approximately 473 ha.

The Assistant Secretary of the then Department of the Environment, Water, Heritage and the Arts determined the SEOC Project to be Not a Controlled Action on 26 August 2010 (Referral Decision EPBC 2010/5315). The NSW Development Consent for the SEOC Project has since lapsed and ACOL is pursuing the continuation of underground mining at the RUM as an alternative to the SEOC Project.

1.3 ASSESSMENT REQUIREMENTS

Assessment requirements for this Preliminary Documentation were provided by the Cth DCCEEW on 29 November 2022. A table summarising where each of these requirements is addressed in this document is provided in Attachment 2.

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) provided advice on the EPBC Referral prepared for the Proposed Action (advice dated 14 December 2022). A response to each of the IESC recommendations is provided in Attachment 3.

The following documents are appended to this report:

- Appendix A: Ravensworth Underground Mine Ecology Assessment (Hunter Eco, 2023).
- Appendix B: Ravensworth Underground Mine Subsidence Review (SCT Operations [SCT], 2021).
- Appendix C: Ashton Ravensworth Integration Project Groundwater Impact Assessment (Australasian Groundwater & Environmental Consultants [AGE], 2024).
- Appendix D: Ashton-Ravensworth Underground Integration Modification Site Water Balance (Hydro Engineering and Consulting [HEC], 2021).
- Appendix E: Ashton Biodiversity Management Plan (ACOL, 2020a).
- Appendix F: Ashton Water Management Plan (ACOL, 2020b).

1.4 CONSULTATION

Consultation with Commonwealth and State Government agencies, Singleton Council and the local community has been undertaken by ACOL and Glencore.

Key comments and issues raised during consultation were considered and addressed during the NSW approval process and in preparation of this Preliminary Documentation.

Commonwealth, State and Local Governments

ACOL and Glencore have consulted with the following Commonwealth and State Government agencies and local councils during the NSW approval process and in preparation of this Preliminary Documentation:

- Cth DCCEEW;
- NSW Resources Regulator;

- NSW Department of Planning and Environment (DPE) (now Department of Planning, Housing and Infrastructure [DPHI]);
- NSW Division of Mining, Exploration and Geoscience;
- NSW Natural Resources Access Regulator;
- NSW Environment Protection Authority;
- Subsidence Advisory NSW;
- Dams Safety NSW;
- NSW Health; and
- Singleton Council.

Community Consultative Committees

The Ravensworth Mine Complex Community Consultative Committee (CCC) was established in accordance with Development Consent DA 104/96 and Project Approval 09_0176. The Ashton Mine Complex CCC was established in accordance with Development Consent DA 309-11-2001-i.

The CCCs provide a mechanism for ongoing communication between the mines and the local community. Membership of the CCCs include representatives of the local community, the Singleton Council, and mine operators (Glencore and ACOL). Meetings for both CCCs are currently held every four months.

The CCCs have been, and will continue to be, consulted on the Proposed Action. In accordance with Condition 4, Schedule 4 of Development Consent DA 104/96, the Ashton Mine Complex CCC would deal with matters associated with the ACOL-operated portion of the RUM subject to agreement of the CCC Chairs and approval of the Secretary.

Public Consultation

Public consultation was undertaken with the Ashton Mine Complex CCC in 2021 during the preparation of the Modification Report to modify Development Consent DA 104/96. The Modification Report was placed on public exhibition by the Department of Planning, Industry and Environment from 25 November 2021 to 8 December 2021, providing an opportunity for the public to comment on the application. Responses to comments raised by the community and NSW Government agencies on the Modification Report are provided in the *Ashton-Ravensworth Underground Mine Integration Modification – Ravensworth Underground Mine Submissions Report* (ACOL, 2021b).

There were no submissions made by members of the public on the RUM Modification 10 application. However, it is noted that three public submissions were received on the associated Ashton Modification 11; one in support due to the ongoing employment of the ACOL workforce and two opposed to the application, principally on the grounds of greenhouse gas emissions.

The ACOL website (www.ashtoncoal.com.au) provides up-to-date information on the Ashton Mine Complex, and provides access to relevant environment and community information, including compliance reports and approval documents. The ACOL Environment and Community Response Line (1800 657 639) allows members of the public to contact ACOL with enquiries or complaints.

The Glencore website also provides up-to-date information on the Ravensworth Mine Complex, and provides access to relevant environment and community information, including compliance reports and approval documents. The Ravensworth Mine Complex Environment and Community Enquiries Hotline (1800 620 553) allows members of the public to contact Glencore with enquiries or complaints.

Environmental reporting and management plans required under Development Consent DA 104/96, for the ACOL-operated portion of the RUM, will be made available on the ACOL website.

ACOL has also established an Aboriginal Community Consultative Forum for the Ashton Underground Mine, with the following objectives:

- to provide a formal vehicle for communication with the broader Aboriginal community and to provide a forum to allow effective communication to take place between Aboriginal stakeholder groups and ACOL; and
- to provide information to the community as well as receive feedback on cultural and community issues.

ACOL consulted with the Aboriginal community when preparing the revised Ashton Heritage Management Plan to incorporate the ACOL-operated portion of the RUM.

ACOL will continue to engage with the Aboriginal community through the Aboriginal Community Consultative Forum and as part of the preparation of future revisions to the Ashton Heritage Management Plan to address the Extraction Plan requirements for the RUM.

2 DESCRIPTION OF THE PROPOSED ACTION

2.1 OVERVIEW

The Proposed Action includes a subset of the activities approved under Development Consent DA 104/96 Modification 10. The Proposed Action includes the following components and activities within the Proposed Action area (Figure 2):

- underground mining of the Pikes Gully and Middle Liddell Seams using longwall mining as shown on Figure 2;
- mining operations until approximately 31 December 2032 (i.e. for a period of approximately 8 years);
- establishment and use of gas, ventilation and water management infrastructure including shafts, bores, pumps and pipelines (required to ventilate and dewater the longwall operation);
- management of water and gas that accumulates in the underground workings during longwall operations within the Proposed Action area;
- transfer of ROM coal from longwall (secondary) extraction of the RUM Pikes Gully and Middle Liddell Seams in the Proposed Action area to the neighbouring Ashton Coal Project via connected underground workings; and
- transfer of water and gas generated during secondary extraction from the Proposed Action area to the neighbouring Ashton Coal Project.

Infrastructure developed as part of the Proposed Action would be located in previously cleared areas or areas approved for clearing under the Controlled Action for the Ravensworth Operations Project (EPBC Approval 2010/5389).

The Proposed Action, the subject of this Preliminary Documentation, explicitly does not include the following:

- any use of the existing workings of the RUM completed prior to operations being placed into care and maintenance in 2014 (within or outside of the Proposed Action area);
- initial development activities that may support the Proposed Action but do not involve ground disturbance or the removal of mature trees or shrubs, including, but is not limited to, survey and demarcation activities, salvage of Aboriginal artefacts, and installation of minor ancillary or supporting infrastructure;
- development of non-subsiding underground roadways which would be used to access the Proposed Action area;
- use of the existing Vent Shaft 5;
- construction and use of Vent Shaft 5 supporting infrastructure;
- maintenance and use of existing infrastructure including access tracks;
- development and use of new access tracks on previously cleared land;
- ongoing exploration activities approved under mining tenements issued under the NSW *Mining Act 1992*;
- existing or proposed activities at the Ashton Coal Project, including the receipt, handling and processing of RUM coal at the Ashton Coal Handling and Processing Plant (CHPP) and receipt of water and gas transferred from the RUM and its management at the Ashton Coal Project;
- any activity associated with the Ravensworth Operations Project including activities that form part of the approved Controlled Action under the EPBC Act for the Ravensworth Operations Project (EPBC Approval 2010/5389); and
- any activity associated with the Ashton Coal Project including activities that form part of the Referral for the Ashton Coal Project (Not A Controlled Action Decision EPBC 2001/524).

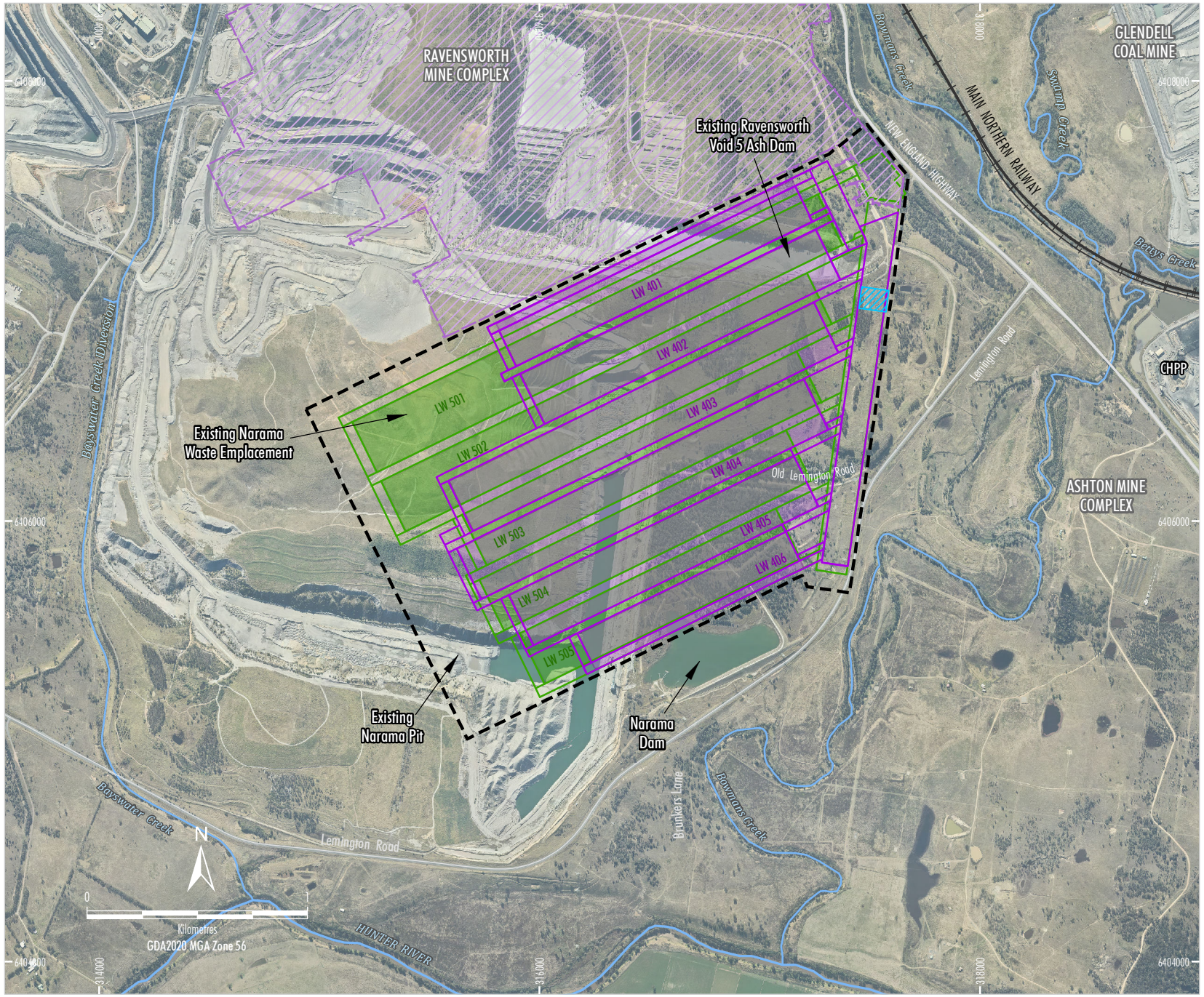
2.2 DEVELOPMENT OF NON-SUBSIDING UNDERGROUND ROADWAYS

Development of non-subsiding underground roadways (also referred to as first workings) are formed by continuous miner units in preparation for longwall mining. Once formed, they allow for personnel access and support infrastructure and services (such as ventilation) during the longwall mining process.

Development of non-subsiding underground roadways, including the roadways required to connect the Ashton Underground Mine to the ACOL-operated portion of the RUM, do not form part of the Proposed Action.

2.3 UNDERGROUND LONGWALL MINING

The Proposed Action would involve extraction of coal from the Pikes Gully and Middle Liddell Seams using underground longwall mining methods.



LEGEND

Completed Pikes Gully Seam Workings

Existing Shaft 5 Location

Components of the Action

Action Area

Indicative Pikes Gully Seam Longwall Layout

Indicative Middle Liddell Seam Longwall Layout

Source: SCT (2021); NSW Spatial Services (2023)
Orthophoto: Ravensworth Mine Complex (2021)

YANCOAL 兖煤澳大有业有限公司

RAVENSWORTH UNDERGROUND MINE
PRELIMINARY DOCUMENTATION

General Arrangement

Figure 2

Longwall extraction is an underground mining method that involves the extraction of rectangular panels of coal defined by underground roadways constructed around each longwall. The longwall mining machine travels back and forth across the width of the coal face, progressively shearing coal from the panel.

As coal is removed from the longwall face, the hydraulic roof supports move forward, allowing the roof and a section of the overlying strata to collapse behind the longwall machine (referred to as forming the 'goaf').

Extraction of coal by longwall mining methods results in the vertical and horizontal movement of the overlying strata. Movements at the surface are generically referred to as subsidence effects.

Subsidence movements are described using the following terminology:

- Subsidence – usually refers to the vertical movement of a point at the surface and is expressed in units of metres (m).
- Tilt – is the change in the slope of a land surface as a result of differential subsidence and is expressed in units of millimetres per metre (mm/m) or a change in grade where 1 mm/m = 0.1 percent (%.)
- Tensile strain – is the change in horizontal distance between two points at the surface where the distance increases (i.e. stretching) and is typically expressed in units of mm/m.
- Compressive strain – is the change in horizontal distance between two points at the surface where the distance decreases (i.e. squeezing) and is typically expressed in units of mm/m.

A Subsidence Review has been prepared by SCT (2021) for the Proposed Action and is presented in Appendix B.

An existing subsidence model for the RUM was updated by SCT (2021) to incorporate the contemporary understanding of multi-seam subsidence behaviour, data from subsidence monitoring at the RUM and Ashton Underground Mine, and include updated topography of the Ravensworth Mine Complex. SCT (2021) presents estimates of the primary subsidence parameters based on the Proposed Action longwall layout:

- Maximum vertical subsidence of up to approximately 5.9 m in areas of previously mined and backfilled open cut areas overlying the longwalls.
- Maximum subsidence of approximately 4.2 m in the small areas of natural ground just north of the Narama Dam.
- Tilts of up to 120 mm/m within the area of the Narama Pit where the start lines for both the Middle Liddell Seam longwalls and Pikes Gully Seam longwalls are closely aligned as well as along the southern edge of Longwall 505 in the Middle Liddell Seam in the vicinity of the edge of Longwall 406 in the Pikes Gully Seam.
- Tilts of up to 175 mm/m where the finish lines of the Pikes Gully Seam longwall are undercut by the Middle Liddell Seam longwalls (i.e. the eastern end). The impacts from these tilts are likely to occur in narrow zones at predictable locations at the eastern end of the longwall panels (Appendix B).
- Strains of up to 60 mm/m within the area of the Narama Pit where the start lines for both the Middle Liddell Seam longwalls and Pikes Gully Seam longwalls are closely aligned as well as along the southern edge of Longwall 505 in the Middle Liddell Seam in the vicinity of the edge of Longwall 406 in the Pikes Gully Seam.
- Maximum strains of up to 90 mm/m where the finish lines of the Pikes Gully Seam longwall are undercut by the Middle Liddell Seam longwalls (i.e. the eastern end) (Appendix B).

Cracking of the surface usually occurs as a result of tensile strains. Vertical subsidence and tilts can change water flow paths over the surface, and also cause ponding where subsidence creates a depression causing lower-lying areas.

Further details of the predicted subsidence effects due to the modified RUM longwall layout are provided in Appendix B. Section 4.2.2 describes the potential impacts to vegetation associated with subsidence.

2.4 CLEARING, EARTHWORKS AND CONSTRUCTION ACTIVITIES FOR THE PROPOSED ACTION

Surface infrastructure for gas, ventilation and water management would be located in previously cleared areas or areas approved for clearing under the Controlled Action for the Ravensworth Operations Project (EPBC Approval 2010/5389). Therefore, no clearing is required for the Proposed Action.

2.5 PHASES AND TIMING OF THE PROPOSED ACTION

The Proposed Action is planned to commence in the second half of 2025 (i.e. when secondary extraction is planned to commence). ACOL is permitted to access and extract approved underground coal resources at the RUM until 31 December 2032 under Development Consent DA 104/96.

Gas management and ventilation infrastructure would be developed progressively as it is required.

2.6 CONSIDERATION OF ALTERNATIVES AND JUSTIFICATION OF THE PROPOSED ACTION

Pursuing underground mining of the State approved RUM coal resource is a logical and efficient extension to the Ashton Underground Mine, and it is ACOL's preferred pathway for continued operations at the Ashton Mine Complex.

Proceeding with the Proposed Action would have the following benefits:

- would provide for an additional approximately 8 years of employment of the ACOL workforce;
- utilises existing planning approvals to maximise economic recovery of an approved State coal resource;
- would avoid disturbance of additional areas (i.e. by limiting direct disturbance activities to previously cleared areas); and
- is on land approved for mine development within current mining leases for the RUM.

Alternatives to the Proposed Action including the location and design elements were considered by ACOL, along with the option of not proceeding with the Proposed Action. An overview of some considerations is provided below:

- **Alternative Location** – The location of the Proposed Action area cannot be readily changed. The location has been determined by the location of the target coal resource and the proximity to the existing Ashton Underground Mine underground workings (which will be used to access the Action Area). The location is also bound by the presence of the Hunter River to the south, Bowmans Creek to the south-east and surrounding mining operations.
- **Alternative Mining Method (Open Cut)** – The depth, seam thickness and dip of the coal seam associated with the Action is more amenable to underground mining methods than open cut mining methods. Open cut mining methods would not be economically feasible over a large area of the Proposed Action as the target seams are located beneath previously mined and backfilled open cut areas of the Ravensworth Operations Project, including final voids and partially rehabilitated waste emplacements.
- **Alternative Mining Method (Bord and Pillar)** – Longwall mining was selected over other underground mining methods (e.g. bord and pillar) due to its superior productivity and its suitability to extract the resource. Longwall mining is currently used at Ashton Underground Mine and therefore ACOL can utilise its existing equipment and expertise to mine the Action area.
- **No Action** – ACOL has considered not undertaking the Proposed Action. However, in the event that the Proposed Action is not developed, the following benefits would be forgone:
  - an additional approximately 8 years of employment of the ACOL workforce;
  - use of existing planning approvals to maximise economic recovery of approved State coal resource;
  - royalty payments to the State; and
  - tax payments to the Commonwealth government associated with the extraction and sale of the resource (e.g. company and income tax payments).

3 STRATEGIC AND STATUTORY CONTEXT

This section outlines the statutory context associated with the Proposed Action, including requirements for assessment and approval under State and Commonwealth legislation and details of State and local planning schemes and policies.

3.1 REGIONAL CONTEXT

The RUM is located within the Hunter Coalfield. The Hunter Coalfield and adjacent Newcastle Coalfield in the Sydney-Gunnedah Basin form the target resource of major coal developments in the Hunter Valley region.

Coal mining operations in the region have been occurring for many decades, with operations commencing at the Ravensworth Mine Complex in the early 1970s and the Ashton Mine Complex in 2004.

Coal mining has close ties with regional communities in the Hunter region. In the Singleton LGA, the mainstays of the economy are coal mining, agriculture, manufacturing and retail. The *Hunter Regional Plan 2041* (NSW Government, 2022) and the *Strategic Statement on Coal Exploration and Mining in NSW* (NSW Government, 2020) both recognise the value of coal production to the NSW economy, and that coal from the Hunter region will see continued demand during the global transition to a low carbon future.

Coal from the Hunter Coalfield is transported via the Hunter Valley rail network (Figure 1), which provides access to domestic coal customers (i.e. primarily electricity production) and international markets via the Port of Newcastle.

In the Upper Hunter Valley, mining employs more than 9,700 people in the Muswellbrook and Singleton LGAs alone (REMPLAN 2022a, 2022b).

3.2 STRATEGIC PROJECT CONTEXT

The RUM is located in the Singleton LGA, approximately 17 kilometres (km) north-west of the township of Singleton in the Upper Hunter Valley (Figure 1). The RUM is located within a recognised mining precinct. On the surface, the land use is dominated by open cut operations associated with the Ravensworth Operations Project and AGL Energy Ltd's (AGL's) Ravensworth South Mine. The RUM is also surrounded by Ashton Mine Complex to the east, Glendell and the Mount Owen Complex to the north-east, Integra Underground Mine to the east, Rix's Creek Mine to the south-east and Hunter Valley Operations to the west and south (Figure 3).

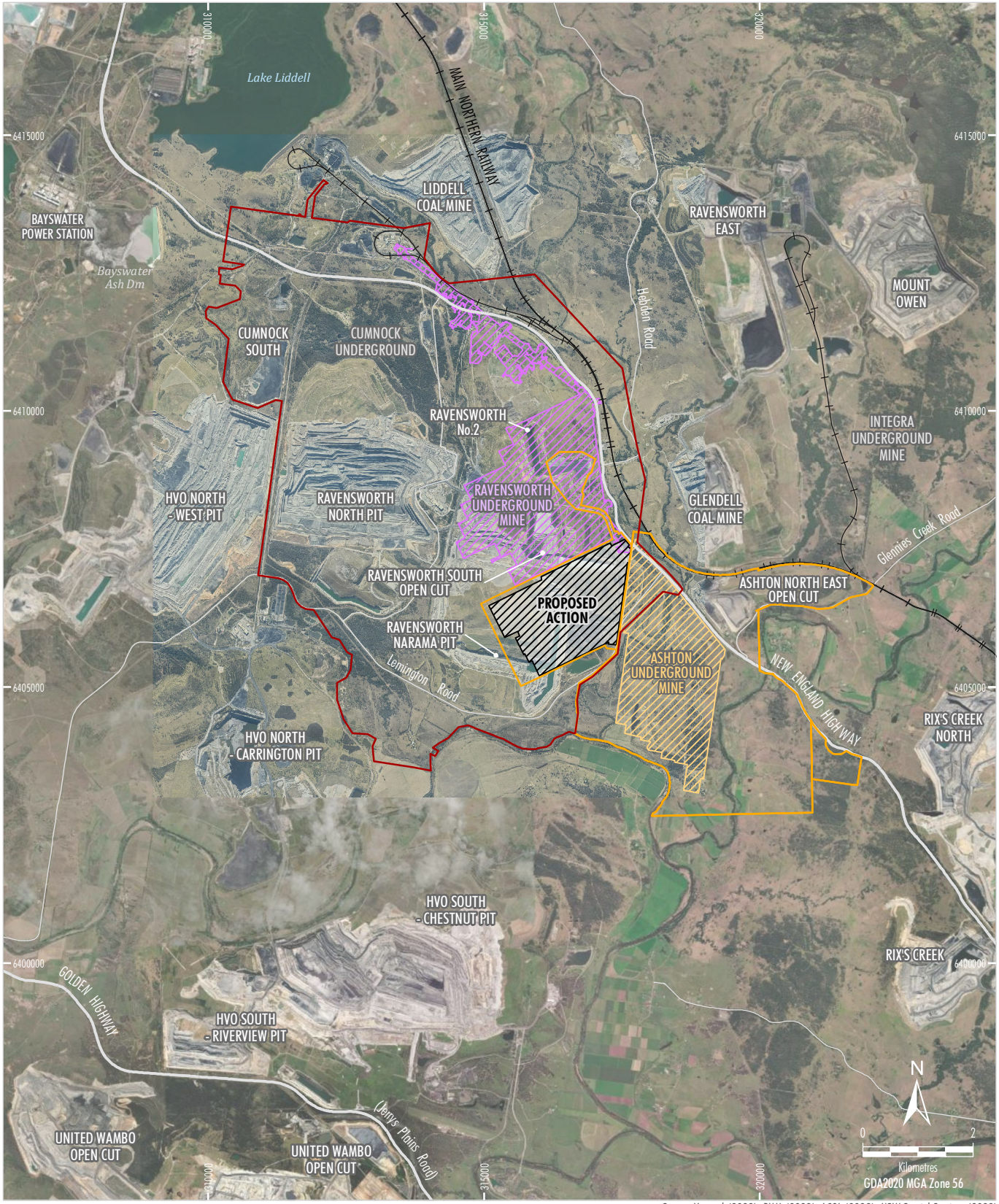
Land uses, other than mining in the vicinity of the RUM, comprise a combination of agricultural land uses, industrial and residential areas in the village of Camberwell.

The RUM and the Ashton Underground Mine share a common mining lease boundary and the approved underground mining areas are separated (at their closest) by approximately 45 m in the Pikes Gully and Upper Lower Liddell Seams (Figure 2).

Mining of the Upper Lower Liddell Seam at the Ashton Underground Mine commenced in 2017 (following mining in the Pikes Gully and Upper Liddell Seams) and is anticipated to be completed by late 2024.

The previously mined RUM (i.e. Longwalls 1 to 9) has been in care and maintenance since 2014. If mining was not to recommence, then the approved but as yet unmined RUM coal resources would most likely not be mined. An opportunity therefore exists for ACOL to access and extract some of RUM's remaining (approved but unmined) coal resources via the Ashton Underground Mine.

Under this proposal, ACOL would shift to extracting the Pikes Gully Seam and Middle Liddell Seam from the ACOL-operated portion of the RUM, after completion of the Upper Lower Liddell Seam at Ashton Underground Mine. Mining would then return to Ashton Underground Mine to extract the remaining approved seam, the Lower Barrett Seam.



ACO-18-03A EPBC PrelimDoc_2016

LEGEND

Ravensworth Mine Complex

Ashton Mine Complex

Ravensworth Underground Mine

Completed Pikes Gully Seam Workings

Ashton Underground Mine

Indicative Longwall Mining Extent

Components of the Action

Indicative Longwall Mining Extent

Source: Yancoal (2023); RUM (2022); ACOL (2022); NSW Spatial Services (2023)
Aerial Imagery: Ravensworth Mine Complex (2021); ESRI Basemap (2023)

YANCOAL 兖煤澳大利亚有限公司

RAVENSWORTH UNDERGROUND MINE
PRELIMINARY DOCUMENTATION

Mining Operations Surrounding the Proposed Action

Figure 3

Yancoal has amended the relevant approval instruments under NSW legislation to integrate the ACOL-operated portion of the RUM into the Ashton Mine Complex, including:

- modifying the relevant Development Consents;
- part transferring the relevant Mining Leases from Glencore to Yancoal-related entities; and
- varying the relevant Environment Protection Licences (EPLs).

The last remaining step is to secure EPBC Approval for the Proposed Action, which is the subject of this Preliminary Documentation.

3.3 COMMONWEALTH LEGISLATION

3.3.1 Environment Protection and Biodiversity Conservation Act 1999

The objective of the EPBC Act is to provide for the protection of the environment, especially those aspects of the environment that are MNES.

Proposals that are likely to have a significant impact on a MNES are defined as a Controlled Action under the EPBC Act. A proposal that is, or may be, a Controlled Action is required to be referred to the Cth DCCEEW to determine whether or not the action is a Controlled Action. Controlled Actions require EPBC approval. The Proposed Action was determined under the EPBC Act to be a Controlled Action on 27 September 2022 (EPBC 2022/09208).

This Preliminary Documentation has been prepared to provide the requested additional information for assessment and approval under the EPBC Act.

3.3.2 National Greenhouse and Energy Reporting Act 2007

The Commonwealth *National Greenhouse and Energy Reporting Act 2007* (NGER Act) introduced a single national reporting framework for the reporting and dissemination of corporations' greenhouse gas emissions and energy use.

ACOL has taken over responsibility for NGER Act reporting for the ACOL-operated portion of the RUM, and will account for the greenhouse gas emissions associated with mining of the ACOL-operated portion of the RUM in Ashton's annual NGER Act report.

The Safeguard Mechanism (underpinned by the *Commonwealth National Greenhouse and Energy Reporting [Safeguard Mechanism] Rule 2015*) was established through the NGER Act and provides baseline emissions and offset requirements for facilities that emit over 100,000 tonnes of carbon dioxide equivalent per year. If a facility exceeds its baseline level, it is generally required to surrender carbon credits, equivalent to the exceedance.

The recent Safeguard Mechanism Reforms (Cth DCCEEW, 2023) introduced declining baselines on a trajectory consistent with achieving Australia's emission reduction targets of 43% below 2005 levels by 2030 and net zero by 2050 (Cth DCCEEW, 2023).

Ashton is a Safeguard facility and will be subject to these new declining baselines.

3.4 RELEVANT NSW LEGISLATION

The EP&A Act is the primary piece of environmental planning legislation in NSW. In addition to the EP&A Act, the following NSW legislation may be applicable to the ACOL-operated portion of the RUM:

- NSW *Biodiversity Conservation Act 2016* (BC Act);
- *Dams Safety Act 2015*;
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974*;
- *Protection of the Environment Operations Act 1997* (PoEO Act); and
- *Water Management Act 2000.*

Licences or approvals required under these Acts have been obtained for the Proposed Action, where relevant.

3.4.1 Environmental Planning and Assessment Act 1979

The EP&A Act and *Environmental Planning and Assessment Regulation 2000* (EP&A Regulation) set the framework for planning and environmental assessment in NSW.

The RUM (formerly known as the Nardell Coal Mine) was approved under Part 4 of the EP&A Act by the then NSW Minister for Urban Affairs and Planning on 20 November 1996 (Development Consent DA 104/96), and has been subsequently modified.

A modification application was submitted to DPE on 9 November 2021 to modify the RUM Development Consent DA 104/96 (Modification 10) under the EP&A Act to enable ACOL to access and extract approved coal resources at the RUM until approximately December 2032.

A parallel application was submitted at the same time to modify Ashton Coal Project's Development Consent DA 309-11-2001-i (Modification 11) to connect the underground mining areas via new non-subsiding first workings. This modification also enables coal, water and gas from the ACOL-operated portion of the RUM to be transferred and managed under Development Consent DA 309-11-2001-i.

Modifications 10 and 11 were approved by DPE on 6 July 2022.

The modification relevant to this Proposed Action is Development Consent DA 104/96 Modification 10.

A detailed description of Modification 10 is provided in the Modification Report (ACOL, 2021a).

The conditions of Development Consent DA 104/96 relevant to managing and mitigating the impacts of the Proposed Action are summarised in Attachment 4.

3.4.2 Biodiversity Conservation Act 2016

The BC Act provides the approach to be followed for conducting an assessment of a development's impacts on threatened species and ecological communities.

Under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017*, a Biodiversity Development Assessment Report is not required to be submitted with a modification if the authority or person determining the application for modification (or determining the environmental assessment requirements for the application) is satisfied that the modification would not increase the impact on biodiversity values.

In the case of Modification 10, the consent authority was satisfied that the Modification would not increase the impact on biodiversity values and a Biodiversity Development Assessment Report was not required.

3.4.3 Dams Safety Act 2015

The objects of the *Dams Safety Act 2015* are to manage matters relating to dams safety, and promote the application of risk management.

There are three declared dams in the area of the Proposed Action and surrounds which are operated and maintained under the *Dams Safety Act 2015*:

- Narama Dam.
- Ravensworth Void 5 Ash.
- Ravensworth Mine Inpit Storage.

There would be no changes proposed to the declared dams as a result of the Proposed Action. ACOL would provide notification to Dams Safety NSW prior to longwall mining within the notification areas for the declared dams in accordance with the requirements of the *Dams Safety Act 2015*.

3.4.4 Mining Act 1992

The objects of the *Mining Act 1992* are to encourage and facilitate the discovery and development of mineral resources in NSW, having regard to the need to encourage ecologically sustainable development.

The *Mining Act 1992* regulates environmental protection and rehabilitation of all mining leases, including the requirement for the submission of a Rehabilitation Management Plan (RMP).

Mining tenements previously held by Glencore-related entities for the ACOL-operated portion of the RUM were part transferred to ACOL on 22 December 2022.

The proposed activities within the ACOL-operated portion of the RUM (i.e. mining of the Pikes Gully Seam and Middle Liddell Seam) would be located within the recently transferred Mining Leases (ML): ML 1834 (previously part of ML 1348), ML 1835 (previously part of ML 1349), ML 1836 (previously part of ML 1668) and ML 1837 (previously part of ML 1495) now held by White Mining (NSW) Pty Limited.

Following approval of RUM Modification 10 and in accordance with the conditions of the Mining Leases, the Ashton Mine Complex RMP has been reviewed and revised to incorporate the ACOL-operated portion of the RUM.

3.4.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* contains provisions for the protection and management of national parks, historic sites, nature reserves and Aboriginal cultural heritage in NSW.

The infrastructure proposed under the Proposed Action (e.g. relocated gas and ventilation infrastructure) would be located in previously cleared or areas approved for clearing, and would avoid Aboriginal cultural heritage sites.

The existing Ashton Heritage Management Plan will also be updated to incorporate the ACOL-operated portion of the RUM.

There are seven known extant Aboriginal heritage sites located near the southern two Pikes Gully Seam longwall panels (i.e. Longwalls 405 and 406). As required under Development Consent DA 104/96, ACOL will undertake further assessment of these sites to determine appropriate management measures and obtain impact permits under the *National Parks and Wildlife Act 1974*, if required. This work will be undertaken prior to secondary extraction of the relevant longwalls.

3.4.6 Protection of the Environment Operations Act 1997

The PoEO Act and the NSW *Protection of the Environment Operations (General) Regulation 2009* set out the general obligations for environmental protection for industry in NSW, which is regulated by the NSW Environment Protection Authority (EPA).

Operations and monitoring at the RUM are currently undertaken in accordance with existing Environment Protection Licence (EPL) 2652 held by Ravensworth Operations Pty Ltd issued under the PoEO Act.

Operations and monitoring at the Ashton Mine Complex are currently undertaken in accordance with existing EPL 11879 held by ACOL issued under the PoEO Act.

The EPLs have been varied to remove the relevant parts of the ACOL-operated portion of the RUM from EPL 2652 and include them in EPL 11879.

3.4.7 Water Management Act 2000

The *Water Management Act 2000* contains provisions for the licensing, allocation, capture and use of water resources.

Under the *Water Management Act 2000*, water sharing plans are in place for water sources relevant to the RUM. Water sharing plans establish rules for sharing water between different users and between the various environmental sources (namely rivers or aquifers). Water sharing plans relevant to the RUM are:

- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.*
- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.*
- *Water Sharing Plan for the Hunter Regulated River Water Source 2016.*

The *Significant impact guidelines 1.3 Coal seam gas and large coal mining developments — impacts on water resources* (Cth DCCEEW, 2022) (Significant Impact Guidelines for Water Resources) relevantly states:

> *A proponent may obtain entitlements to extract water under a state water plan which has been prepared in accordance with the requirements of the NWI.*
>
> *If a proponent can demonstrate that all of the water used by a proposed action is authorised through such entitlements, the action is less likely to require a referral due to significant impacts on the hydrological characteristics of a water resource.*

3.5 RELEVANT NSW PLANNING POLICIES

3.5.1 Strategic Statement on Coal Exploration and Mining in NSW

The *Strategic Statement on Coal Exploration and Mining in NSW* outlines how the NSW Government will continue to support responsible resource development for the benefit of the State (NSW Government, 2020). The *Strategic Statement on Coal Exploration and Mining in NSW* recognises the value of coal production to the NSW economy, including:

- The long history of coal mining in NSW and its close ties with regional communities in the Hunter Valley region.
- The potential for coal production to provide significant benefits to local communities, including jobs and investment.
- Coal production's significant contributions to export earnings as the State's biggest single export earner.

The Proposed Action would provide for the ongoing safe and efficient extraction of significant coal resources at the RUM that the State Government has approved to be mined, subject to the conditions of the Development Consent DA 104/96.

3.5.2 Aquifer Interference Policy

The *Aquifer Interference Policy* (AIP) (NSW Government, 2012) has been developed by the NSW Government as a component of the NSW Government's *Strategic Regional Land Use Policy.* The AIP applies State-wide and details water licence and impact assessment requirements.

The stated purpose of the AIP is to ensure equitable water sharing between various water users and proper licencing of water taken by aquifer interference activities, such that the take is accounted for in the water budget and water sharing arrangements.

The *Water Management Act 2000* defines an aquifer interference activity as that which involves any of the following:

(a) the penetration of an aquifer,

(b) the interference with water in an aquifer,

(c) the obstruction of the flow of water in an aquifer,

(d) the taking of water from an aquifer in the course of carrying out mining or any other activities prescribed by the regulations,

(e) the disposal of water taken from an aquifer as referred to in paragraph (d).

The Groundwater Assessment (Appendix C) has been prepared in consideration of the AIP.

4 LISTED THREATENED SPECIES AND COMMUNITIES

As part of its Controlled Action decision, the Cth DCCEEW considered that the Proposed Action has the potential to significantly impact the following listed ecological communities:

- Central Hunter Valley eucalypt forest and woodland – Critically Endangered; and
- Hunter Valley Weeping Myall (*Acacia pendula*) woodland – Critically Endangered.

Potential impacts to these communities are assessed below.

4.1 VEGETATION WITHIN THE PROPOSED ACTION AREA

Open cut mining currently dominates the Proposed Action area and surrounds (Figure 2). Within the Proposed Action area, the original character of the vegetation has been greatly altered as a result of historical and current land uses including mining and grazing. Areas of the existing waste emplacement have been rehabilitated to grassland using exotic species in the north and north-east of the Proposed Action area.

An area of native (regrowth) vegetation is present in the south-east of the Proposed Action area, which presumably has revegetated since the relaxation of grazing across this area approximately 30 to 40 years ago. Despite past clearing, the vegetation formation in this area is regenerating well and is in moderately good condition.

Flora and fauna surveys across the Ravensworth Mine Complex, including the Proposed Action area, were completed by Umwelt (2010) between 2007 and 2009.

Dr Colin Driscoll (Hunter Eco, 2023) conducted a desktop review and site inspection to validate previous surveys and to ground-truth the extent of threatened ecological communities (TECs) within the Proposed Action area in 2022 (Appendix A).

Vegetation mapping of the Proposed Action area is provided on Figure 4 and summarised in Table 1.

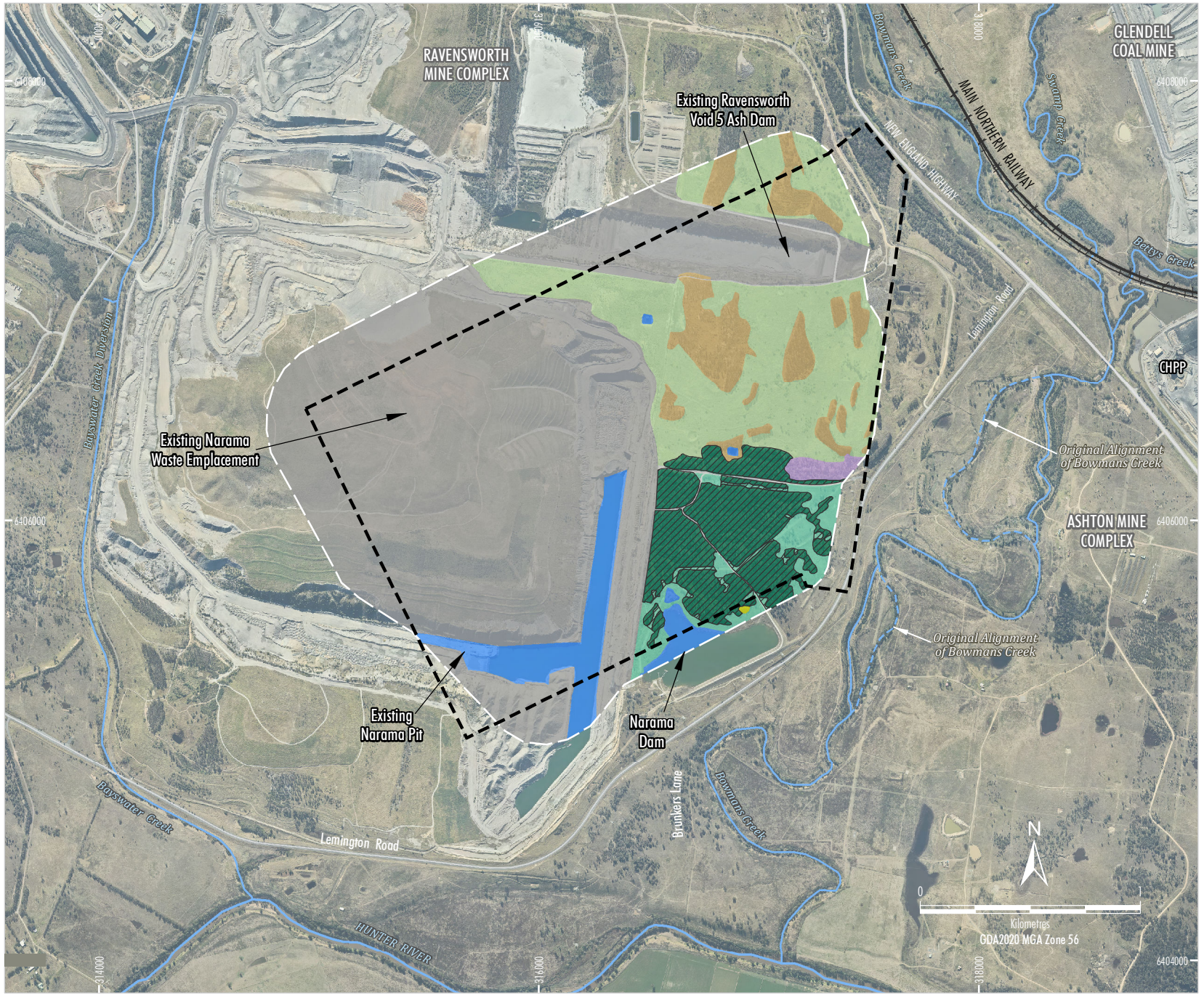
As shown in Table 1, the majority of the overlying land within the Proposed Action area is subject to prior or currently active open cut mining activities including rehabilitated overburden emplacement areas.

Table 1
Mapped Vegetation Communities

Generic Name	PCT	Area (ha)
Mine disturbance associated with overlying open cut mining activities – not part of Proposed Action	-	289.8
Overburden Rehabilitation Grass – Shrub	-	89.1
Overburden Rehabilitation Woodland	-	29.4
Overburden Rehabilitation Weeping Myall Woodland	-	3.0
Narrow-leaved Ironbark – Bull Oak – Grey Box Derived Native Grassland	1603	12.7
Narrow-leaved Ironbark – Bull Oak – Grey Box Derived Native Grassland^	1603	2.2
Narrow-leaved Ironbark – Bull Oak – Grey Box woodland^	1603	42.8
Invasive Swamp Oak	-	0.1
Waterbody	-	25.5
Road	-	3.1
Total Mapped Area		**497.7**

PCT = NSW Plant Community Type.

^ Central Hunter Valley Eucalypt Forest and Woodland (EPBC Act TEC).



LEGEND

- Indicative Underground Mining Area
- Subsidence Assessment Area

Vegetation Communities

- Narrow-leaved Ironbark - Bull Oak - Grey Box Woodland (PCT 1603)
- Narrow-leaved Ironbark - Bull Oak - Grey Box Derived Native Grassland (PCT 1603)
- Swamp Oak Regrowth
- Overburden Rehabilitation Woodland Containing Weeping Myall
- Overburden Rehabilitation Woodland
- Overburden Rehabilitation Grass - Shrub
- Mine Working
- Road
- Waterbody

Threatened Ecological Communities

- Central Hunter Valley Eucalypt Forest and Woodland

Source: SCT (2021); NSW Spatial Services (2023); Hunter Eco (2023)
Orthophoto: Ravensworth Mine Complex (2021)

YANCOAL 兖煤澳大利亚有限公司

RAVENSWORTH UNDERGROUND MINE
PRELIMINARY DOCUMENTATION

Vegetation Communities

Figure 4

4.2 CENTRAL HUNTER VALLEY EUCALYPT FOREST AND WOODLAND

4.2.1 Presence in the Action Area and Surrounds

A 42.8 ha area of native woodland is present within the Proposed Action area. Its content matches the NSW Plant Community Type (PCT) 1603 *Narrow-leaved Ironbark - Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter*. This PCT is assigned to the NSW-listed *Central Hunter Grey Box—Ironbark Woodland in the New South Wales North Coast and Sydney Basin Bioregions* TEC.

The floristic content of this community, particularly the dominant canopy species, also align with the EPBC-listed *Central Hunter Valley eucalypt forest and woodland* TEC as per the *Approved Conservation Advice (including listing advice) for the Central Hunter Valley eucalypt forest and woodland ecological community* (Department of the Environment, 2015). This TEC is listed as critically endangered under the EPBC Act (Department of the Environment, 2015). The derived native grassland areas are excluded from the NSW-listed TEC, however are included in the EPBC Act-listed TEC to the extent of a 30 m or less gap between the woodland patches, which totals an area of approximately 2.2 ha (Appendix A).

The *Central Hunter Valley eucalypt forest and woodland* TEC is surrounded by the Narama Pit (Ravensworth Operations Project) to the west, rehabilitated overburden emplacement to the north, Narama Dam to the south and cleared paddocks and Lemington Road to the east and south-east (Figure 4). The woodland has been isolated from other remnant woodland vegetation due to the surrounding historical and current mining operations (including the active open cut immediately to the west), and agricultural developments and it is unlikely to provide key habitat connectively. Established access tracks, laydown areas and powerline corridors also traverse the woodland community.

4.2.2 Direct, Indirect and Cumulative Impacts

No direct clearance of the *Central Hunter Valley eucalypt forest and woodland* TEC is proposed as part of the Proposed Action.

There is approximately 42.8 ha of *Central Hunter Valley eucalypt forest and woodland* TEC (and a further 2.2 ha of derived native grassland) within the Proposed Action area that would be subject to indirect impacts (subsidence) as a result of longwall mining (Figure 4).

Extraction of coal by longwall mining methods would result in the vertical and horizontal movement of the land surface (i.e. subsidence effects). SCT (2021) predicted subsidence effects resulting from the Proposed Action in *Ravensworth Underground Mine Subsidence Review.* The relevant findings are summarised in Section 2.3 and the full report can be found in Appendix B.

Subsidence effects have the potential to impact vegetation overlying an underground mining area. Based on ACOL's multi-seam underground mining experience at the Ashton Underground Mine as well as experience at other Hunter Valley underground mine (e.g. Wambo Underground Mine), the primary impact mechanisms for overlying vegetation are likely to be ponding and shallow surface cracking.

Ponding can occur in areas effected by subsidence, where surface sinking and depression causes lower-lying areas. If this occurs in areas where there is groundwater or surface water, water from the surrounding area can accumulate forming 'ponds'. This could potentially cause flooding of the overlying vegetation.

A comparison of the pre-subsidence (i.e. current landform) and predicted post-subsidence landform was undertaken by Hunter Eco (2023) to assess changes to flow patterns and potential ponding over the Proposed Action area that may impact vegetation. Based on the likely new drainage across the post-subsidence landform, there is expected to be limited ponding resulting from the Proposed Action (Appendix B).

Cracking occurs on the surface when there is sufficient 'bending' of the ground surface as the subsidence trough develops, generally in areas along longwall ends or edges, or near steep slopes at the surface. This usually occurs as a result of tensile strains (Section 2.3); however, it can also occur when compressive strains result in buckling of strata near the surface. This can potentially impact overlying vegetation if cracks occur in the soil surrounding the vegetation.

SCT (2021) concluded that differential horizontal dilation is expected to occur at the transition between flat terrain and steeply sloping terrain (e.g. near the highwalls of the Narama Pit and Ravensworth Void 5 Ash Dam; Figure 4). Cracks are therefore expected along, and slightly back from, the crest of open cut voids, which may be the case along the western extent of the *Central Hunter Valley eucalypt forest and woodland* TEC where it is adjacent to the Narama Pit. Some of these cracks may be more than 1 m wide, however, these larger cracks are likely to occur close to the pit crest within the cleared access tracks and laydown areas associated with the Ravensworth Operations Project. Smaller surface cracks would likely occur within the *Central Hunter Valley eucalypt forest and woodland* TEC. While these small cracks may have very localised impacts, they would be unlikely to significantly impact the wider population of the *Hunter Valley eucalypt forest and woodland* TEC.

Surface cracking associated with longwall mining is readily remediated. The techniques used to remediate surface cracking associated with longwall subsidence at the Ashton Underground Mine would be employed at the Proposed Action to remediate surface cracking associated with the Action.

As a comparison, the predicted levels of subsidence, tilt and strain over remnant woodland vegetation at the neighbouring Ashton Underground Mine were similar or greater than those predicted for the Proposed Action. ACOL has mined three coal seams beneath this wooded area while maintaining compliance with the "negligible impact to threatened species, populations, habitat or ecological communities" Subsidence Performance Measure prescribed in Development Consent DA 301-11-2001-i (Appendix A). The Wambo Underground Mine has also undermined *Central Hunter Valley eucalypt forest and woodland* TEC with no significant impact observed despite the presence of the subsidence effects including observed cracking of the surrounding soil (Wambo Coal Pty Limited, 2021; 2022).

Hunter Eco (2023) has undertaken an impact assessment for this vegetation community in accordance with the *Matters of National Environmental Significance – Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment, 2013). This assessment concludes the Proposed Action would not result in any direct clearance of the *Central Hunter Valley eucalypt forest and woodland* TEC. Consistent with previous observations at the Ashton Underground Mine, subsidence from the Action is not expected to impact vegetation above the longwall panels. Therefore, the Action is not considered to have a significant impact on the *Central Hunter Valley eucalypt forest and woodland* TEC (Appendix A).

4.2.3 Avoidance, Safeguards and Mitigation Measures

As described above, the mine plan and associated surface disturbance activities have been purposefully designed to avoid direct impacts on the *Central Hunter Valley eucalypt forest and woodland* TEC.

ACOL would implement weed, pest and bushfire management measures at the ACOL-operated portion of the RUM in accordance with the Ashton Biodiversity Management Plan, which would be updated to incorporate the Proposed Action (refer Section 4.4).

As described above, surface remediation works would be carried out where required to minimise the potential impact from surface cracking. The surface remediation measures would be described in the updated Ashton Biodiversity Management Plan.

4.2.4 Conclusion/Consequential Impact

The Proposed Action would not clear the *Central Hunter Valley eucalypt forest and woodland* TEC. Potential subsidence effects on the community can be managed through the Extraction Plan required under Development Consent DA 104/96, consistent with that successfully implemented for forested areas at ACOL's Ashton Underground Mine including implementation of weed, pest and bushfire management measures and remediation of surface cracks due to subsidence.

Hunter Eco (2023) concludes the Proposed Action is not considered to have a significant impact on the *Central Hunter Valley eucalypt forest and woodland* TEC (Appendix A).

The Proposed Action would not affect the long-term viability of the *Central Hunter Valley eucalypt forest and woodland* TEC at a local or regional scale.

4.3 HUNTER VALLEY WEEPING MYALL WOODLAND

4.3.1 Presence in the Action Area and Surrounds

A 3 ha area of mixed plantation (rehabilitation) is present within the Proposed Action area and includes approximately 20 widely spaced Weeping Myall trees (Figure 4). These Weeping Myall trees are part of a prior plantation on previously cleared land as shown on a 1993 aerial photo of the Proposed Action area (refer Figure 3 of Appendix A). Weeping Myall is widespread west of the Great Divide from Victoria through NSW to Queensland with apparently disjunct occurrences in the Hunter catchment.

Hunter Eco (2023) has reviewed the Weeping Myall trees within the Proposed Action area in the context of the *Approved Conservation Advice (including listing advice) for Hunter Valley Weeping Myall (Acacia pendula) Woodland* (Department of the Environment (2015) and other relevant literature including Bell *et al* (2007), and the *National Recovery Plan Weeping Myall – Coobah – Scrub Wilga Shrubland of the Hunter Valley* (Office of Environment and Heritage, 2013) (Appendix A).

Relevantly, Section 1.2 of the Commonwealth listing advice for the critically endangered community *Hunter Valley Weeping Myall* (Acacia pendula) *Woodland* (Department of the Environment, 2014) states that:

> *It is thought that Hunter Valley stands are a relic from the last glaciation when the Hunter Valley is likely to have been dominated by 'western semi-arid' flora.*

Hunter Eco (2023) concluded that there is nothing relictual about a group of recently planted individuals that could not have been sourced from any of the potentially relic Hunter Valley populations that cannot be propagated. Notwithstanding, Hunter Eco has assessed the potential impact on the Weeping Myall in the context of the conservation advice for *Hunter Valley Weeping Myall* (Acacia pendula) *Woodland* TEC.

4.3.2 Direct, Indirect and Cumulative Impacts

No direct clearance of the approximately 20 Weeping Myall trees is proposed as part of the Proposed Action.

The potential indirect impacts due to subsidence effects, as described for the *Central Hunter Valley eucalypt forest and woodland* TEC (Section 4.2.2) would also apply to the approximately 20 Weeping Myall trees (Figure 4). Only part of the rehabilitation area containing the Weeping Myall trees is located directly above the longwall panels. The western area of the plantation is located beyond the end of the longwall panels and therefore likely to experience reduced subsidence effects.

Hunter Eco (2023) has undertaken an impact assessment for the Weeping Myall trees in accordance with the *Matters of National Environmental Significance – Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (Department of the Environment, 2013). This assessment found the Proposed Action would not result in any direct clearance of the Weeping Myall trees. Consistent with previous observations at the Ashton Underground Mine, subsidence from the Proposed Action is not expected to adversely impact vegetation above the longwall panels. Therefore, the Proposed Action is not considered to have a significant impact on the Weeping Myall trees (Appendix A).

Further, monitoring of *Acacia pendula* above underground mining areas elsewhere in the Hunter Valley showed no observable impacts on the health of the *Acacia pendula* stand, with respect to age classes, recruitment, health, infestations and senescence (Wambo Coal Pty Limited, 2011).

4.3.3 Avoidance, Safeguards and Mitigation Measures

As described above, direct clearance of the Weeping Myall trees would be avoided.

ACOL would implement weed, pest and bushfire management measures at the ACOL-operated portion of the RUM in accordance with the Ashton Biodiversity Management Plan, which would be updated to incorporate the Proposed Action. The revised Biodiversity Management Plan would consider the *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomi* (Department of the Environment and Energy, 2018) as the adopted Threat Abatement Plan for the *Hunter Valley Weeping Myall Woodland* TEC.

4.3.4 Conclusion/Consequential Impact

The Proposed Action would not clear the *Hunter Valley Weeping Myall Woodland* TEC. Potential subsidence effects on the community can be managed through the Extraction Plan required under Development Consent DA 104/96, consistent with that successfully implemented for forested areas at ACOL's Ashton Underground Mine including implementation of weed, pest and bushfire management measures and remediation of surface cracks due to subsidence.

Hunter Eco (2023) concludes the Proposed Action is not considered to have a significant impact on the *Hunter Valley Weeping Myall Woodland* TEC (Appendix A).

The Proposed Action would not affect the long-term viability of the *Hunter Valley Weeping Myall Woodland* TEC at a local or regional scale.

4.4 MONITORING AND MANAGEMENT

Development Consent DA 104/96 includes subsidence performance measures which prescribe that (among other things) underground mining has "negligible impact" on "threatened species, threatened populations, or endangered ecological communities".

The conditions of Development Consent DA 104/96 also require an Extraction Plan to be prepared for approval by the NSW Planning Secretary prior to commencing longwall extraction within the Proposed Action area.

The Extraction Plan is required to include a Biodiversity Management Plan, which must be prepared in consultation with the NSW Biodiversity Conservation Division (BCD) and NSW Resources Regulator. The Biodiversity Management Plan will be updated to address management and monitoring for the Proposed Action (in addition to the existing management and monitoring described for the Ashton Mine Complex). In accordance with Condition 6, Schedule 3 of Development Consent DA 104/96, the Biodiversity Management Plan must:

- include a program of works to ensure that overall terrestrial and aquatic biodiversity values are the same or better than existed in the locality prior to longwall mining; and
- provide for the management of the potential impacts and/or environmental consequences of the proposed second workings on aquatic and terrestrial flora and fauna.

Consistent with the existing Ashton Biodiversity Management Plan (Appendix E), the Biodiversity Management Plan for the Proposed Action would include:

- detailed performance indicators for subsidence impacts to threatened flora and fauna and biodiversity values (i.e. negligible impact on threatened species, threatened populations, or endangered ecological communities);
- bi-annual fauna monitoring and annual vegetation monitoring, including within remnant woodland areas and land overlying underground mining operations;
- annual riparian vegetation monitoring (including of potential groundwater dependent ecosystems [GDEs] on Bowmans Creek);
- bi-annual (spring and autumn) aquatic ecology monitoring;
- remediation of surface cracking where it is determined to adversely impact on threatened vegetation; and
- trigger action response plans in the event that a performance indicator is exceeded, such as a decline in tree health/condition being observed through monitoring.

In addition, the Biodiversity Management Plan would be updated to include an annual vegetation monitoring for the *Central Hunter Valley eucalypt forest and woodland* TEC, Weeping Myall trees and other established vegetation within the Proposed Action area for the duration of the Proposed Action. The aim of the monitoring program will be to:

- ensure that existing vegetation not affected by past mining activities are maintained as viable habitats; and
- monitor any potential impacts attributable to the Proposed Action, and where required guide remediation activities so as to minimise any potential further impacts on established habitat.

The Extraction Plan required by Development Consent DA 104/96 must include a Subsidence Monitoring Program, which would:

- provide data to assist with the management of the risks associated with subsidence;
- validate the subsidence predictions;

- analyse the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences; and
- inform the contingency plan and adaptive management process under the Biodiversity Management Plan.

If monitoring determines that a performance measure in the Development Consent DA 104/96 has been exceeded (or is likely to be exceeded), ACOL will undertake the following in accordance with the Ashton Biodiversity Management Plan (incorporating the Proposed Action):

- report the likely exceedance of the performance indicator to the relevant agencies as soon as practicable after becoming aware of the exceedance;
- identify an appropriate course of action with respect to the identified impact in consultation with appropriate specialists and relevant agencies; and
- review the effectiveness of the Biodiversity Management Plan and performance measures to adequately manage potential impacts within the approval limits.

Condition 2, Schedule 3 of Development Consent DA 104/96 requires ACOL to provide a suitable offset to compensate for the impact or environmental consequence, where this Performance Measure is exceeded and the NSW Planning Secretary determines that:

- it is not reasonable or feasible to remediate the impact or environmental consequence; or
- remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence.

The approved Ashton Underground Mine has mined beneath remnant woodland vegetation while maintaining compliance with the “negligible impact to threatened species, populations, habitat or ecological communities” Subsidence Performance Measure prescribed in Development Consent DA 301-11-2001-i. Accordingly, the existing measures and monitoring in the Ashton Biodiversity Management Plan are considered effective in managing the potential impacts of the Proposed Action on biodiversity.

The roles and responsibilities for implementation of the Ashton Biodiversity Management Plan are provided in Section 4.6 of Appendix E.

ACOL would report its performance against the Performance Measures in the Annual Review required under Condition 2, Schedule 4 of Development Consent DA 104/96.

The rehabilitation of the Proposed Action would need to be undertaken in accordance with the requirements of Condition 27, Schedule 3 of Development Consent DA 104/96 which requires the land:

> *to be restored and maintained to the same or higher land capability and agricultural suitability than prior to mining…*
>
> *Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of local native plant species (unless the Resources Regulator agrees otherwise)*
> *…*

5 WATER RESOURCES

5.1 EXISTING ENVIRONMENT

The stratigraphic sequence in the region comprises two distinct units; Quaternary alluvium and Permian strata.

The Quaternary alluvium consists of unconsolidated silt, sand and gravel in the alluvial floodplains of the Hunter River and its tributaries. The alluvium unconformably overlies the Permian strata, which comprise coal seam sequences with overburden and interburden consisting of sandstone, siltstone, tuffaceous mudstone, and conglomerate (Appendix C).

The target coal seams for the Proposed Action are contained within the Permian Wittingham Coal Measures. In the locality of the RUM and Ashton Underground Mine, the lower sequences of the Wittingham Coal Measures are inclusive of the Hebden to Bayswater seams subcrop (Appendix C).

Both regionally and locally, groundwater is recognised as occurring within both the Quaternary alluvium and the Permian Wittingham Coal Measures. The two main water bearing systems within the Proposed Action area are the Permian coal measures and the unconsolidated alluvial sediments associated with the Hunter River and Bowmans Creek (Appendix C).

The Proposed Action area is located within the Hunter River catchment and the Bowmans Creek sub-catchment. The Hunter River is located south of the Proposed Action area and flows to the east.

Bowmans Creek is located approximately 300 m to the east of the Proposed Action longwall panels and was realigned by ACOL in two locations prior to it being undermined by the Ashton Underground Mine operations (Figure 2). Bowmans Creek flows southwards into the Hunter River.

The majority of the Proposed Action area has been disturbed by mining operations and surface water flows within the Proposed Action area are managed by the existing surface water management system for the Ravensworth Operations Project. The majority of surface water flows over the area of remnant (or regrowth) vegetation in the south-east of the Proposed Action area flow southwards into the Narama Dam, which is part of the Ravensworth Operations Project water management system.

The Bowmans Creek Alluvium is directly east of the Proposed Action longwall panels and is typically between 7 to 15 m thick in the local area. The depth to water through the Bowmans Creek alluvium is variable, but is in the range of 4 to 10 m directly east of the Proposed Action (representing a saturated thickness of up 10 m in the deepest parts of the alluvium) (Appendix C). Groundwater levels recorded within the Bowmans Creek alluvium show a strong correlation with rainfall (Appendix C).

Other nearby creeks include Glennies Creek located more than 2 km to the east of the Proposed Action and the re-aligned Bayswater Creek located between the Ravensworth Narama Pit and Ravensworth North Pit (Figure 3), west of the Proposed Action.

Historical mining in the area has depressurised the deeper Permian formation, reducing the flow of groundwater from the Permian strata to the alluvial sediments relative to pre-mining conditions (in some places the hydraulic gradient has reversed with groundwater within alluvial sediments providing a recharge source to the underlying Permian strata). Notwithstanding, groundwater levels within the alluvial system is maintained through rainfall recharge demonstrating minimal impact on these groundwater sources from the surrounding mining (Appendix C).

Water users and water dependent assets are described in Sections 5.2 and 5.5.

5.2 WATER REGULATION

Water use in the vicinity of the Proposed Action is regulated by the NSW Government under the *Water Management Act 2000*. The following water sharing plans are relevant to the Proposed Action:

- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.
- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022*.
- *Water Sharing Plan for the Hunter Regulated River Water Source 2016*.

The Permian strata inclusive of the Proposed Action coal resource is wholly located within the Sydney Basin-North Coast Groundwater Source, regulated under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.

Bowmans Creek and the Bowmans Creek alluvium are located within the Jerrys Water Source, regulated under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022.*

The Hunter River alluvium in the vicinity of the Proposed Action is located within the Hunter Regulated River Alluvial Water Source, regulated under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2022.*

Glennies Creek, located more than 2 km to the east of the Proposed Action comprises the Glennies Water Source and is regulated under the *Water Sharing Plan for the Hunter Regulated River Water Source 2016.* While impacts to Glennies Creek due to the Proposed Action are not expected, AGE has conservatively included this water resource in the Groundwater Assessment.

5.3 WATER USERS

There are no privately-owned surface water or groundwater users in close proximity to the Proposed Action as the land north of the Hunter River is owned by mining companies (ACOL, Glencore and AGL).

Potential GDEs in the vicinity of the Action are discussed in Section 5.5.

5.4 SURFACE WATER

An assessment of the potential impacts due to subsidence of the surface from underground mining activities, which may alter flow patterns on a local scale and changes in baseflow because of underground mining activities is provided below. The assessment focuses on the potential impacts to Bowmans Creek and the Hunter River, as the two surface water resources proximal to the Proposed Action.

5.4.1 Direct, Indirect and Cumulative Impacts

A Subsidence Review of the proposed longwall extraction was prepared by SCT (2021) and is presented in Appendix B.

The Subsidence Review indicates that subsidence impacts of the Proposed Action would be consistent with the findings of earlier subsidence assessments for the mining layout approved under NSW Development Consent DA 104/96. The Proposed Action would comply with the existing Performance Measures in Development Consent DA 104/96 (Appendix B). As per Attachment 4, these Performance Measures include environmental outcomes for watercourses (i.e. no greater subsidence impact or environmental consequence to Bowmans Creek and its alluvium than predicted in the Environmental Assessments), as well as biodiversity and heritage.

The Proposed Action has been designed to avoid impacting the Narama Dam and dam wall, as far as practical. As shown on Figure 2, the dam wall (southern side of dam) is located more than 250 m from the longwall panels. At this distance the geotechnical assessment concluded that longwall mining would not be expected to cause any significant subsidence movements in the vicinity of the dam wall (SCT, 2021).

The Void 5 Ash Dam wall was designed and constructed to withstand subsidence from the RUM, which was approved and in operation prior to construction of the dam wall. Subsequently, part of Void 5 Ash Dam was undermined during the previously completed Pikes Gully coal seam in the RUM (i.e. immediately to the north of the Proposed Action).

With the implementation of monitoring and management measures for the Narama Dam and Void 5 Ash Dam, as described in Section 5.4.4, the risk of dam failure and subsequent downstream impacts due to the Proposed Action is considered to be low.

Hunter Eco (2023) compared the pre-subsidence digital elevation model (DEM) and predicted post-subsidence DEM and found that flow patterns would remain similar post-mining, with flow exiting the area and entering Bowmans Creek at the same points as for pre-mining conditions (Appendix A).

The February 1955 Hunter Valley flood is known as being the largest recorded flood the region has ever experienced (HEC, 2021). The high runoff and streamflow experienced were caused by short-term high intensity rainfall in addition to significant rainfall in the preceding weeks and months.

A comparison of the Proposed Action longwall extent to the 1955 Hunter Valley Flood Plain Atlas maps (Water Resources Commission of NSW, 2019) shows that the extent of predicted subsidence associated with the Proposed Action lies outside the extent of inundation from the 1955 flood.

5.4.2 Baseflow

AGE (2024) has assessed potential impacts of the Proposed Action on the Hunter River, Bowmans Creek and their connected alluvium using a numerical groundwater model. In summary (Appendix B):

- historical mining has not impacted water levels in the Hunter River and Bowmans Creek alluvium;
- the Proposed Action would result in less than 0.2 m of drawdown in the Hunter River and Bowmans Creek alluvium; and
- reduction in baseflow to the Hunter River and Bowmans Creek due to the Proposed Action would be negligible.

5.4.3 Site Water Balance

As discussed in Section 2, the Proposed Action does not include (emphasis added):

> *existing or proposed activities at the Ashton Coal Project, including the receipt, handling and processing of RUM coal at the Ashton Coal Handling and Processing Plant and* ***receipt of water and gas transferred from the RUM and its management at the Ashton Coal Project****.*

Notwithstanding, a site water balance was undertaken by HEC (2021) (Appendix D) to evaluate the effects of the ACOL-operated portion of the RUM on the Ashton Underground Mine water management system. HEC (2021) concluded that the ACOL-operated portion of the RUM would not result in any significant changes in forecast external raw water requirements or overflow risk from site storages (Appendix D).

The Proposed Action would not result in additional drainage to Hunter River, Bayswater Creek or Bowmans Creek.

ACOL would continue to obtain and hold relevant water licences under the *Water Management Act 2000* to account for the take of water associated with the Ashton Mine Complex and the ACOL-operated portion of the RUM.

In accordance with Conditions 6 and 23, Schedule 3 of Development Consent DA 104/96, the Ashton Water Management Plan (including the Site Water Balance) would be revised to incorporate the Proposed Action (Appendix F).

5.4.4 Monitoring and Management

Condition 1, Schedule 3 of Development Consent DA 104/96 requires ACOL to ensure that the ACOL-operated portion of the RUM does not cause any exceedance of the following Performance Measures:

- **Bowmans Creek and its alluvium:** No greater subsidence impact or environmental consequences than predicted in the EAs.
- **Hunter River and its alluvium:** Negligible environmental consequences.

Subsidence

Condition 6, Schedule 3 of Development Consent DA 104/96 also requires preparation of an Extraction Plan, which must be approved by the Secretary of the NSW DPHI prior to secondary extraction. The Extraction Plan is required to include a Subsidence Monitoring Program, Water Management Plan and Built Features Management Plans (BFMPs) for any overlying third-party owned infrastructure (such as roads, power lines, fences, dams, pipelines, access tracks and other infrastructure as relevant).

Consistent with the Subsidence Monitoring Program described in the approved Extraction Plan for the Ashton Underground Mine, ACOL conducts regular inspections of the land surface above the active mining area. The inspections cover the full extent of subsidence within the 45-degree angle of draw and are conducted by a mine surveyor. The Subsidence Monitoring Program for the Proposed Action would:

- provide data to assist with the management of the risks associated with subsidence;
- validate the subsidence predictions;
- analyse the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences; and
- inform the contingency plan and adaptive management process under the Water Management Plan.

The Subsidence Monitoring Program would be designed to identify the following potential subsidence impacts where relevant:

- surface cracking;
- surface humps and "troughs";
- condition of drainage lines;
- areas of ponding;
- step changes in land surface;
- slope instability; and
- general vegetation condition.

ACOL is investigating the use of drone LiDAR to supplement its existing Subsidence Monitoring Program. If viable, this drone monitoring would be described in the Subsidence Monitoring Program for the Proposed Action.

Monitoring results would inform the need to implement appropriate remediation where required.

Water Resources

The Water Management Plan would include surface and groundwater impact assessment criteria and trigger levels for investigating any potentially adverse impacts on water resources or water quality. ACOL operates the existing Ashton Underground Mine in accordance with an approved Water Management Plan prepared under Condition 26, Schedule 3 of Development Consent DA 309-11-2001-i. The Ashton Water Management Plan would be reviewed and updated to incorporate the Proposed Action, and would include consideration of potential acid sulfate soils in the Proposed Action area. The Ashton Water Management Plan (Appendix F) includes:

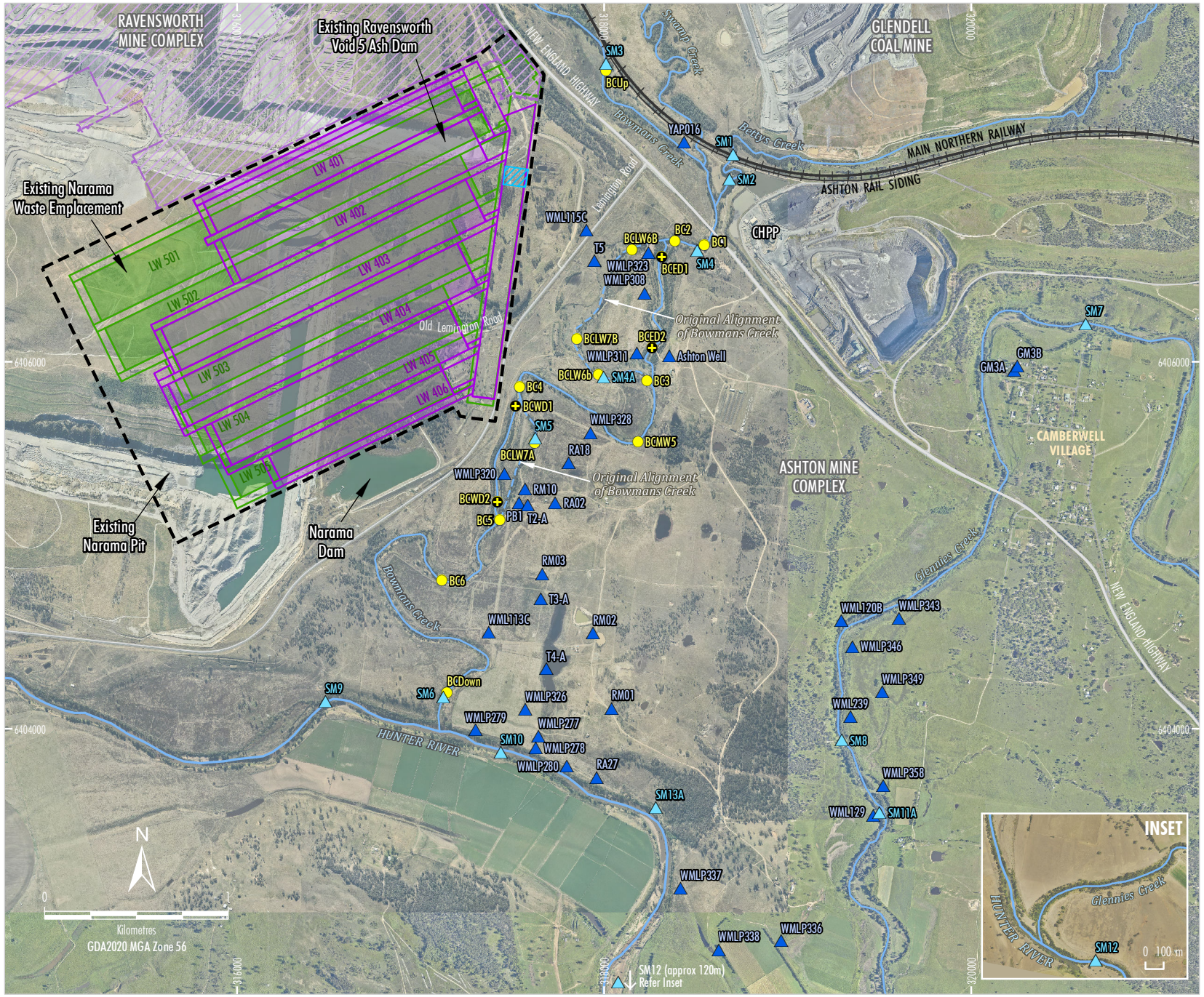
- an Erosion and Sediment Control Plan, including measures to repair subsidence induced surface cracking or instability;
- surface water monitoring at several locations on Bowmans Creek and the Hunter River (as shown on Figure 5 and summarised in Table 2);
- surface water quality investigation trigger levels;
- groundwater quality and level investigation trigger levels; and
- a surface water and groundwater response plan that is implemented if an investigation trigger indicator value is exceeded.

Minor ephemeral drainage lines would be monitored to identify potential development of nick points. Where nick points are identified, reshaping would be undertaken to ensure velocities and scour characteristics are not altered.

Monthly inspections of sediment control structures in the Action area that report to Bowmans Creek, as well as inspections following significant rainfall events (more than 25 mm in 24 hours), would be conducted by ACOL personnel. During these inspections, sediment control structures would be inspected for capacity, structural integrity and effectiveness to maintain water quality passively discharging off-site to Bowmans Creek. Where necessary, repairs would be undertaken in accordance with the BFMPs.

Surface cracking would be closely monitored and remediated as required to ensure existing drainage lines continue to function. Where required, cracks would be reshaped, scarified and stabilised, topsoil applied if necessary and then direct seeded.

Interim erosion control devices such as hay bales and geotextile barriers would be used as necessary to divert surface runoff away from the remediated area until sufficient ground cover has been established. Nick points in grassed or wooded areas would be reshaped and remediated in a similar manner or managed by the use of coir log dams.



LEGEND

Completed Pikes Gully Seam Workings

Existing Shaft 5 Location

Components of the Action

Action Area

Indicative Pikes Gully Seam Longwall Layout

Indicative Middle Liddell Seam Longwall Layout

Monitoring Sites

Alluvial Groundwater Monitoring Site

Surface Water Monitoring Site

Aquatic Ecology Sampling Site

Aquatic Ecology Sampling Site and Photo Point Assessment Location

Source: SCT (2021); ACOL (2023); NSW Spatial Services (2023)
Orthophoto: Ravensworth Mine Complex (2021); Ashton (2021)

YANCOAL 兖煤澳大有业有限公司

RAVENSWORTH UNDERGROUND MINE
PRELIMINARY DOCUMENTATION

Ashton Mine Complex
Surface Water and Groundwater Monitoring Sites
Figure 5

Table 2
Surface Water Sampling Program

Watercourse	Sites	Parameters	Frequency
Bowmans Creek	SM3, SM4, SM4A, SM5, SM6	pH, EC, TSS, TDS, flow (qualitative)*	Monthly
		Tot. Hardness, Oil & Grease, turbidity, Ca, Mg, Na, K, Cl, SO4, HCO3, CO3, Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, Zn, NH_3, NO_4, F.	Annual
	BCUp, BC1, BC2, BCED1, BCLW6b, BCLW6B, BCLW7B, BCED2, BC3, BCMW5, BC4, BCWD1, BCLW7A, BCWD2, BC5, BC6, BCDown^	Aquatic ecology sampling and stream health assessment: field observations of aquatic habitat, macroinvertebrate sampling, macrophyte sampling, fish trapping, selective 'edge' and riffle habitat sampling, field water quality, taxonomic identifications and diversity assessment, SIGNAL index calculations, site condition index (RCE).	Annual
	BCED1, BCED2, BCWD1, BCWD2	Photo point assessment and comparison or erosion and deposition features.	Annual
Bettys Creek	SM1, SM2	pH, EC, TSS, TDS, flow (qualitative)*	Monthly
		Tot. Hardness, Oil & Grease, turbidity, Ca, Mg, Na, K, Cl, SO4, HCO3, CO3, Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, Zn, NH_3, NO_4, F.	Annual
Glennies Creek	SM7, SM8, SM11A	pH, EC, TSS, TDS, flow (qualitative)*	Monthly
Hunter River	SM9, SM10, SM12, SM13A	pH, EC, TSS, TDS, flow (qualitative)*	Monthly
		Tot. Hardness, Oil & Grease, turbidity, Ca, Mg, Na, K, Cl, SO4, HCO3, CO3, Al, As, Cd, Cr, Cu, Fe, Pb, Mn, Hg, Ni, Se, Zn, NH_3, NO_4, F.	Annual

* Data logged every 10 minutes. Qualitative flow assessment at the time and location of sampling involves the designation of either zero flow (i.e. a stagnant pool), trickle, low, moderate or high flow.
^ A number of these sites were brought into the monitoring program sequentially as the staged diversion works proceeded and other sites are to be brought in sequentially as mining proceeds. These latter sites will be introduced into the aquatic ecology monitoring program on a staged basis, that is, relative to the progression of the respective longwall mine. Sampling of each of these short-term longwall sites will be scheduled into the regular sampling program to incorporate a before, and at least two after samples from each site, according to the scheduled mining program. Not all sites are to be sampled for the full stream health monitoring program but will be sampled for fish passage and/or field water quality as appropriate.

Geotechnical Stability

A monitoring program and remediation protocols (where required) would be described in the BFMP.

As recommended by SCT, a geotechnical stability assessment and detailed review of low-level subsidence movement effects on the Narama Dam wall and Void 5 Ash Dam wall would be undertaken to inform the BFMPs. Consistent with the conditions of NSW Development Consent DA 104/96, agreement from the dam owner, consent from Dams Safety NSW and approval of the BFMP by the NSW Planning Secretary will be required prior to longwall mining in proximity to these dams. Further, ACOL would be required to meet the Performance Measures listed of NSW Development Consent DA 104/96 (refer Attachment 4) under the Extraction Plan and BFMPs. Consequently, the risk of dam failure and subsequent downstream impacts due to the Proposed Action is considered very low.

Spontaneous Combustion

Spontaneous combustion is a critical hazard for underground coal mines as it presents a potential ignition source for gas within the mining environment. ACOL manages the risk of spontaneous combustion in accordance with its Principal Hazard Management Plan for Spontaneous Combustion.

Management of spontaneous combustion is based on four key principles: prevention, detection, control and incident management. To address the potential for spontaneous combustion impacts, ACOL's existing Principal Hazard Management Plan for Spontaneous Combustion including the Trigger Action Response Plan (TARP) would be updated prior to commencement of the Proposed Action area. This would include consideration of the following monitoring and management measures:

- visual inspections when mining beneath or in close proximity to the existing waste rock emplacement overlying the longwall panels;
- use of thermal imaging monitoring to identify any hot spots, as appropriate;
- surface water management controls to be implemented in case of a spontaneous combustion incident (in accordance with TARPs);

- land remediation measures (e.g. backfill and grading of area) to manage any potential heating event; and
- clear definitions of roles, responsibilities, notifications and training.

5.5 GROUNDWATER

A Groundwater Assessment for the Proposed Action has been prepared by AGE (2024) and is presented in Appendix C. The Groundwater Assessment has been peer reviewed by Dr Noel Merrick (HydroAlgorithmics Pty Ltd) and the review report is presented in Attachment 5.

5.5.1 Groundwater Setting

The Permian aquifers in the vicinity of the Proposed Action are not considered to be high value water resources due to comparatively poor water quality, low yield and lack of anthropogenic or environmental use. Therefore, potential impacts to the Permian aquifer are not the focus of this significant impact assessment.

The Groundwater Assessment has been prepared to address the IESC advice (dated 14 December 2022). It has considered the *Information Guidelines for the Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals* (IESC, 2018) and associated explanatory notes, including:

- Uncertainty Analysis – Guidance for groundwater modelling within a risk management framework (Middlemis & Peeters, 2018);
- Assessing Groundwater-Dependent Ecosystems (Doody, Hancock & Pritchard, 2019); and
- How to Derive Site-specific Guideline Values for Physical and Chemical Parameters (Huynh & Hobbs, 2019).

The Proposed Action is located in a well-established mining region (Figure 4). The Proposed Action would involve longwall mining within the Pikes Gully and Middle Liddell Seams. These seams have been historically dewatered and are approved for further mining at adjacent mining operations, including:

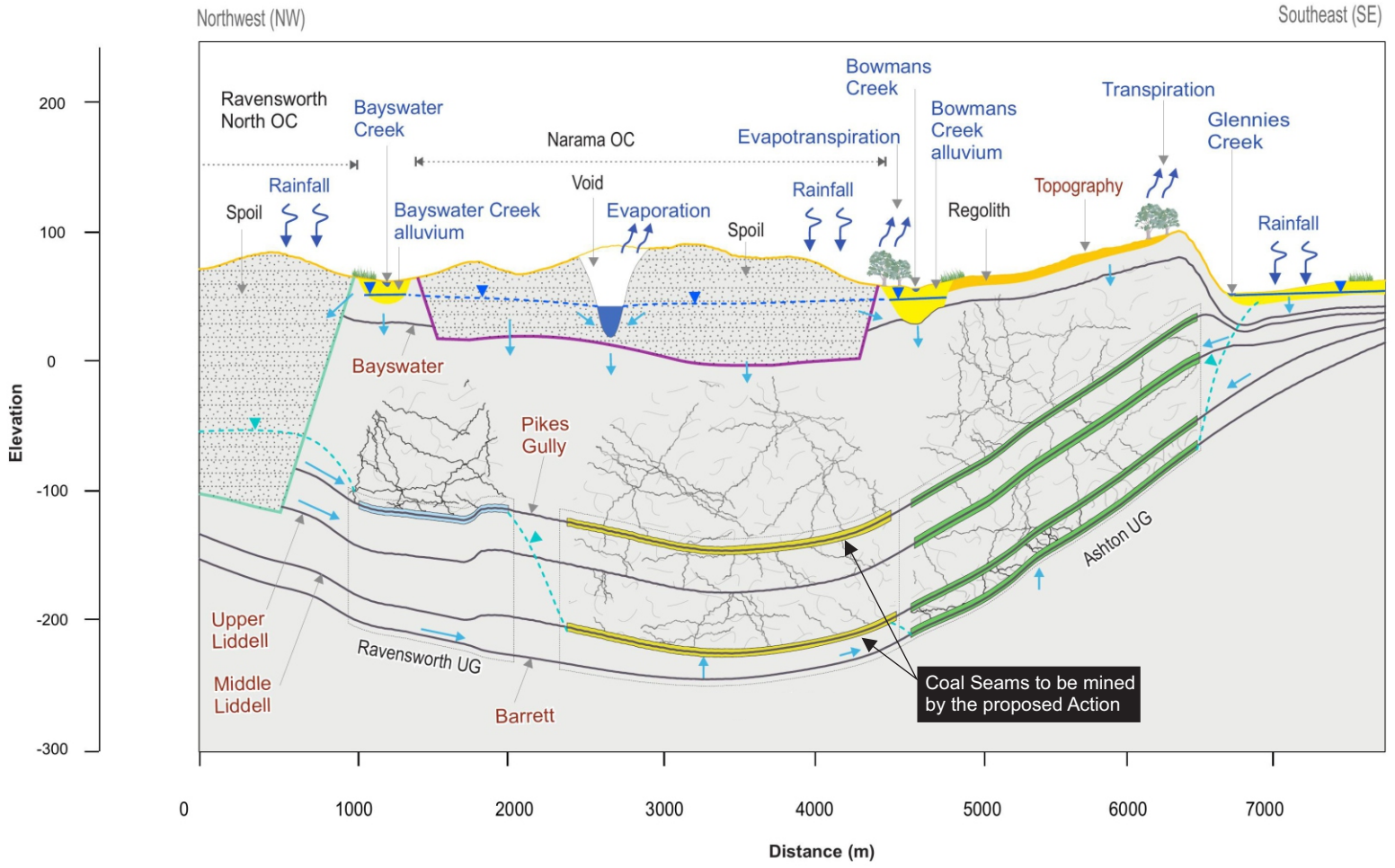
- previous mining of the Pikes Gully, Upper Liddell and Upper Lower Liddell Seams at the Ashton Underground Mine;
- approved future mining of the Lower Barrett Seam at the Ashton Underground Mine;
- previous mining of all seams to the Lower Barrett Seam by the Ashton North-East Open Cut;
- previous mining of the Pikes Gully Seam at the Ravensworth Underground Mine;
- previous mining of all seams to the Bayswater Seam at the Ravensworth Open Cut mines;
- previous mining of all seams to the Hebden Seam at the Integra Open Cut Mine;
- previous and current mining of the Middle Liddell Seam at the Integra Underground Mine;
- previous and current mining of all seams to the Lower Barrett Seam at the Glendell Open Cut Mine; and
- previous and proposed mining of all seams to the Barrett Seam at the Hunter Valley Operations (HVO) North operations.

A conceptual west to east cross-section through RUM and Ashton Underground Mine mining areas is presented in Figure 6. The cross section graphically shows the main processes influencing the groundwater regime including recharge, flow directions and discharge.

5.5.2 Potential Impacts on Groundwater Resources

AGE (2024) evaluated the potential impacts of the Proposed Action (extraction of the Pikes Gully and Middle Liddell Seams at the ACOL operated portion of the RUM) on groundwater resources using a peer reviewed numerical groundwater model. Consistent with the outcomes of the Groundwater Review provided as part of the referral, the Groundwater Assessment concludes (Appendix C):

- the Proposed Action would result in less than 0.2 m of drawdown in the Bowmans Creek alluvium, with less drawdown expected in the Hunter River and Glennies Creek;
- reduction in baseflow to Bowmans Creek, Glennies Creek and the Hunter River due to the Proposed Action would be negligible;
- privately-owned bores would not be impacted by the Proposed Action; and
- the Proposed Action would have negligible impact on potential GDEs.



LEGEND

- Narama OC (Yr 1991 - 1998)
- Ravensworth North OC (Yr 1980 - 2013)
- Ravensworth UG (Yr 2007 - 2014)
- Proposed Action (Yr 2022 - 2029)
- Ashton UG (Yr 2007 - 2035)
- Fracture Zone

Source: AGE (2023)

YANCOAL 兖煤澳大利亚有限公司

RAVENSWORTH UNDERGROUND MINE
PRELIMINARY DOCUMENTATION

Ecohydrological Conceptual Model

Figure 6

AGE (2024) also modelled potential cumulative impacts of the Proposed Action together with historical and approved mining at the RUM, Ravensworth Mine Complex, the Ashton Underground Mine and other neighbouring mining operations. The Proposed Action would have a negligible contribution to cumulative impacts (Appendix C).

Dr Noel Merrick in the peer review of the Groundwater Assessment concluded that the assessment methodology used by AGE was appropriate, and the groundwater modelling has been conducted competently (Attachment 5).

5.5.3 Monitoring and Management

Condition 6, Schedule 3 of Development Consent DA 104/96 requires preparation of an Extraction Plan, which must be approved by the Secretary of the NSW DPHI prior to secondary extraction. The Extraction Plan is required to include a Water Management Plan.

The Water Management Plan would include surface and groundwater impact assessment criteria and trigger levels for investigating any potentially adverse impacts on water resources or water quality.
ACOL operates the existing Ashton Underground Mine in accordance with an approved Water Management Plan prepared under Condition 26, Schedule 3 of Development Consent DA 309-11-2001-i. The existing Ashton Coal Project Water Management Plan would be reviewed and updated to incorporate the Proposed Action. The Ashton Water Management Plan (Appendix F) includes:

- groundwater monitoring at several locations in the Bowmans Creek and Hunter River alluvium;
- groundwater level and quality trigger levels; and
- a surface water and groundwater response plan that is implemented if a trigger level is exceeded.

The current RUM and Ashton Underground Mine groundwater monitoring network consists of 64 monitoring bores and vibrating wire piezometer installations that monitor the alluvial and fractured rock aquifers as shown on Figure 4.3 of Appendix C. The alluvial monitoring program is summarised in Table 3.

Where available, ACOL will investigate reinstating monitoring at historical Ravensworth monitoring bores, located to the west and south-west of the Proposed Action, and include these bores within its monitoring program for the Proposed Action (where data is available). The location of the additional bores is shown on Figure 6.1 of Appendix C.

5.6 GROUNDWATER DEPENDENT ECOSYSTEMS

GDEs are ecosystems that rely upon groundwater for their continued existence. GDEs may be completely dependent on groundwater (i.e. obligate GDEs), such as aquifer GDEs, or may access groundwater intermittently to supplement their water requirements (i.e. facultative GDEs), such as riparian tree species in arid and semi-arid areas (Doody, Hancock & Pritchard, 2019).

5.6.1 Potential GDEs in the Action Area and Surrounds

The Groundwater Dependent Ecosystem Atlas (GDE Atlas) was developed by the Bureau of Meteorology as a national dataset of Australian GDEs to inform groundwater planning and management (Bureau of Meteorology, 2020). The GDE Atlas contains information about three types of ecosystems defined in the Australian Groundwater-Dependent Ecosystems Toolbox (Richardson et al., 2011).

GDEs derived in the GDE Atlas are mapped according to the following classifications:

- High potential for groundwater interaction.
- Moderate potential for groundwater interaction.
- Low potential for groundwater interaction.

The GDE Atlas identifies the following potential aquatic GDEs in the vicinity of the Proposed Action:

- Bowmans Creek is mapped as having moderate potential for groundwater interaction; and
- the Hunter River is mapped as having high potential for groundwater interaction.

The GDE Atlas identifies the following potential terrestrial GDEs in the vicinity of the Proposed Action:

- vegetation within the Proposed Action area is mapped as having low potential for groundwater interaction;
- vegetation along Bowmans Creek is mapped as having either high or low potential for groundwater interaction; and
- vegetation along the Hunter River is mapped as having either high or low potential for groundwater interaction.

Table 3
Alluvial Groundwater Monitoring Program

ID	Target Alluvial Sequence	Monthly Sampling	Quarterly Sampling	Annual Sampling
Ashton Well	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ2
GM3A	Glennies Creek Alluvium	WL	WL and WQ1	WL and WQ2
GM3B	Glennies Creek Alluvium	WL	WL and WQ1	WL and WQ2
PB1	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ2
RA02	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ3
RA18	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ2
RA27	Hunter River Alluvium	WL	WL and WQ1	WL and WQ3
RM01	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ2
RM02	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ1
RM03	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ2
RM10	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ2
T2-A	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
T3-A	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ3
T4-A	Bowmans Creek Alluvium	WL	WL and WQ2	WL and WQ3
T5	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ3
WML113C	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WML115C	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ2
WML120B	Glennies Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WML129	Glennies Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WML239	Glennies Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP277	Hunter River Alluvium	WL	WL and WQ1	WL and WQ3
WMLP278	Hunter River Alluvium	WL	WL and WQ1	WL and WQ3
WMLP279	Hunter River Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP280	Hunter River Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP308	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ3
WMLP311	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP320	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP323	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP326	Bowmans Creek Alluvium	WL	WL and WQ1	WL and WQ2
WMLP328	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP336	Hunter River Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP337	Hunter River Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP338	Hunter River Alluvium	WL	WL and WQ1	WL and WQ3
WMPL343	Glennies Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP346	Glennies Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP349	Glennies Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
WMLP358	Glennies Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3
YAP016	Bowmans Creek Alluvium	WL and WQ1	WL and WQ2	WL and WQ3

Note: This table does not include non-alluvial Ashton Mine Complex groundwater monitoring sites (e.g. targeting the coal seams).
WL = Water Level.
WQ1 = field water quality parameters (pH and electrical conductivity [EC]).
WQ2 = laboratory analysis of pH, EC and cation/anions.
WQ3 = laboratory analysis of pH, EC, temperature, total dissolved solids (TDS), turbidity, Na, K, Ca, Mg, F, Cl, SO4 HCO3, NO3, Total N, Total P, Cu, Pb, Zn, Ni, Fe, Mn, As, Se, Cd, Cr, Total Alkalinity, Total Cyanide.

The *Central Hunter Valley eucalypt forest and woodland* TEC and Weeping Myall are not considered to be GDEs given these communities occur more widely across the region and are not restricted to areas where they could potentially access groundwater. Further, parts of the *Central Hunter Valley eucalypt forest and woodland* TEC are located immediately adjacent to the Narama Pit where groundwater levels would be drawn down below potential rooting depths and shown no decline in condition.

5.6.2 Site-specific Review of Potential GDEs

A site-specific review of potential GDEs in the vicinity of the Proposed Action was completed by HunterEco (2023) as summarised below and presented in Appendix A.

A survey of the vegetation along the section of Bowmans Creek south of the existing diversion was conducted on 24 January 2023 by Dr Colin Driscoll. The creek upstream from this point has been highly modified with eastern and western diversion channels constructed to relocate those parts of the original creek away from the Ashton Underground Mine.

In the area surveyed (south of the western diversion), Bowmans Creek is incised in places up to a depth of approximately 5 m in relation to the surrounding land and over 50 m wide between tops of bank. The trees along the creek follow a typical riparian gallery pattern generally confined to creek bed level and steep sides (Appendix A).

The canopy is dominated by River Oak (*Casuarinacunninghamiana*) on both sides of the creek, along with an approximately 200 m patch of 19 River Red Gums (*Eucalyptus camaldulensis*) again on both sides; there are also four scattered River Red Gums downstream to the Hunter River. The River Red Gums are generally located in stretches of Bowmans Creek mapped as having high GDE potential in the GDE Atlas. The patch of River Red Gums contained a mix of ages from small saplings, through to large and very old trees up to over 1 m diameter at breast height. Overall, these trees are in healthy condition with no evidence of dieback; similarly for the River Oak. At the water edge there are patches of native Common Reed (*Phragmites australis*) (Appendix A).

Typical of Hunter waterways, there are a number of exotic species scattered throughout: Balloon Vine (*Cardiospermum grandiflorum*), Giant Reed (*Arundo donax*), Pepper Tree (*Schinus molle var. areira*) and Weeping Willow (*Salix spp.).* Ground cover consists of exotic grasses (Appendix A).

The gallery forest structure along Bowmans Creek is indicative of an aquatic GDE with vegetation primarily dependent on creek baseflow (Appendix A).

There is potential for terrestrial GDEs in the Bowmans Creek alluvium where there are relatively shallow depths to water. The depth to groundwater directly east of the Proposed Action is more variable and generally deeper. There will be areas here where the riparian vegetation is utilising some groundwater, but this is likely limited to areas where the depth to water is less than 10 m (Appendix C).

An *Aquatic Ecology and Groundwater Dependent Ecosystem Assessment* was prepared by EcoLogical Australia (2022) for the HVO Continuation Project, located to the west of the Proposed Action. Numerous stygofauna surveys have been undertaken in the Hunter River alluvium and surrounds since 2000. Stygofauna are known to occur in the alluvium of the Hunter River and Bowmans Creek. The taxa collected to date are known from other parts of the Hunter Valley, although there are potentially other stygofauna taxa in the aquifers that have not been sampled (EcoLogical Australia, 2022).

5.6.3 Potential Impacts to GDEs

AGE (2024) has assessed potential impacts to potential terrestrial GDEs, aquatic GDEs and stygofauna using the numerical groundwater model. In summary (Appendix C):

- the Proposed Action would result in less than 0.2 m of drawdown in the Bowmans Creek alluvium; and
- reduction in baseflow to Bowmans Creek due to Proposed Action would be negligible.

The changes to baseflow and limited drawdown in Bowmans Creek and Hunter River indicate that potential GDEs (including the River Red Gums) along water courses will not be impacted.

5.6.4 Monitoring and Management

Potential impacts to GDEs would be managed through the Extraction Plan (including the Water Management Plan) required under Condition 6, Schedule 3 of Development Consent DA 104/96 as well as the Ashton Coal Management Plan and Biodiversity Management Plan, required under Conditions 26 and 28 of Development Consent DA309-11-2001-i, respectively (these existing plans would be updated to incorporate the Proposed Action). A description of the relevant management measures for these plans is provided in Sections 4.4, 5.4.4 and 5.5.3.

5.7 SIGNIFICANT IMPACT ASSESSMENT

The Significant Impact Guidelines for Water Resources (Cth DCCEEW, 2022) provide the following definition for a 'significant impact' on water resources:

> *A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity (Booth v Bosworth, 2001). Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the water resource which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. All these factors should be considered when determining whether an action is likely to have a significant impact.*
> *…*
> *An action is likely to have a significant impact on a water resource if there is a real or not remote chance or possibility that it will directly or indirectly result in a change to:*
>
> - *the hydrology of a water resource*
> - *the water quality of a water resource*
>
> *that is of sufficient scale or intensity as to reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes, or to create a material risk of such reduction in utility occurring.*

The following subsections consider whether the Proposed Action would have a 'significant impact' on a water resource.

5.7.1 Value of a Water Resource

The Significant Impact Guidelines for Water Resources (Cth DCCEEW, 2022) provide the following guidance on considering the 'value' of a water resource:

> *It is important to consider the value of the water resource in determining whether the impacts of a proposed action on a water resource are likely to be significant. The key factor that will be relevant in determining the value of a water resource will be its utility for all third party uses, including environmental and other public benefit outcomes…*

All land within the Proposed Action area is owned by mining companies (Glencore, Yancoal, and AGL entities). The surface water drainage features in the Proposed Action area primarily have ephemeral flow regimes and are not considered to be high value water resources.

Historical mining in the area has depressurised the deeper Permian formation. The Permian aquifers in the vicinity of the Proposed Action are not considered to be high value water resources due to comparatively poor water quality, low yield and lack of anthropogenic or environmental use. Therefore, potential impacts to the Permian aquifer are not the focus of this significant impact assessment.

There are no privately-owned groundwater bores or surface water users in the vicinity of the Proposed Action.

The Hunter River is a regulated river supplying water from Glenbawn Dam to a range of industrial and agricultural users as well as town water supplies. The Hunter River, Bowmans Creek and associated alluvium also support environmental water users, including riparian vegetation and some potential GDEs.

Accordingly, this significant impact assessment has focussed on potential impacts to the Hunter River, Bowmans Creek and associated alluvium.

5.7.2 Hydrology of a Water Resource

The Significant Impact Guidelines for Water Resources (Cth DCCEEW, 2022) provide the following guidance on potential impacts of an action on hydrological characteristics:

> *A significant impact on the hydrological characteristics of a water resource may occur where there are, as a result of the action:*
>
> - *changes in the water quantity, including the timing of variations in water quantity*
> - *changes in the integrity of hydrological or hydrogeological connections, including structural damage (for example, large scale subsidence)*
> - *changes in the area or extent of a water resource.*
>
> *…*
>
> *A proponent may obtain entitlements to extract water under a state water plan which has been prepared in accordance with the requirements of the NWI.*
>
> *If a proponent can demonstrate that all of the water used by a proposed action is authorised through such entitlements, the action is less likely to require a referral due to significant impacts on the hydrological characteristics of a water resource.*

The Groundwater Assessment for the Proposed Action concludes (Appendix C):

- the Proposed Action would result in less than 0.2 m of drawdown in the Bowmans Creek alluvium;
- reduction in baseflow to Bowmans Creek due to the Proposed Action would be negligible;
- privately-owned bores would not be impacted by the Proposed Action; and
- the Proposed Action would have negligible impact on potential GDEs.

The identified River Red Gums along Bowmans Creek would not be impacted by the Proposed Action and the negligible change to baseflows and limited drawdown in the alluvium implies that the potential GDEs along watercourses would also not be impacted (Appendix C).

Hunter Eco (2023) determined that surface water flow patterns would remain very similar following underground mining associated with the Proposed Action (Appendix A).

ACOL hold sufficient licences under the *Water Management Act 2000* to account for water take associated with the Proposed Action.

It is considered unlikely that the Proposed Action would result directly or indirectly in a substantial change in the hydrology of groundwater or surface water resources.

5.7.3 Water Quality of a Water Resource

The Significant Impact Guidelines for Water Resources (Cth DCCEEW, 2022) provide the following guidance on potential impacts of an action on water quality characteristics:

> *A significant impact on a water resource may occur where, as a result of the action:*
>
> - *there is a risk that the ability to achieve relevant local or regional water quality objectives would be materially compromised, and as a result the action:*
>   - *creates risks to human or animal health or to the condition of the natural environment as a result of the change in water quality*
>   - *substantially reduces the amount of water available for human consumptive uses or for other uses, including environmental uses, which are dependent on water of the appropriate quality*
>   - *causes persistent organic chemicals, heavy metals, salt or other potentially harmful substances to accumulate in the environment*
>   - *seriously affects the habitat or lifecycle of a native species dependent on a water resource, or*
>   - *causes the establishment of an invasive species (or the spread of an existing invasive species) that is harmful to the ecosystem function of the water resource, or*
> - *there is a significant worsening of local water quality (where current local water quality is superior to local or regional water quality objectives), or*
> - *high quality water is released into an ecosystem which is adapted to a lower quality of water.*

Mining activities across the Hunter Valley and in the vicinity of the Proposed Action (including at the Ashton Underground Mine) have led to a lowering of the groundwater level within the Permian strata. This has had the effect of reducing the potential for poorer quality water within the Permian strata to discharge to the Hunter River, Bowmans Creek and their connected alluvium. As discharge from the Permian strata to the alluvial groundwater is reduced by increasing depressurisation of the underlying seams, salinity of alluvial groundwater is likely to decrease over time (Appendix C).

The Proposed Action would not compromise the ability to achieve local or regional water quality objectives and there would be no change in the beneficial uses of water resources in or around the area due to the Proposed Action, including in the long term. Therefore, the Proposed Action would not have a significant impact on the water quality of a water resource.

5.7.4 Cumulative Impacts

The Significant Impact Guidelines for Water Resources (Cth DCCEEW, 2022) require the action to be considered with other developments, whether past, present or reasonably foreseeable developments.

The Proposed Action is located in a well-established mining region as described in Section 5.5.1.

Historical mining in the area has resulted in the deeper Permian formation being depressurised, reducing the flow of water from the Permian formation to the alluvial sediments relative to pre-mining conditions. Long-term monitoring of alluvial water sources in the vicinity of the Proposed Action area has demonstrated that historic and ongoing mining has not significantly impacted on groundwater levels and groundwater quality within the alluvial system (Appendix C).

AGE (2024) modelled potential cumulative impacts of the Proposed Action together with historical and approved mining at the RUM, Ravensworth open cut mines, the Ashton Underground Mine and other neighbouring mining operations. The Proposed Action would have a negligible contribution to cumulative impacts on water resources (Appendix C).

5.7.5 Conclusion

Assessment of the potential direct and indirect impacts on water resources as a result of the Proposed Action has demonstrated there would not be:

- a substantial change to the value of a water resource;
- a substantial change to the hydrology of a water resource; or
- a substantial change in water quality of a water resource.

Therefore it is concluded that the Proposed Action will not have a significant direct or indirect impact on water resources when considered both on a project specific basis, or cumulatively with other developments.

6 ECONOMIC AND SOCIAL MATTERS

The RUM and the Ashton Underground Mine share a common mining lease boundary and the approved underground mining areas are separated (at their closest) by approximately 45 m in the Pikes Gully and Upper Lower Liddell Seams (Figure 2).

Mining of the Upper Lower Liddell Seam at the Ashton Underground Mine commenced in 2017 (following mining in the Pikes Gully and Upper Liddell Seams) and is anticipated to be completed by late 2024. An opportunity exists for ACOL to access and extract approved but unmined RUM coal resources via the Ashton Underground Mine, after completion of mining the Upper Lower Liddell Seam. The Proposed Action would produce a metallurgical coal product that can be used in the steelmaking process.

The RUM has been in care and maintenance since 2014. If mining was not to recommence, then the approved but as yet unmined RUM coal resources would most likely not be mined and, therefore, the NSW Government royalties and tax payments associated with the mining of the approved RUM coal in the Pikes Gully and Middle Liddell Seams may not be realised.

ACOL would utilise the existing Ashton Coal Project workforce to mine the ACOL-operated portion of the RUM. Accordingly, the Proposed Action would provide for the ongoing employment of the ACOL workforce (personnel and contractors).

The RUM Modification 9 Environmental Assessment (GSS Environmental, 2012) proposed an operational workforce of 410 long-term total average employees, which is similar to the 386 employees previously assessed for the Ashton Coal Complex. Social impact themes for the local area in the context of a proposed mining development were identified in the *Glendell Continued Operations Project Social Impact Assessment* (Umwelt, 2019) – the Glendell Mine is located approximately 1 km from the Proposed Action area. These themes include issues such as dust and noise emissions, health, community, economic benefits, employment, property prices and impacts on water. A review of the relevance of the Proposed Action to the social impact themes identified by Umwelt (2019) is provided in Table 4. Based on the review, there would be a negligible change in social impacts under the Proposed Action.

Given the Proposed Action is located within an established mining precinct, involves the continued employment of the existing ACOL workforce and use of established off-site infrastructure (e.g. road network and rail and port infrastructure), there would be a negligible regional and national economic and social impacts.

The estimated capital investment for the Proposed Action is approximately $165 million Australian Dollars (AUD).

An economic assessment completed by NSW Mining, Exploration & Geoscience on the Modification Report concluded the Proposed Action (MEG, 2021):

- would generate approximately $120 million AUD in royalties;
- have a Net Present Value of approximately $84 million AUD; and
- have a total resource value of approximately $1.7 billion AUD.

A Conservation Agreement (dated 16 September 2010) was made between ACOL and the NSW Minister for the Environment under the NP&W Act. The Conservation Agreement covers a parcel of land equal to approximately 65.7 ha in the south-east of the Ashton Coal Project. The Conservation Agreement area contains remnant Hunter Valley vegetation, threatened fauna species and archaeological sites of high significance.

6.1 ONGOING CONSULTATION

Ongoing community consultation will be undertaken via the Ashton Mine Complex CCC. The purpose of the Ashton Mine Complex CCC is to:

- establish good working relationships and encourage the proponent, committee members and other relevant stakeholders to share information;
- allow the proponent to seek feedback from community representatives, stakeholder groups and council or respond to project-related matters; and
- give community representatives, stakeholder groups and councils a forum to ask for information or give feedback on a project.

Table 4
Review of Social Impact Themes Identified in Glendell Continued Operations Project Social Impact Assessment

Social Impact Theme	Definition*	Relevance of Proposed Action
Social Amenity	Social amenity concerns primarily relate to the impacts on way of life and rural lifestyle and include the impacts experienced as a result of dust/air quality, operational noise, blasting (vibration and plumes), visual impact and potential odour.	The amenity impacts associated with the ACOL-operated portion of the RUM (e.g. associated with operation of ventilation and flaring infrastructure) would continue until up to 2032. Given the limited potential for noise and dust emissions from the Proposed Action, the Action would not materially change the way of life and rural lifestyle for the local community. ACOL has operated the Ashton Underground Mine in accordance with relevant amenity criteria since 2005. Since, 2020, ACOL has received five complaints relating to noise (two complaints in 2021) and dust (three complaints in 2019), although investigations undertaken by ACOL at the time did not identify any significant noise or dust source attributable to the Ashton Underground Mine.
Sense of Community and Culture	Changes to the cohesion and character of the community, including impacts on cultural heritage.	The Proposed Action is located within a recognised mining precinct. On the surface, the land use is dominated by open cut operations associated with the Ravensworth Operations Project and AGL's Ravensworth South Mine. The Proposed Action is also surrounding by Ashton Mine Complex located to the east, the Mount Owen Complex located to the north-east, Integra Underground located to the east and Rix's Creek Mine located to the south-east. Under the Proposed Action, the ACOL-Operated portion of the RUM would be completed by 2032. The existing ACOL workforce would continue to be employed to mine the already State approved coal resources. The amenity impacts would be managed in accordance with the Ashton Noise Management Plan and Air Quality and Greenhouse Management Plan until December 2032. The infrastructure proposed under the Proposed Action (e.g. relocated gas and ventilation infrastructure) would be located in previously cleared and approved areas. No new impacts to Aboriginal cultural heritage are expected.
Economic Contribution and Community Investment	Contribution to the regional economy and community investment efforts. Opportunities for employment, training and partnerships, particularly for near neighbours, the Aboriginal community and emergency services.	Under the Proposed Action, the ACOL-operated portion of the RUM would be completed by 2032. The existing ACOL workforce would continue to be employed to mine the already State approved coal resources. The Proposed Action would enable to continuation of positive economic effects such as employment opportunities, royalty payments to NSW and tax payments to the Commonwealth government associated with the extraction and sale of the resource (e.g. company and income tax payments). It is expected that ACOL would continue to make contributions to community groups and causes under the Proposed Action, consistent with current practices. ACOL would continue to engage with the Aboriginal and local community via the Ashton and Ravensworth CCC and Aboriginal Community Consultation Forum to identify opportunities employment, training and partnerships.
Access to and Use of Infrastructure and Services	Potential disruption on the local road network due to operational activities (e.g. blasting and cumulative effects of mine traffic). Inability to access particular services and facilities in the area, (e.g. provision of telecommunications, housing/accommodation).	The Proposed Action does not propose any new activities that would disrupt the local road network or reduce access to services or facilities. The Action would utilise existing infrastructure and facilities at the Ashton Underground Mine, including telecommunications infrastructure. There is no change proposed to the existing ACOL workforce under the Action and therefore there are negligible impacts expected to services or facilities in the area.
Water Access and Use	Access to and use of water, including impacts on both ground and surface water.	As described in Section 5, the Proposed Action would not have a significant impact on water resources.

Table 4 (Continued)
Review of Social Impact Themes Identified in Glendell Continued Operations Project Social Impact Assessment

Social Impact Theme	Definition*	Relevance of Proposed Action
Engagement and Decision-Making	Existing engagement mechanisms and the ongoing potential to have a voice in the assessment process - provide input and feedback to decision making.	ACOL engaged with the Ashton Mine Complex CCC as part of the engagement undertaken for the Modifications and has considered comments raised in the Modification Report and this Preliminary Documentation (where relevant). As described in Section 4.4, ACOL would continue to engage with the local community in relation to the Proposed Action.
Intergenerational Equity	Intergenerational equity refers to addressing the needs of the present generation without compromising the ability of future generations to meet their own needs (International Association for Impact Assessment, 2003). The Intergenerational equity theme includes impacts relating to future land use, land management (including the management of pests such as wild dogs) and climate change.	The Proposed Action does not propose any material change to landforms in the underground areas at the RUM. The predicted vertical subsidence in the area of natural ground would not result in a material change to landforms and any minor subsidence impacts would be monitored and remediated as they occur (if required). The Proposed Action would not change the future land use or land management at the RUM. Weed and pest management would be undertaken in accordance with the Ashton Coal Project Biodiversity Management Plan. The Proposed Action would be undertaken in accordance with relevant greenhouse gas legislation including the Safeguard Mechanism.
Health and Wellbeing	Health impacts as a result of dust impacts, including respiratory issues and psychosocial affects relating to the cumulative presence of mining.	The Proposed Action would involve the transfer of ROM coal mined at the ACOL-portion of the RUM to the Ashton CHPP for processing and transport to market. Accordingly, the only air quality emissions associated with the Proposed Action would be related to ventilation and flaring of the fugitive emissions released during the extraction of coal from the ACOL-operated portion of the RUM. The Proposed Action would comply with all air quality criteria in Development Consent DA 104/96. The Proposed Action is not expected to result in new psychosocial impacts.
Personal and Property Rights	Impacts of the project on private property values and the ability to sell/move out of the area.	Under the Proposed Action, the ACOL-operated portion of the RUM would be completed by 2032. The existing ACOL workforce would continue to be employed to mine the State approved coal resources. It is anticipated that the Action would result in a negligible change to property values and the ability to sell properties.

* Social impact themes and definition sourced from the Glendell Continued Operations Project Social Impact Assessment (Umwelt, 2019).

The Ashton Mine Complex CCC would deal with matters associated with the Proposed Action.

Matters that are typically discussed at committee meetings include (but are not limited to):

- community concerns and the resolution of community complaints;
- the implementation of any conditions of approval or consent and management plans;
- any proposed amendments or modifications to projects; and
- the results of any monitoring, annual reviews or independent audits.

ACOL will continue to engage with the Aboriginal community through the Aboriginal Community Consultation Forum and as part of the preparation of future revisions to the Ashton Heritage Management Plan, which will be updated to incorporate the Proposed Action.

7 ENVIRONMENTAL HISTORY OF REFERRING PARTY

The following projects have previously been referred by ACOL (or its associated entities):

- EPBC 2001/524 – Ashton Coal Project (Not a Controlled Action).
- EPBC 2010/5315– SEOC Project (Not a Controlled Action).

Yancoal has a documented *Environment and Community Relations Policy* (Yancoal, 2022) that applies to the Ashton Coal Complex and ACOL (Attachment 6) and is summarised below.

Yancoal accepts its responsibility to conduct its operation in a lawful and environmentally sound manner and to work in consultation with the community and other stakeholders. Yancoal will:

- *"Identify, understand, assess and manage potential environmental impacts and community issues.*
- *Implement, validate and maintain an effective documented environment and community relations management system.*
- *Strive for continual improvement in environmental performance.*
- *Provide the resources and training to our employees necessary to achieve our objectives.*
- *Deliver outcomes that meet or exceed our environmental licences and approvals, and bring a positive benefit to the communities in which we operate.*
- *Comply with applicable legislation and regulations.*
- *Foster positive relationships with regulatory agencies and community stakeholders.*
- *Be accountable for our actions.*
- *Strive for excellence in environmental management and in the establishment of strong, trusting and sustainable community relationships."*

Details of proceedings against ACOL are summarised below:

- NSW Land and Environment Court (LEC File No. 181 of 2012):
  - Date of proceeding: 22 June 2012, 25-28 June 2012.
  - Environmental Legislation: National Parks and Wildlife Act 1974.
  - Description: Subsidence impacts from the Ashton Underground Mine has caused harm to Aboriginal objects at three locations.
  - Decision: Case dismissed.
- NSW Land and Environment Court (LEC File No. 213 of 2011):
  - Date of proceeding: 14-16 November 2011.
  - Environmental Legislation: Environmental Planning and Assessment Act 1979.
  - Description: Modification application compliance with requirements of section 75W of the Environmental Planning and Assessment Act 1979.
  - Decision: Case dismissed.
- NSW Land and Environment Court (LEC File No. 177 of 2011):
  - Date of proceeding: 18 August 2011, 27 September 2011.
  - Environmental Legislation: *National Parks and Wildlife Act 1974*.
  - Description: Grant traditional owners and archaeological expert access to four Aboriginal sites at the Ashton Coal Project.
  - Decision: Access granted to relevant parties for the purpose of inspection and preparation of reports.

8 JUSTIFICATION AND CONCLUSION

This Preliminary Documentation has been prepared in consideration of relevant legislation and Cth DCCEEW's Preliminary Documentation Additional Information Request. ACOL, as the referring party for the identified ACOL-operated portion of the RUM (Figure 2), would make revisions to all relevant Ashton management plans, licences, and agreements to incorporate changes from the Proposed Action as necessary.

Yancoal has amended the relevant approval instruments under NSW legislation to integrate the ACOL-operated portion of the RUM into the Ashton Mine Complex, including:

- Modifying the Development Consents DA 104/96 and Development Consent DA 309-11-2001-i;
- Part transferring the Mining Leases from Glencore to Yancoal-related entities (ML 1834, ML 1835, ML 1836 and ML 1837); and
- Varying the Environment Protection Licence EPL 11879.

The last remaining step is to secure EPBC Approval for the Proposed Action, which is the subject of this Preliminary Documentation.

8.1 CONSOLIDATED SUMMARY OF IMPACT ASSESSMENT

ACOL would operate the ACOL-operated portion of the RUM in accordance with the existing Ashton environmental management plans and environmental monitoring programs, incorporating any necessary revisions.

A review of potential impacts of the Proposed Action has been undertaken (Sections 4 and 5 and Appendices A and C). These assessments conclude that the Proposed Action would not have significant impact to listed threatened species and communities or water resources.

8.2 JUSTIFICATION FOR THE PROPOSED ACTION

The Proposed Action would enable ACOL to mine coal resources at the RUM. These coal resources would most likely not be mined without the Proposed Action.

The Proposed Action would have the following benefits:

- would provide for the efficient extraction of State approved resources that would potentially not be mined;
- would provide for an additional approximately 8 years of employment of the ACOL workforce;
- would utilise existing planning approvals to maximise economic recovery of coal resources approved under Development Consent DA 104/96;
- would be an efficient use of existing infrastructure, facilities and services at the Ashton Coal Complex; and
- provide a source of metallurgical coal to satisfy the forecasted market demand for use in the steel making process.

Management of potential impacts of the Proposed Action would be cost effective as they involve measures already implemented under the Ashton Environmental Management Plans.

8.3 ECOLOGICALLY SUSTAINABLE DEVELOPMENT CONSIDERATIONS

8.3.1 Background

The concept of sustainable development came to prominence at the World Commission on Environment and Development (1987), in the report titled Our Common Future, which defined sustainable development as:

> *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

In recognition of the importance of sustainable development, the Commonwealth Government developed a *National Strategy for Ecologically Sustainable Development* (NSESD) (Commonwealth of Australia, 1992) that defines Ecologically Sustainable Development (ESD) as:

> *using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.*

The NSESD was developed with the following core objectives:

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

Australia's commitment to the principles of ESD is considered in section 3A of the EPBC Act, which defines the principles of ESD as:

(a) *decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;*

(b) *if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;*

(c) *the principle of inter-generational equity that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;*

(d) *the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;*

(e) *improved valuation, pricing and incentive mechanisms should be promoted.*

8.3.2 Consideration of Ecologically Sustainable Development for the Proposed Action

The design, planning and assessment of the Proposed Action have been carried out applying the principles of ESD, through:

- incorporation of risk assessment and analysis at various stages in the design and environmental assessment and within decision-making processes;
- adoption of high standards for environmental and occupational health and safety performance;
- consultation with regulatory and community stakeholders; and
- optimisation of the potential economic benefits to the community arising from the development of the Proposed Action.

In addition, it can be demonstrated that the Proposed Action can be operated in accordance with ESD principles through the application of existing mitigation and management measures to minimise environmental impacts of the Action. The following sub-sections describe the consideration and application of the principles of ESD to the Action.

Long-term and Short-term Considerations

The integration of long-term and short-term economic, environmental, social and equitable considerations is recognised as a principle of ESD in section 3A(a) of the EPBC Act.

Assessment of potential short-term and long-term impacts was carried out during the preparation of the Modification Report for the NSW approval process and this Preliminary Documentation on aspects of subsidence, groundwater and surface water, biodiversity, groundwater-dependent ecosystems, heritage and socio-economics.

The rehabilitation of the Proposed Action would need to be undertaken in accordance with the requirements of Condition 27, Schedule 3 of Development Consent DA 104/96 which requires the land:

> *to be restored and maintained to the same or higher land capability and agricultural suitability than prior to mining…*
>
> *Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of local native plant species (unless the Resources Regulator agrees otherwise)*
> *…*

Precautionary Principle

The precautionary principle (i.e. where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation) is recognised as a principle of ESD in section 3A(b) of the EPBC Act.

Environmental assessment involves predicting the likely environmental outcomes of a development. The precautionary principle reinforces the need to take risk and uncertainty into account, especially in relation to threats of irreversible environmental damage.

Consideration of the precautionary principle has been adopted throughout the assessment of impacts for the Proposed Action.

A range of mitigation measures have been adopted as components of the Action design to minimise the potential for serious impacts to the environment, including the continuation of environmental management and monitoring programmes and compensatory measures.

Minimal uncertainty regarding the information used in these specialist assessments is expected given the extensive experience and knowledge gained from the operation of the adjacent Ashton Underground Mine. ACOL has successfully managed environmental impacts during the mining of the Pikes Gully, Upper Liddell and Upper Lower Liddell Seams to achieve the Performance Measures in Development Consent DA 309-11-2001-i.

Social Equity

Social equity is defined by inter-generational and intra-generational equity. Inter-generational equity is the concept that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations, while intra-generational equity is applied within the same generation.

Consideration of social equity has been undertaken for the Proposed Action and is provided in Section 6.

The Proposed Action would benefit current and future generations through the employment of the ACOL workforce for an additional 8 years. It would also provide continued significant stimulus to local and regional economies, thus contributing to future generations through social welfare, amenity and infrastructure.

The Proposed Action would provide a source of metallurgical coal to satisfy the forecasted market demand for use in the steel making process.

Conservation of Biological Diversity and Ecological Integrity

Biological diversity or "biodiversity" is considered to be the number, relative abundance, and genetic diversity of organisms from all habitats (including terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are a part), and includes diversity within species and between species as well as diversity of ecosystems (Lindenmayer and Burgman, 2005).

For the purposes of this Preliminary Documentation, ecological integrity has been considered in terms of ecological health and ecological values.

Consideration of biological diversity and ecological integrity has been undertaken for the Proposed Action and is provided in Section 4.

The rehabilitation of the Proposed Action would need to be undertaken in accordance with the requirements of Condition 27, Schedule 3 of Development Consent DA 104/96 which requires the land:

> *to be restored and maintained to the same or higher land capability and agricultural suitability than prior to mining…*
>
> *Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of local native plant species (unless the Resources Regulator agrees otherwise)*
>
> *…*

Valuation

One of the common broad underlying goals or concepts of sustainability is economic efficiency, including improved valuation of the environment. Resources should be carefully managed to maximise the welfare of society, both now and for future generations.

In the past, some natural resources have been misconstrued as being free or underpriced, leading to their wasteful use and consequent degradation. Consideration of economic efficiency, with improved valuation of the environment, aims to overcome the underpricing of natural resources and has the effect of integrating economic and environmental considerations in decision making, as required by ESD.

ACOL would continue to hold relevant licences under the *Water Management Act 2000* to account for the take of water associated with the Ashton Coal Project and the ACOL-operated portion of the RUM, including the acquisition of additional licences if needed.

8.4 CONCLUSION

The Proposed Action would enable ACOL to mine State approved coal resources at the RUM.

The ACOL-operated portion of the RUM would be operated in accordance with the existing management and monitoring regime (as required to be updated from time to time) described in Development Consent DA 104/96. The relevant Ashton Coal Project environmental management and operational plans would be updated to include the ACOL-operated portion of the RUM, which would be the responsibility of ACOL.

ACOL has already longwall mined the target coal seams of the Action at its adjacent Ashton Underground Mine. The potential environmental impacts and effectiveness of the proposed management and mitigations measures are therefore well understood for the Proposed Action. As such, there are unlikely to be any unknown, unpredictable or irreversible impacts due to the Action.

The Proposed Action would be conducted and managed to comply with the Performance Measures established under Development Consent DA 104/96, including those relevant to threatened species and communities, and water resources.

Based on the outcomes of the environmental review, the Proposed Action, when considered on a project specific basis or cumulatively with other developments, would not result in significant impacts to listed threatened species and communities or water resources.

9 REFERENCES

Ashton Coal Operations Pty Limited (2020a) *Biodiversity Management Plan.*

Ashton Coal Operations Pty Limited (2020b) *Water Management Plan.*

Ashton Coal Operations Pty Limited (2021a) *Ashton-Ravensworth Underground Mine Integration Modification – Ravensworth Underground Mine Modification Report.*

Ashton Coal Operations Pty Limited (2021b) *Ashton-Ravensworth Underground Mine Integration Modification – Ravensworth Underground Mine Submissions Report.*

Australasian Groundwater & Environmental Consultants (2024) *Ashton Ravensworth Integration Project Groundwater Impact Assessment*.

Bell, S., Peake, T. and Driscoll, C. (2007) *Dealing with taxonomic uncertainty in Weeping Myall Acacia pendula from the Hunter catchment, New South Wales.*

Bureau of Meteorology (2020) *Groundwater Dependent Ecosystem Atlas*.

Commonwealth of Australia (1992) *National Strategy for Ecologically Sustainable Development*.

Commonwealth Department of Climate Change, Energy, the Environment and Water (2022) *Significant impact guidelines 1.3 Coal seam gas and large coal mining developments – impacts on water resources*.

Commonwealth Department of Climate Change, Energy, the Environment and Water (2023) *Safeguard Mechanism Reforms.* Website (accessed July 2023): *www.dcceew.gov.au/climate-change/emissions-reporting/national-greenhouse-energy-reporting-scheme/safeguard-mechanism*

Department of the Environment (2013) *Matters of National Environmental Significance – Significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999*.

Department of the Environment (2014) *Approved Conservation Advice (including listing advice) for Hunter Valley Weeping Myall (Acacia pendula) Woodland*.

Department of the Environment (2015) *Approved Conservation Advice (including listing advice) for the Central Hunter Valley eucalypt forest and woodland ecological community*.

Department of the Environment and Energy (2018) *Threat abatement plan for disease in natural ecosystems caused by Phytophthora cinnamomic.*

Doody, T.M., Hancock, P.J. and Pritchard, J.L. (2019) *Information Guidelines Explanatory Note: Assessing groundwater-dependent ecosystems*. Report prepared for the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development through the Department of the Environment and Energy, Commonwealth of Australia 2019.

EcoLogical Australia (2022) *Aquatic Ecology and Groundwater Dependent Ecosystem Assessment*.

GSS Environmental (2012) *Ravensworth Underground Mine Liddell Seam Project Environmental Assessment.*

Hunter Eco (2023) *Supplementary Biodiversity Review.*

Huynh, T. & Hobbs, D. (2019) *Deriving site specific guideline values for physicochemical parameters and toxicants*. Report prepared for the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development through the Department of the Environment and Energy, Commonwealth of Australia 2019

Hydro Engineering and Consulting (2021) *Ashton-Ravensworth Underground Integration Modification Site Water Balance*.

Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (2018) *Information Guidelines for the Independent Expert Scientific Committee advice on coal seam gas and large coal mining development proposals*.

International Association for Impact Assessment (2003) *International Principles for Social Impact Assessment.*

Lindenmayer, D. & Burgman, M. (2005) *Practical Conservation Biology*.

Middlemis, H. & Peeters, L.J.M. (2018) *Uncertainty analysis—Guidance for groundwater modelling within a risk management framework.* A report prepared for the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development through the Department of the Environment and Energy, Commonwealth of Australia 2018.

New South Wales Government (2012) *Aquifer Interference Policy.*

New South Wales Government (2020) *Strategic Statement on Coal Exploration and Mining in NSW.*

Office of Environment and Heritage (2013) *National Recovery Plan Weeping Myall – Coobah – Scrub Wilga Shrubland of the Hunter Valley*.

REMPLAN (2022a) *Muswellbrook Economic Profile Output – Industries*.

REMPLAN (2022b) *Singleton Economic Profile Output – Industries*.

Richardson, S., Irvine, E., Froend, R., Boon, P., Barber, S. & Bonneville, B. (2011) *Australian Groundwater-dependent ecosystems toolbox part 1: assessment framework*.

SCT Operations (2021) *Ravensworth Underground Mine Subsidence Review.*

Umwelt (2010) *Ravensworth Operations Project Ecological Assessment*.

Umwelt (2019) *Glendell Continued Operations Project Social Impact Assessment*.

Wambo Coal Pty Limited (2011) *2010-2011 Annual Environmental Management Report*.

Wambo Coal Pty Limited (2021) *Wambo Coal Biodiversity Management Plan.*

Wambo Coal Pty Limited (2022) *2021 Wambo Coal Pty Ltd Annual Review*.

Water Resources Commission of NSW (2019) *Hunter Valley Flood Plain Atlas.* Available at: https://flooddata.ses.nsw.gov.au/dataset/hunter-valley-flood-plain-atlas-pdf

World Commission on Environment and Development (1987) *Our Common Future*.

Yancoal Australia Limited (2022) *Yancoal Policy – Environment and Community Relations*.

ATTACHMENT 1
ASHTON COAL OPERATIONS RAVENSWORTH UNDERGROUND MINE EPBC ACT REFERRAL

Ashton Coal Operations Ravensworth Underground Mine

Application Number: **01004** Commencement Date: **06/04/2022** Status: **Resubmitted**

1. About the project

1.1 Project details

Project title *

Ashton Coal Operations Ravensworth Underground Mine

Project industry type *

Mining

Project industry sub-type

Coal

Estimated start date *

1/08/2022

Estimated end date *

31/12/2032

1.2 Proposed Action details

Provide an overview of the proposed action, including all proposed activities. *

Background

The Ravensworth Mine Complex and Ashton Mine Complex are neighbouring open cut and underground coal mining complexes, located in the Singleton Local Government Area, in the Hunter Valley region of New South Wales (NSW) (Att A 'Referral Description', Figure 1, Page 2).

The Ravensworth Mine Complex includes the Ravensworth Operations Project and the Ravensworth Underground Mine (RUM). The Ravensworth Operations Project includes the Ravensworth North and Ravensworth Narama pits. The RUM is owned and operated by Resource Pacific Pty Limited (RPPL). Glencore Coal Assets Australia Pty Limited oversees the management of RUM. The proposed Action that is the subject of this Referral applies to part of the RUM only.

Approval of the RUM (formally Nardell Underground Coal Mine) was originally granted under NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 20 November 1996 (Development Consent DA 104/96) and was last modified (Modification 9) on 20 June 2013.

The RUM DA 104/96 includes underground longwall mining within the Lemington (B and C), Pikes Gully, Liddell (Upper and Middle) and Barrett coal seams. In October 2014, after the completion of Longwall 9 in the Pikes Gully Seam, operations at RUM were placed into care and maintenance and no further underground mining has occurred since. A total of nine longwalls (Longwalls 1 to 9) were mined out of the State approved 16 longwall panels in the Pikes Gully Seam. The RUM has an approved operational capacity of up to 7 million tonnes per annum of run-of-mine (ROM) coal until 31 July 2024.

The Ashton Mine Complex includes the Ashton Coal Project (including the completed North East Open Cut and the Ashton Underground Mine) and approved but not yet commenced Ashton South East Open Cut (SEOC) Project. The Ashton Coal Project is operated by Ashton Coal Operations Pty Limited (ACOL), a wholly owned subsidiary of Yancoal Australia Limited (Yancoal).

ACOL and RPPL submitted an application on 9 November 2021 to modify DA 104/96 under the NSW EP&A Act to enable ACOL to access and extract approved coal resources at the RUM until approximately December 2032. The coal would be accessed from ACOL's neighbouring Ashton Underground Mine via new non-subsiding first workings developed between the two mining areas. Development of first workings in the Pikes Gully Seam between the two mines would need to commence in August 2022 to enable continuity of ACOL's operations. A description of the proposed modification to DA 104/96 and the integration of the RUM and Ashton Coal Project is provided in the *Ashton-Ravensworth Underground Mine Integration Modification – Ravensworth Underground Mine Modification Report* (Att F 'RUM Modification Report', Section 4, pages 13-15).

Activities Included in the Action

The **proposed Action** that is the subject of this Referral includes the following components and activities within the Action Area (shown as the Indicative Underground Mining Area on Figure 2 (refer Att A 'Referral Description', Page 4):

- underground mining of the Pikes Gully and Middle Liddell coal seams using longwall mining as shown on Figure 2 (refer Att A 'Referral Description', Page 4);
- mining operations until approximately 31 December 2032 (i.e. for a period of approximately 8 years);
- establishment and use of gas, ventilation and water management infrastructure including shafts, bores, pumps and pipelines;
- management of water and gas that accumulates in the underground workings within the Action Area;
- transfer of ROM coal from the RUM Pikes Gully and Middle Liddell coal seams in the Action Area to the neighbouring Ashton Coal Project via connected underground workings; and
- transfer of water and gas from the Action Area to the neighbouring Ashton Coal Project.

Infrastructure developed as part of the Action would be located in previously cleared areas or areas approved for clearing under the Controlled Action for the Ravensworth Operations Project (2010/5389).

Subsidence effects caused by the Action may have an indirect impact on threatened ecological communities or species, or their habitat. The total area within the bounds of the Action's development footprint is approximately 421 hectares, with an area subject to potential subsidence effects (disturbance) of approximately 421 hectares.

A description of the **proposed Action**, a summary of the EPBC Act Approvals Context and the activities not included in the Action are provided in Attachment A (Att 'Referral Description', pages 1-4).

Is the project action part of a staged development or related to other actions or proposals in the region?

Yes

Is the proposed action the first stage of a staged development (or a larger project)?

No

Related referral(s)

EPBC Number	Project Title
2010/5389	Ravensworth Operations Project

Provide information about the staged development (or relevant larger project).

The Ravensworth Operations Project was referred under the Environment Protection and Biodiversity Conservation 1999 (EPBC) Act on 5 March 2010 and included a project area of approximately 5,590 hectares for its existing and proposed open cut mining operations. The Assistant Secretary of the then Department of Sustainability, Environment, Water, Population and Communities approved the Controlled Action on 8 April 2011 (EPBC Approval 2010/5389). EPBC Approval 2010/5389 has been varied on seven occasions, most recently on 10 November 2016. The approved Controlled Action 2010/5389 includes open cut mining activities located within the proposed Action Area.

White Mining Limited referred the Ashton Coal Project under the EPBC Act on 10 December 2001. The Ashton Coal Project comprised three integrated components including a small open cut mine, surface facilities and the Ashton Underground Mine. The Assistant Secretary of the then Environment Australia determined this project to be Not a Controlled Action on 4 January 2002 (Referral Decision 2001/524).

The proposed Action is located adjacent to the Ashton Coal Project ('Not a Controlled Action' Decision 2001/524). The Action would enable coal to be accessed from ACOL's neighbouring Ashton Underground Mine via new non-subsiding first workings developed between the RUM and Ashton Underground Mine mining areas.

What Commonwealth or state legislation, planning frameworks or policy documents are relevant to the proposed action, and how are they relevant? *

The NSW EP&A Act and the NSW *Environmental Planning and Assessment Regulation 2021* set the framework for planning and environmental assessment in NSW.

Approval of the RUM (formally Nardell Underground Coal Mine) was originally granted under NSW EP&A Act on 20 November 1996 (Development Consent DA 104/96) and was last modified (Modification 9) on 20 June 2013.

ACOL and RPPL submitted an application on 9 November 2021 to modify Development Consent DA 104/96 under the NSW EP&A Act to enable ACOL to access and extract approved coal resources at the RUM until approximately December 2032. The coal would be accessed from ACOL's neighbouring Ashton Underground Mine via new non-subsiding first workings developed between the two mining areas. Development of first workings in the Pikes Gully Seam between the two mines would need to commence in August 2022 to enable continuity of ACOL's operations. A description of the proposed modification to Development Consent DA 104/96 and the integration of the RUM and Ashton Coal Project is provided in the *Ashton-Ravensworth Underground Mine Integration Modification – Ravensworth Underground Mine Modification Report* (Att F 'RUM Modification Report', Section 4, pages 13-15).

ACOL also lodged a separate application on 9 November 2021 to modify Development Consent DA 309-11-2001-i under the NSW EP&A Act to enable ACOL to receive, handle and process RUM coal at the Ashton Coal Handling and Processing Plant and receive and manage water and gas transferred from the RUM at the Ashton Coal Project. These proposed activities at the Ashton Coal Project do not form part of the Action that is the subject of this referral.

Relevant leases, licences or approvals required under other NSW legislation would also be varied and/or obtained for the Action as required.

Describe any public consultation that has been, is being or will be undertaken regarding the project area, including with Indigenous stakeholders. Attach any completed consultation documentations, if relevant. *

ACOL and Glencore regularly engage with the community through the following mechanisms:

1. dedicated websites (https://www.ashtoncoal.com.au/ and https://www.glencore.com.au/operations-and-projects/coal/current-operations/ravensworth-operations);
2. Ashton Coal Community Consultative Committee (CCC) and Ravensworth Complex CCC meetings which occur three times per year (with meeting minutes provided on each site's website and emailed to interested stakeholders); and
3. media releases and other media activities.

Specific engagement completed to date in relation to the Action has included:

1. Consultation with the Ashton Coal and Ravensworth Complex CCCs including provision of information and opportunities for discussion about the proposed Ashton-Ravensworth Underground Mine Integration Modification at the Q3 and Q4 2021 and Q1 2022 meetings.
2. Exhibition of the proposed Ashton-Ravensworth Underground Mine Integration Modification Report and modification application from 25 November to 8 December 2021.
3. Provision of the Ashton-Ravensworth Underground Mine Integration Modification Submissions Reports (Att G 'RUM Submissions Report', Sections 1-6, pages 1-15)

1.3 Identity - Referring party

Privacy Notice:

Personal information means information or an opinion about an identified individual, or an individual who is reasonably identifiable.

By completing and submitting this form, you consent to the collection of all personal information contained in this form. If you are providing the personal information of other individuals in this form, please ensure you have their consent before doing so.

The Department of Agriculture, Water and the Environment (the department) collects your personal information (as defined by the Privacy Act 1988) through this platform for the purposes of enabling the department to consider your submission and contact you in relation to your submission. If you fail to provide some or all of the personal information requested on this platform (name and email address), the department will be unable to contact you to seek further information (if required) and subsequently may impact the consideration given to your submission.

Personal information may be disclosed to other Australian government agencies, persons or organisations where necessary for the above purposes, provided the disclosure is consistent with relevant laws, in particular the Privacy Act 1988 (Privacy Act). Your personal information will be used and stored in accordance with the Australian Privacy Principles.

See our Privacy Policy to learn more about accessing or correcting personal information or making a complaint. Alternatively, email us at privacy@awe.gov.au.

☑ **Confirm that you have read and understand this Privacy Notice ***

Is Referring party an organisation or business? *

Yes

Referring party organisation details

ABN	22078556500
Organisation name	ASHTON COAL OPERATIONS PTY LTD
Organisation address	73 Glennies Creek Road, Camberwell NSW 2330

Referring party details

Name	Michael Moore
Job title	Manager, Approvals
Phone	02 8583 5422
Email	michael.moore@yancoal.com.au
Address	Darling Park - Tower 2, Level 18, 201 Sussex Street, Sydney NSW 2000

1.3 Identity - Person proposing to take the action

Are the Person proposing to take the action details the same as the Referring party details? *

No

Is Person proposing to take the action an organisation or business? *

Yes

Person proposing to take the action organisation details

ABN	22078556500
Organisation name	Ashton Coal Operations Pty Limited
Organisation address	73 Glennies Creek Road, Camberwell, 2330, NSW, Australia

Person proposing to take the action details

Name	Mark Jacobs

Job title	Executive General Manager - Sustainability, Approvals, Stakeholders and Assets
Phone	02 8583 5910
Email	mark.jacobs@yancoal.com.au
Address	Darling Park - Tower 2, Level 18, 201 Sussex St, Sydney, 2000, NSW, Australia

Are you proposing the action as part of a Joint Venture? *

No

Are you proposing the action as part of a Trust? *

No

Describe the Person proposing the action's history of responsible environmental management including details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the Person proposing to take the action. *

The following projects have previously been referred by ACOL (or its associated entities):

- EPBC 2001/524 – Ashton Coal Project (Not a Controlled Action).
- EPBC 2010/5315) – South East Open Cut Project (Not a Controlled Action).

Yancoal has a documented Environment and Community Relations Policy (refer to Att D 'Yancoal Environment and Community Relations Policy' page 1) that applies to the Ashton Mine Complex and ACOL.

Details of proceedings against ACOL is summarised below:

NSW Land and Environment Court (LEC File No. 181 of 2012):

Date of proceeding: 22 June 2012, 25-28 June 2012

Environmental Legislation: *National Parks and Wildlife Act 1974*

Description: Subsidence impacts from the Ashton Underground Mine has caused harm to Aboriginal objects at three locations.

Decision: Case dismissed.

NSW Land and Environment Court (LEC File No. 213 of 2011):

Date of proceeding: 14-16 November 2011

Environmental Legislation: *Environment Planning and Assessment Act 1979*

Description: Modification application compliance with requirements of section 75W of the *Environment Planning and Assessment Act 1979.*

Decision: Case dismissed.

NSW Land and Environment Court (LEC File No. 177 of 2011):

Date of proceeding: 18 August 2011, 27 September 2011

Environmental Legislation: *National Parks and Wildlife Act 1974*

Description: Grant traditional owners and archaeological expert access to four Aboriginal sites at the Ashton Coal Project.

Decision: Access granted to relevant parties for the purpose of inspection and preparation of reports.

1.3 Identity - Proposed designated proponent

Are the Proposed designated proponent details the same as the Person proposing to take the action? *

Yes

Proposed designated proponent organisation details

ABN	22078556500
Organisation name	Ashton Coal Operations Pty Limited
Organisation address	73 Glennies Creek Road, Camberwell, 2330, NSW, Australia

Proposed designated proponent details

Name	Mark Jacobs
Job title	Executive General Manager - Sustainability, Approvals, Stakeholders and Assets
Phone	02 8583 5910
Email	mark.jacobs@yancoal.com.au
Address	Darling Park - Tower 2, Level 18, 201 Sussex St, Sydney, 2000, NSW, Australia

1.3 Identity - Summary of allocation

Confirmed Referring party's identity

The Referring party is the person preparing the information in this referral.

ABN	22078556500
Organisation name	ASHTON COAL OPERATIONS PTY LTD
Organisation address	73 Glennies Creek Road, Camberwell NSW 2330
Representative's name	Michael Moore
Representative's job title	Manager, Approvals
Phone	02 8583 5422
Email	michael.moore@yancoal.com.au
Address	Darling Park - Tower 2, Level 18, 201 Sussex Street, Sydney NSW 2000

Confirmed Person proposing to take the action's identity

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN	22078556500
Organisation name	Ashton Coal Operations Pty Limited
Organisation address	73 Glennies Creek Road, Camberwell, 2330, NSW, Australia
Representative's name	Mark Jacobs
Representative's job title	Executive General Manager - Sustainability, Approvals, Stakeholders and Assets
Phone	02 8583 5910

Email	mark.jacobs@yancoal.com.au
Address	Darling Park - Tower 2, Level 18, 201 Sussex St, Sydney, 2000, NSW, Australia

Confirmed Proposed designated proponent's identity

The Person proposing to take the action is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

1.4 Payment details - Payment exemption and fee waiver

Do you qualify for an exemption from fees under EPBC Regulation 5.23 (1) (a)? *

No

Has the department issued you with a credit note? *

No

Have you applied for or been granted a waiver for full or partial fees under Regulation 5.21A? *

No

Are you going to apply for a waiver of full or partial fees under EPBC Regulation 5.21A? *

No

Would you like to add a purchase order number to your invoice? *

No

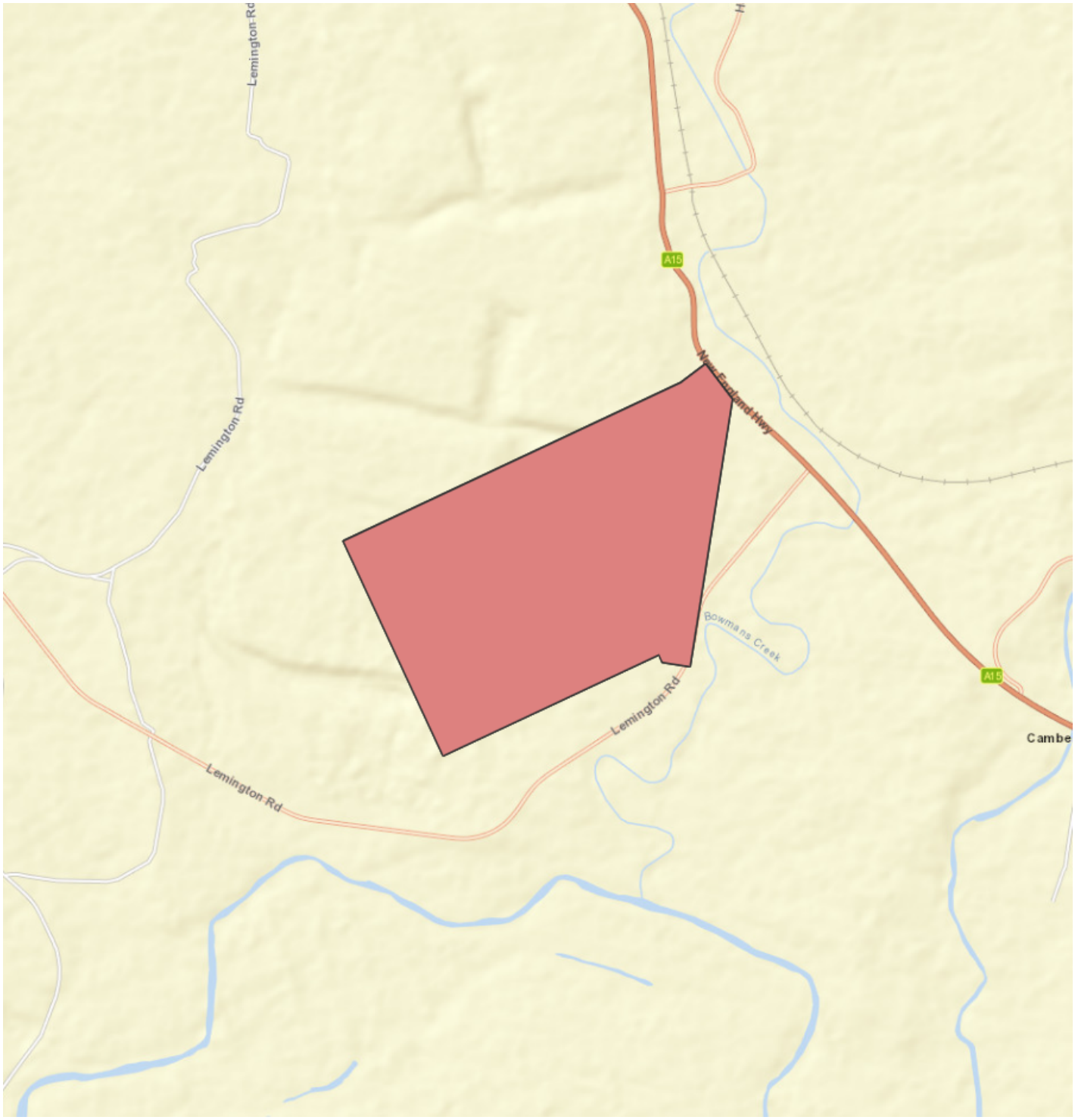
1.4 Payment details - Payment allocation

Who would you like to allocate as the entity responsible for payment? *

Person proposing to take the action

2. Location

2.1 Project footprint



2.2 Footprint details

What is the address of the proposed action? *

Ravensworth Underground Mine, Lemington Road, Ravensworth, NSW, 2330.

Where is the primary jurisdiction of the proposed action? *

New South Wales

Is there a secondary jurisdiction for this proposed action? *

No

What is the tenure of the action area relevant to the project area? *

The Action is located on freehold land owned by Glencore (being the major Joint Venture Party of the Ravensworth Mine Complex), AGL (as the owner of the historical Ravensworth Void 5) and also on land owned by the Singleton Council (non-freehold as the owner of the Lemington Road reserve), all of which are within the existing mining tenements held by Glencore. Parts of these mining tenements will be transferred to ACOL to facilitate ACOL undertaking the proposed Action.

3. Existing environment

3.1 Physical description

Describe the current condition of the project area's environment.

Open cut mining currently dominates the existing Action Area (Att A 'Referral Description', Figure 2, Page 4). Within the Action Area, the original character of the vegetation has been greatly altered as a result of historical and current land uses including mining and grazing and is generally in poor condition in disturbed areas. Areas of the existing waste emplacement have been rehabilitated to grassland using exotic species in the north and north-east of the Action Area. For the grassland areas, the condition has been noted as good (Att C 'Ravensworth Operations Project Ecology Assessment', Table 4.3, page 79).

An area of remnant (or regrowth) vegetation is present in the south-east of the Action Area, which presumably has revegetated since the relaxation of grazing across this area approximately 30 to 40 years ago. Despite past clearing, the vegetation formation in this area was regenerating well and is in moderately good condition. Weed invasion is primarily a concern on disturbed edges (Att C 'Ravensworth Operations Project Ecology Assessment', Table 4.2, page 79).

The existing ACOL workforce that currently operates the Ashton Coal Project would be used to operate the ACOL-operated portion of the RUM.

Describe any existing or proposed uses for the project area.

The existing land use in the Action Area is mining (historical and continuing) and agricultural activities. Mining activities are authorised at the Ravensworth Operations Project until the end of 2039 with rehabilitation activities to continue thereafter. Neighbouring land uses include power generation, open cut and underground mining and other agricultural activities.

Surface disturbance areas associated with the Ravensworth Operations Project (EPBC Approval 2010/5389) are and would continue to be progressively rehabilitated to their agreed post mining land use. There would be no change in current or future land use as a result of the proposed Action.

Describe any outstanding natural features and/or any other important or unique values that applies to the project area.

The Action Area has historically been mined and/or cleared for grazing.

There are no outstanding natural features or other unique values within the Action Area.

The Ravensworth State Forest is located approximately 9 km north-east of the Action Area and the Wollemi National Park is located approximately 13 km south-east of the Action Area.

Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

Within the Action Area, topography ranges from approximately 110 m AHD in the north to approximately 75 m AHD in the south and south-east. The land in the Action Area generally falls towards the Hunter River to the south, except along the eastern extent of the Action Area where the land generally falls eastward towards Bowmans Creek. Water within the Action Area is currently managed in accordance with the Ravensworth Operations Project Water Management Plan.

3.2 Flora and fauna

Describe the flora and fauna within the affected area and attach any investigations of surveys if applicable.

Flora and fauna surveys across the Ravensworth Mine Complex, including the Action Area, were completed by Umwelt between 2007 and 2009 (Att C 'Ravensworth Operations Project Ecology Assessment', Section 3, page 36-66).

The majority of the Action Area has been disturbed and modified by historical and ongoing mining activities. The modified areas include open cut mining areas, waste emplacements, water management and other infrastructure. Parts of the waste emplacements in the north-east of the Action Area have been rehabilitated with endemic and non-endemic eucalypt species with some areas also containing belah (*Casuarina cristata*) (Att C 'Ravensworth Operations Project Ecology Assessment', Section 4.1.3.9 page 73). A planted area just north of Old Lemington Road contains a large number of planted Weeping Myall (*Acacia pendula*) (Att C 'Ravensworth Operations Project Ecology Assessment', Section 4.1.3.9 page 73, Section 4.1.4.2 page 76, Figure 4.2 page 74) which, where it occurs in the Hunter Valley, may conform with the EPBC Act listed Hunter Valley Weeping Myall (*Acacia pendula*) Woodland. The area recorded was estimated to contain approximately 70 to 90 adults and 10 to 20 juveniles which are likely to be suckers from the adult plants. One juvenile plant within the road reserve may have naturally recruited from planted adults (Att C 'Ravensworth Operations Project Ecology Assessment', Section 4.1.3.9 page 73).

The remaining rehabilitated waste emplacement in the north-east and west of the Action Area comprises pasture, dominated by the introduced Rhodes grass (*Chloris gayana*) and kikuyu (*Pennisteum clandestinum*) (Att C 'Ravensworth Operations Project Ecology Assessment', Section 4.1.3.10 page 75).

An area of remnant (or regrowth) vegetation is located north of the Narama Dam within the Action Area and was mapped as Central Hunter Box – Ironbark Woodland (Att C 'Ravensworth Operations Project Ecology Assessment', Section 4.1.3.1 page 67, Figure 4.1 page 68). The Central Hunter Box – Ironbark Woodland is the dominant woodland community across the Ravensworth Mine Complex and conforms to the Central Hunter Valley Eucalypt Forest and Woodland CEEC. The majority of the community is regenerating from historical clearing for agriculture, with regeneration occurring over the past approximately 30 to 40 years presumably after the relaxation of stock grazing.

Targeted searches for the Koala across the Ravensworth Mine Complex and assessed Koala habitat at 42 sites. No Koalas or Koala scats were identified during the extensive searches, nor did Koalas respond to the 12 call playback sessions. No Koala core habitat was identified and the area is not considered to provide Koala habitat (Att C 'Ravensworth Operations Project Ecology Assessment', Section 4.2.4.2 page 98).

No EPBC Act listed threatened fauna species were located in the Action Area (Att C 'Ravensworth Operations Project Ecology Assessment', Figure 4.2 page 74). The Grey-headed Flying-fox (*Pteropus poliocephalus*) and Green and Golden Bell Frog (*Litoria aurea*) were recorded at the Ravensworth Mine Complex but outside of the Action Area (Att C 'Ravensworth Operations Project Ecology Assessment', Figure 4.2 page 74).

Describe the vegetation (including the status of native vegetation and soil) within the project area.

Soil

The main soils in this landscape are Yellow Soloth soils on slopes with some Yellow Solodic soils on concave slopes. These soils have a moderate to high erosion hazard and a high structural degradation hazard (Att H 'RUM Mod9 Environmental Assessment', Section 3.6, pages 12-13).

The Action Area has been cleared through past agricultural practices and mining activities, however some tracts of remnant (or regrowth) vegetation exist. Areas of the existing waste emplacement have been rehabilitated to grassland in the north and north-east of the Action Area.

The pre-mining land capability for the Project Site as predominately Class IV land. Further degradation of the Action Area has occurred due to open cut mining activities.

Vegetation

The vegetation characteristics of the Action Area are described in the previous responses.

3.3 Heritage

Describe any Commonwealth heritage places overseas or other places recognised as having heritage values that apply to the project area.

There are no Commonwealth Heritage Places or other places recognised as having values within the Action Area. The closest Commonwealth Heritage Place to the Action is the Muswellbrook Post Office, which is located approximately 26 km north-west of the Action Area and would not be impacted by the Action.

Describe any Indigenous heritage values that apply to the project area.

Aboriginal heritage values in the Action Area are described in Aboriginal Heritage Due Diligence Assessment: DA 104/96 Ravensworth Underground Mine Proposed Modification 9 – Liddell Seam Project (Att I 'RUM Mod9 Aboriginal Heritage Assessment', Section 3.1, pages 11-14). There are seven extant Aboriginal sites (isolated finds and artefact scatters) overlying the southern longwalls that may be subject to indirect subsidence impacts.

ACOL would obtain permits under the *National Parks and Wildlife Act 1974* prior to potential indirect impacts related to the Action to relevant extant Aboriginal heritage sites (where appropriate) located near the southern two Pikes Gully Seam longwall panels.

3.4 Hydrology

Describe the hydrology characteristics that apply to the project area and attach any hydrological investigations or surveys if applicable. *

Surface Water

The proposed Action Area is located within the Hunter River catchment and also the Bowmans Creek sub-catchment. The Hunter River is located south of the Action Area and flows to the east.

Bowmans Creek is located east of the Action Area and was realigned by ACOL in two locations prior to it being undermined by the Ashton Underground Mine operations (Att A 'Referral Description', Figure 2, Page 4). Bowmans Creek flows southwards into the Hunter River.

The majority of the Action Area has been disturbed by mining operations and surface water flows within the Action Area are managed by the existing surface water management system for the Ravensworth Operations Project. Surface water flows over the area of remnant (or regrowth) vegetation in the south-east of the Action Area flow southwards into the Narama Dam, which is part of the Ravensworth Operations Project water management system.

Groundwater

The groundwater resource within and surrounding the Action Area is described in Attachment B (Att B 'RUM EPBC Referral Groundwater Assessment', Section 3, pages 6-7) . The hydrogeological regime of the Action Area and surrounds comprises four key hydrostratigraphic units:

- the Permian porous rock groundwater sources within the Sydney Basin – North Coast Groundwater Source;
- an alluvial groundwater system associated with the Hunter River;
- an alluvial groundwater system associated with Bowmans Creek (located above the adjacent Ashton Underground Mine); and
- an alluvial groundwater system associated with Glennies Creek (located above the adjacent Ashton Underground Mine).

The Action is subject directly (and indirectly) to the water sharing rules of the following Water Sharing Plans under the NSW *Water Management Act 2000:*

- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* (Hunter Regulated River Alluvial Water Source).
- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (Sydney Basin-North Coast Groundwater Source).
- *Water Sharing Plan for the Hunter Regulated River Water Source 2016* (Hunter Regulated River Water Source).

The proposed Longwalls do not directly undermine the Hunter River, Bowmans Creek, Glennies Creek or the saturated areas of the alluviums associated with these water courses.

4. Impacts and mitigation

4.1 Impact details

Potential Matters of National Environmental Significance (MNES) relevant to your proposed action area.

EPBC Act section	Controlling provision	Impacted	Reviewed
S12	World Heritage	No	Yes
S15B	National Heritage	No	Yes
S16	Ramsar Wetland	No	Yes
S18	Threatened Species and Ecological Communities	Yes	Yes
S20	Migratory Species	Yes	Yes

EPBC Act section	Controlling provision	Impacted	Reviewed
S21	Nuclear	No	Yes
S23	Commonwealth Marine Area	No	Yes
S24B	Great Barrier Reef	No	Yes
S24D	Water resource in relation to large coal mining development or coal seam gas	Yes	Yes
S26	Commonwealth Land	No	Yes
S27B	Commonwealth heritage places overseas	No	Yes
S28	Commonwealth or Commonwealth Agency	No	Yes

World Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action is located within a coal mining precinct, away from protected World Heritage matters.

National Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action is located within a coal mining precinct, away from protected National Heritage matters.

Ramsar Wetland

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

There would not be any impact on the RAMSAR wetlands as a result of the Action, as the proposed Action would not be a material and substantial cause of indirect impacts and any indirect impacts from the Action would not extend sufficiently close to the Hunter Estuary Wetlands RAMSAR wetland.

Threatened Species and Ecological Communities

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Threatened species

Direct impact	Indirect impact	Species
No	Yes	Acacia pendula
No	Yes	Anthochaera phrygia
No	Yes	Aprasia parapulchella
No	Yes	Asperula asthenes
No	Yes	Botaurus poiciloptilus
No	Yes	Calidris ferruginea
No	Yes	Chalinolobus dwyeri

Direct impact	Indirect impact	Species
No	Yes	Dasyurus maculatus
No	Yes	Dasyurus maculatus maculatus (SE mainland population)
No	Yes	Delma impar
No	Yes	Erythrotriorchis radiatus
No	Yes	Eucalyptus glaucina
No	Yes	Euphrasia arguta
No	Yes	Falco hypoleucos
No	Yes	Grantiella picta
No	Yes	Hirundapus caudacutus
No	Yes	Lathamus discolor
No	Yes	Litoria aurea
No	Yes	Litoria booroolongensis
No	Yes	Numenius madagascariensis
No	Yes	Nyctophilus corbeni
No	Yes	Petauroides volans
No	Yes	Petaurus australis australis
No	Yes	Petrogale penicillata
No	Yes	Phascolarctos cinereus
No	Yes	Prasophyllum sp. Wybong (C.Phelps ORG 5269)
No	Yes	Pseudomys novaehollandiae
No	Yes	Pteropus poliocephalus
No	Yes	Pterostylis gibbosa
No	Yes	Rostratula australis
No	Yes	Thesium australe

Ecological communities

—

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

The Action will not cause additional direct disturbance (land clearing) to a listed threatened species, community, or their habitat.

Subsidence effects may have an indirect impact on protected matters (if they were to be present in the Action area).

Threatened ecological communities that may occur in the action area (based on the Protected Matters Search) include:

- Hunter Valley Weeping Myall (*Acacia pendula*) Woodland.
- Central Hunter Valley Eucalypt Forest and Woodland.
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.
- River-flat Eucalypt Forest on Coastal Floodplains of Southern New South Wales and Eastern Victoria Species.

- Coastal Swamp Sclerophyll Forest of New South Wales and South East Queensland Species.

Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

Describe why you do not consider this to be a Significant Impact. *

The Action will not cause additional direct disturbance (land clearing) to a listed threatened species, community, or their habitat.

The Action will not have a significant impact on ecological communities because:

1. The Action would not reduce the extent of any community and would not increase fragmentation of any community, given no direct disturbance is proposed.
2. The Action would not adversely affect habitat critical to the survival of any community.
3. The Action would not modify or destroy abiotic (non living) factors (such as water, nutrients, or soil) necessary for the community's survival.
4. Indirect subsidence effects would have a negligible impact on any community.
5. The Action would not cause a change in the species composition of an occurrence of any community.
6. The Action would not cause a reduction in the quality or integrity of an occurrence of any community.
7. The Action would not interfere with the recovery of any community.

The Action will not have a significant impact on the threatened fauna species because:

1. No direct disturbance is proposed by the Action and therefore potential habitat for threatened fauna species would not be impacted.
2. Indirect subsidence impacts as a result of underground mining are highly unlikely to affect potential foraging habitat used by relevant threatened fauna species.
3. A number of the threatened fauna species are highly mobile (e.g. birds) and would also likely to use areas of potential habitat outside of the Action Area.
4. The Action is highly unlikely to fragment an existing population or modify potential habitat to the extent that a threatened fauna species is likely to decline further.

The Action will not have a significant impact on a threatened flora species because:

1. Land in the Action Area has been disturbed by historical and existing agricultural and mining activities reducing the potential for threatened flora species to occur in the Action Area.
2. No threatened flora species listed under the EPBC Act have been recorded during surveys across the Action Area.
3. Indirect subsidence impacts as a result of underground mining are highly unlikely to affect the threatened flora species.
4. The Action is highly unlikely to disrupt the lifecycle of a threatened flora species, given there is no disturbance proposed and absence of records from the area.

Attachment E (Att E 'Assessment of Potential Impacts on Protected Flora and Fauna, pages 1-6) provides further justification that there would be no significant impact to protected matters.

Do you think your proposed action is a controlled action? *

No

Please elaborate why you do not think your proposed action is a controlled action. *

On the basis of the reasons outlined in this Referral, in particular that no land clearing is proposed, the Action is not considered a controlled action as it is not likely to have a significant impact on a listed threatened species, community, or their habitat.

Attachment E (Att E 'Assessment of Potential Impacts on Protected Flora and Fauna, pages 1-6) provides further justification that there would be no significant impact to protected matters.

Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

Biodiversity

Infrastructure developed as part of the Action would be located in previously cleared areas or areas approved for clearing under the Controlled Action for the Ravensworth Operations Project (2010/5389) (i.e. the proposed Action has been designed to avoid disturbance of remnant/regrowth vegetation).

The longwall panels are mostly located beneath existing open cut mining areas and therefore would avoid impacts to overlying vegetation or surface water resources in these areas. The proposed Action longwalls are also within the footprint of the longwalls originally approved under the NSW EP&A Act (i.e. RUM NSW Development Consent DA 104/96).

Management of Mine Subsidence

ACOL would develop Extraction Plans for the Action to reduce and manage potential impacts of subsidence, which would be subject to approval by the NSW DPE in accordance with Schedule 3, Condition 6 of Development Consent DA 104/96 for the RUM.

Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

The proposed Action has been designed to avoid disturbance of remnant/regrowth vegetation and therefore no offset is proposed.

Migratory Species

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Species
No	Yes	Actitis hypoleucos
No	Yes	Apus pacificus
No	Yes	Calidris acuminata
No	Yes	Calidris ferruginea
No	Yes	Calidris melanotos
No	Yes	Gallinago hardwickii
No	Yes	Hirundapus caudacutus
No	Yes	Monarcha melanopsis
No	Yes	Motacilla flava
No	Yes	Myiagra cyanoleuca

Direct impact	Indirect impact	Species
No	Yes	Numenius madagascariensis
No	Yes	Rhipidura rufifrons

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

The Action will not cause additional direct disturbance (land clearing) to any habitat of threatened migratory species.

Subsidence effects are unlikely to, but may, have an indirect impact on protected matters (if they were to be present in the Action area).

Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

Describe why you do not consider this to be a Significant Impact. *

These species have not been recorded in the Action Area.

The Action will not have a significant impact on migratory species listed under the EPBC Act because:

1. No direct disturbance is proposed by the Action and therefore potential habitat for these species would not be impacted.
2. The Action does not involve disturbance of vegetation.
3. None of these species are considered to be at the limit of their known migratory ranges.
4. Each of these species is highly mobile, and foraging and territorial ranges far exceed the Action Area.
5. Each of these species is highly mobile, and the Action Area is not considered to contain limiting foraging or breeding habitat for these species.
6. Indirect subsidence impacts as a result of underground mining are highly unlikely to affect habitat used by these species.

Do you think your proposed action is a controlled action? *

No

Please elaborate why you do not think your proposed action is a controlled action. *

On the basis of the reasons outlined in this Referral, in particular that no land clearing is proposed, the Action is not considered a controlled action as it is not likely to have a significant impact on a listed threatened migratory species or their habitat.

Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

Biodiversity

Infrastructure developed as part of the Action would be located in previously cleared areas or areas approved for clearing under the Controlled Action for the Ravensworth Operations Project (2010/5389) (i.e. the proposed Action has been designed to avoid disturbance of remnant/regrowth vegetation).

The longwall panels are mostly located beneath existing open cut mining areas and therefore would avoid impacts to overlying vegetation or surface water resources in these areas. The proposed Action longwalls are also within the footprint of the longwalls originally approved under the NSW EP&A Act (i.e. RUM NSW Development Consent DA 104/96).

Management of Mine Subsidence

ACOL would develop Extraction Plans for the Action to reduce and manage potential impacts of subsidence, which would be subject to approval by the NSW DPE in accordance with Schedule 3, Condition 6 of Development Consent DA 104/96 for the RUM.

Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

The proposed Action has been designed to avoid disturbance of remnant/regrowth vegetation and therefore no offset is proposed.

Nuclear

Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action is not a nuclear action.

Commonwealth Marine Area

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action is located within a coal mining precinct, away from protected Commonwealth Marine Areas.

Great Barrier Reef

Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action is located within a coal mining precinct, away from the Great Barrier Reef.

Water resource in relation to large coal mining development or coal seam gas

Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

Yes

Briefly describe why your action has a direct and/or indirect impact on this protected matter. *

The proposed Action involves underground coal mining at the existing Ravensworth Mine Complex.

Potential indirect impacts on surface water resources may arise as a result of:

- subsidence of the surface due to underground mining activities, which may alter flow patterns on a local scale; and
- changes in baseflow as a result of underground mining activities.

The main potential impacts on the groundwater regime due to the Action are as a result of potential depressurisation of aquifers, drawdown on the groundwater table and changes in groundwater flow patterns, aquifer storage and baseflow.

Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

No

Describe why you do not consider this to be a Significant Impact. *

Surface Water

Potential indirect impacts on surface water resources may arise as a result of:

- subsidence of the surface due to underground mining activities, which may alter flow patterns on a local scale; and
- changes in baseflow as a result of underground mining activities.

Hunter River, Bowmans Creek and Glennies Creek are located approximately 1.2 km, 0.3 km and 2.5 km away from the secondary extraction footprint of the proposed Action. Bowmans Creek has been previously realigned by ACOL (as part of the Ashton Coal Project) in two locations and its prior course and associated alluvium has been undermined by the Ashton Underground Mine operations (Att A 'Referral Description', Figure 2, Page 4).

The Hunter River, Bowmans Creek and Glennies Creek are outside of the Action Area and would not be impacted by subsidence from the Action and therefore would be no direct or indirect subsidence related impacts that may affect flow patterns of the Hunter River, Bowmans Creek or Glennies Creek as a result of the proposed Action. The proposed Action would also not result in any bank stability and riparian vegetation impacts.

The potential changes in flows in the Hunter River, Bowmans Creek and Glennies Creek in the Groundwater Assessment for the proposed Action were modelled by AGE (Att B 'RUM EPBC Referral Groundwater Assessment', Section 5.1.3 page 14). The reduction in baseflow in the Hunter River, Glennies Creek and Bowmans Creeks as a result of the Action would be negligible during mining and post-mining (Att B 'RUM EPBC Referral Groundwater Assessment', Section 7 page 29). . Notwithstanding, ACOL holds sufficient Water Access Licences (WALs) entitlements to account for the negligible predicted take, where required.

In consideration of the *Significant impact guidelines 1.3: Coal seam gas and large coal mining developments - impacts on water resources* (Department of the Environment, 2013), the Action is unlikely to directly or indirectly significantly impact the hydrology or water quality of water resources.

Groundwater

The main potential impacts on the groundwater regime due to the Action are as a result of potential depressurisation of aquifers, drawdown on the groundwater table and changes in groundwater flow patterns, aquifer storage and baseflow.

In consideration of the Water Trigger Guidelines, it is concluded the Action is unlikely to have a significant impact on groundwater resources because (Att B 'RUM EPBC Referral Groundwater Assessment', Section 7 page 29):

- Historical mining operations in proximity to RUM had extensively depressurised the coal measures associated with the Action.
- ACOL would hold WALs with sufficient entitlements within the relevant water sources under the NSW Water Sharing Plans to account for both direct and indirect takes for the life of the Action
- There were no significant impacts predicted to private bore holders.
- There were no significant impacts predicted to groundwater dependent ecosystems.
- There would be no significant impact on water quality in the Hunter River, Bowmans Creek, Glennies Creek or the alluviums associated with these water courses.

Based on the modelling completed and evidence available, the Action is not expected to materially affect the availability and quality of water for all third-party users, including environmental and other public benefit outcomes. In consideration of the impacts that are already occurring and are approved to occur at mining operations surrounding the RUM and the approved future mining, the proposed Action is not likely to have a significant impact on a water resource (Att B 'RUM EPBC Referral Groundwater Assessment', Section 7 page 29).

Water Licensing

Under the NSW *Water Management Act 2000*, all water taken by aquifer interference activities (such as mining) is required to be accounted for within the extraction limits set by any relevant Water Sharing Plans (i.e. state water resource plans).

The Action is subject directly (and indirectly) to the water sharing rules of the following Water Sharing Plans under the NSW *Water Management Act 2000:*

- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* (Hunter Regulated River Alluvial Water Source).
- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* (Sydney Basin-North Coast Groundwater Source).
- *Water Sharing Plan for the Hunter Regulated River Water Source 2016* (Hunter Regulated River Water Source).

ACOL holds sufficient WAL entitlements to account for the predicted water takes associated with the proposed Action.

Do you think your proposed action is a controlled action? *

No

Please elaborate why you do not think your proposed action is a controlled action. *

On the basis of the reasons outlined in this Referral, including Attachment B (Att B 'RUM EPBC Referral Groundwater Assessment'), the Action is not considered a controlled action as it is not likely to have a significant impact on a water resource.

Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

Water Resources

The longwall panels are located beneath existing and approved open cut mining operations that target the same coal measures as the proposed Action. Historical mining operations in proximity to RUM have extensively depressurised the coal measures. Notably, the Ashton Coal Project, located immediately east of the RUM, the West Pit at Hunter Valley Operations North, located approximately 4 km to the west of the approved RUM longwalls, and the Glendell Open Cut, to the north-east of RUM, target coal seams down to the Barrett seam. Predictions show significant depressurisation of coal measures including Pikes Gully, Liddell and Barrett seams associated with the operations surrounding the RUM (Att B 'RUM EPBC Referral Groundwater Assessment', Section 3.1.1, page 7). In addition, mining at Ravensworth North, located between Ravensworth Narama open cut mine and the West Pit at Hunter Valley Operations North, targets seams down to the Barrett seam (i.e. beneath the targeted seams of the Action) (Att B 'RUM EPBC Referral Groundwater Assessment', Section 5.2.1 page 18).

The longwall panels also avoid undermining the Hunter River and Bowmans Creek and the saturated alluvium associated with these water courses. The proposed Action would also not result in any bank stability and riparian vegetation impacts.

ACOL would update its existing Ashton Coal Project Water Management Plan to incorporate the Action. The groundwater and surface water management plans would include erosion and sediment control measures, surface and groundwater monitoring and a surface water and groundwater response plan.

Management of Mine Subsidence

ACOL would develop Extraction Plans for the Action to reduce and manage potential impacts of subsidence, which would be subject to approval by the NSW DPE in accordance with Schedule 3, Condition 6 of Development Consent DA 104/96 for the RUM.

Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

ACOL holds sufficient WAL entitlements to account for the predicted water takes associated with the proposed Action and would manage the Action in accordance with the Ashton Water Management Plan. Therefore no offset is proposed.

Commonwealth Land

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action is not on Commonwealth Land.

Commonwealth heritage places overseas

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed Action is located within a coal mining precinct, away from protected Commonwealth heritage places overseas.

Commonwealth or Commonwealth Agency

Is the proposed action to be taken by the Commonwealth or a Commonwealth Agency? *

No

4.2 Impact summary

Conclusion on the likelihood of significant impacts

You have indicated that the proposed action will likely have a significant impact on the following Matters of National Environmental Significance:

None

Conclusion on the likelihood of unlikely significant impacts

You have indicated that the proposed action will unlikely have a significant impact on the following Matters of National Environmental Significance:

- World Heritage (S12)
- National Heritage (S15B)
- Ramsar Wetland (S16)
- Threatened Species and Ecological Communities (S18)
- Migratory Species (S20)
- Nuclear (S21)
- Commonwealth Marine Area (S23)
- Great Barrier Reef (S24B)
- Water resource in relation to large coal mining development or coal seam gas (S24D)
- Commonwealth Land (S26)
- Commonwealth heritage places overseas (S27B)
- Commonwealth or Commonwealth Agency (S28)

4.3 Alternatives

Do you have any possible alternatives for your proposed action to be considered as part of your referral? *

No

Describe why alternatives for your proposed action was not possible. *

Pursuing underground mining of the State approved RUM coal resource is a logical and efficient extension to the Ashton Underground Mine, and it is ACOL's preferred pathway for continued operations at the Ashton Mine Complex.

Proceeding with the proposed Action would have the following benefits:

- would provide for continued operations and continued employment of the ACOL workforce at the Ashton Coal Project until approximately 2032;
- utilises existing planning approvals to maximise economic recovery of approved State coal resource;
- would avoid disturbance of additional areas (i.e. by limiting disturbance to previously cleared areas);
- provides better environmental and social outcomes than developing the State approved SEOC Project; and
- is on land approved for mine development within current mining leases for the RUM.

The alternative would be to cease mining at the RUM. Closing the RUM would forgo the approved but undeveloped State resource with consequential loss of royalties to the state and loss of employment for the ACOL workforce.

The original plan to extend mining operations at the Ashton Mine Complex was to develop the approved SEOC Project. However the State approval for this Project lapsed on 17 April 2022 and is no longer available as an approved development.

5. Lodgement

5.1 Attachments

1.2 Overview of the proposed action

#1.	Attachment A - Referral Description	Document	Description of the proposed Action
#2.	Attachment F - RUM Modification Report	Document	Ravensworth Underground Mine Modification Report

1.2 Commonwealth or state legislation, planning frameworks or policy documents that are relevant to the proposed action

#1.	Attachment F - RUM Modification Report	Document	Ravensworth Underground Mine Modification Report

1.2 Public consultation regarding the project area

#1.	Attachment G - RUM Submissions Report	Document	Ravensworth Underground Mine Modification - Submissions Report
#2.	Ashton Coal Wesbite	Link (Webpage)	https://www.ashtoncoal.com.au/
#3.	Glencore - Ravensworth Operations Website	Link (Webpage)	https://www.glencore.com.au/operations-and-projects/coal/current-operations/ravensworth-operations

1.3 (Proposer's identity) Proposer's history of responsible environmental management

#1.	Attachment D - Yancoal Environment and Community Policy	Document	Yancoal's Environment and Community Relations Policy

3.1 Current condition of the project area's environment

#1.	Attachment C - Ravensworth Operations Project Ecology Assessment	Document	Ecology Assessment for the Ravensworth Operations Project

3.2 Flora and fauna within the affected area

#1.	Attachment C - Ravensworth Operations Project Ecology Assessment	Document	Ecology Assessment for the Ravensworth Operations Project

3.2 Vegetation within the project area

#1.	

	Attachment H - RUM Mod9 Environmental Assessment	Document	Ravensworth Underground Mine Modification 9 Environmental Assessment

3.3 Indigenous heritage values that apply to the project area

#1.	Attachment I - RUM Mod9 Aboriginal Heritage Assessment	Document	Aboriginal Heritage Due Diligence Assessment at the Ravensworth Underground Mine

3.4 Hydrology characteristics that apply to the project area

#1.	Attachment A - Referral Description	Document	Description of the proposed Action
#2.	Attachment B - RUM EPBC Referral Groundwater Assessment	Document	Groundwater Assessment to support the RUM EPBC Referral

4.1 (Threatened Species and Ecological Communities) Why you do not consider the direct and/or indirect impact to be a Significant Impact

#1.	Attachment E - Assessment of Potential Impacts on Protected Flora and Fauna	Document	Assessment of Potential Impacts on Protected Flora and Fauna

4.1 (Threatened Species and Ecological Communities) Why you do not think your proposed action is a controlled action

#1.	Attachment E - Assessment of Potential Impacts on Protected Flora and Fauna	Document	Assessment of Potential Impacts on Protected Flora and Fauna

4.1 (Water resource in relation to large coal mining development or coal seam gas) Why you do not consider the direct and/or indirect impact to be a Significant Impact

#1.	Attachment A - Referral Description	Document	Description of the proposed Action
#2.	Attachment B - RUM EPBC Referral Groundwater Assessment	Document	Groundwater Assessment to support the RUM EPBC Referral

4.1 (Water resource in relation to large coal mining development or coal seam gas) Why you do not think your proposed action is a controlled action

#1.	Attachment B - RUM EPBC Referral Groundwater Assessment	Document	Groundwater Assessment to support the RUM EPBC Referral

4.1 (Water resource in relation to large coal mining development or coal seam gas) Avoidance or mitigation measures proposed for this action

#1.	Attachment B - RUM EPBC Referral Groundwater Assessment	Document	Groundwater Assessment to support the RUM EPBC Referral

5.2 Declarations

Completed Referring party's declaration

The Referring party is the person preparing the information in this referral.

ABN	22078556500
Organisation name	ASHTON COAL OPERATIONS PTY LTD
Organisation address	73 Glennies Creek Road, Camberwell NSW 2330
Representative's name	Michael Moore
Representative's job title	Manager, Approvals
Phone	02 8583 5422
Email	michael.moore@yancoal.com.au
Address	Darling Park - Tower 2, Level 18, 201 Sussex Street, Sydney NSW 2000

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ By checking this box, I, **Michael Moore of ASHTON COAL OPERATIONS PTY LTD**, declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

Completed Person proposing to take the action's declaration

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN	22078556500
Organisation name	Ashton Coal Operations Pty Limited
Organisation address	73 Glennies Creek Road, Camberwell, 2330, NSW, Australia
Representative's name	Mark Jacobs
Representative's job title	Executive General Manager - Sustainability, Approvals, Stakeholders and Assets
Phone	02 8583 5910
Email	mark.jacobs@yancoal.com.au
Address	Darling Park - Tower 2, Level 18, 201 Sussex St, Sydney, 2000, NSW, Australia

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ I, **Mark Jacobs of Ashton Coal Operations Pty Limited**, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or

misleading information is a serious offence. I declare that I am not taking the action on behalf or for the benefit of any other person or entity. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

Completed Proposed designated proponent's declaration

The Proposed designated proponent is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ I, **Mark Jacobs of Ashton Coal Operations Pty Limited**, the Proposed designated proponent, consent to the designation of myself as the Proposed designated proponent for the purposes of the action described in this EPBC Act Referral. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

ATTACHMENT 2
CROSS REFERENCE OF ASSESSMENT REQUIREMENTS FOR THE PRELIMINARY DOCUMENTATION

Table A2-1
Cross Reference of Assessment Requirements for the Preliminary Documentation

DCCEEW Request Section	Preliminary Documentation Requirement	Relevant Section in Preliminary Documentation
1. Description of the action	Descriptions of any proposed **clearing, earthworks and construction activities** or other elements proposed to be taken within the construction footprint.	Section 2.4
	Descriptions of the **preconstruction, construction, and operational phases** of the proposed action.	Section 2.2 and 2.4
	The anticipated **timing and duration** (including start and completion dates) for each known activity, stage, or element of the proposed action.	Section 2.5
	Feasible alternatives to the proposed action or elements of the proposed action, and **justification for the preferred option**.	Section 2.6
	Consultation about the proposed action that is planned or has been completed, including any documented results or responses.	Section 1.4
	Requirements for assessment and approval under **state legislation**, including any conditions that apply (or will apply) to the proposed action, in addition to any other requirements for approval or conditions that apply, or that the proponent reasonably believes are likely to apply, to the proposed action.	Section 3.4
	Details of any **local or State government planning scheme**, or plan or policy under any local or State government planning system that deals with the proposed action.	Section 3.5
	How the action **relates to any other action** (of which the proponent is aware) that is being or will be taken in the region.	Section 1.2.1
2. Description of the environment and Matters of National Environmental Significance	On a **map** identify: • The **extent of the community** within the proposed action area.	Figure 4
	• Any **connected areas** of the community extending beyond the proposed action area.	Figure 4 and Appendix A
	Provide the **total area of the community** in hectares (ha), and if the community occurs in multiple distinct areas within the site, provide the area (ha) for each occurrence.	Section 4.1 and Appendix A
2.1. Species/communities general information	Explain how the mapped areas of the community meet (or not meet) the key **diagnostic characteristics, condition thresholds** or criteria, or **patch definitions** as set out in the relevant EPBC Act conservation advices, listing advices and/or recovery plans.	Section 4 and Appendix A
	If the proposed action is being assessed under the NSW BAM: • clearly identify the Plant Community Types and Vegetation Zones in the proposed action area that are associated with the species.	Section 4 and Appendix A
	• clearly identify the Plant Community Types and Vegetation Zones that align with the EPBC listed community in the proposed action area.	Section 4 and Appendix A
2.2. Species/communities specific information	Provide further evidence to demonstrate that the 3 ha patch does not conform to the EPBC-listed Hunter Valley Weeping Myall (*Acacia pendula*) Woodland. If the patch does conform to the EPBC-listed ecological community, you must complete the information required in Section 3.	Section 4.3 and Appendix A

Table A2-1 (Continued)
Cross Reference of Assessment Requirements for the Preliminary Documentation

DCCEEW Request Section	Preliminary Documentation Requirement	Relevant Section in Preliminary Documentation
3. Impact assessment 3.1. Listed Threatened Species and Communities 3.1.1. Impact assessment	Identify the **nature and extent** of the likely short-term and long-term impacts from the activities, elements, or stages of the proposed action. When identifying impacts, refer to the **significant impact criteria** for ecological communities in the Matters of National Environmental Significance Significant impact guidelines 1.1, noting that the impact criteria differ among threatened ecological communities with different listing statuses.	Sections 4.2 and 4.3 and Appendix A
	Quantify the area of direct and indirect impacts for each community including the total area of impact in hectares.	Sections 4.2 and 4.3 and Appendix A
	Provide an analysis of the **likely impacts** and the **long-term viability** of the community if the proposed action was to proceed, at a: • **Local** (site level) **scale**	Sections 4.2 and 4.3 and Appendix A
	• **Regional scale**	Sections 4.2 and 4.3 and Appendix A
	Provide details on whether any impacts are likely to **be unknown, unpredictable or irreversible** and what confidence is placed on the predictions or relevant impacts.	Section 8.4 and Appendix A
	Provide **justification for any conclusions** regarding potential impacts in relation to specific needs and characteristics of each species and/or community, including references to conservation advices, listing advices, recovery plans, and any other technical data or information. If these are not applicable, a brief statement to this effect must be included.	Sections 4.2 and 4.3 and Appendix A

Table A2-1 (Continued)
Cross Reference of Assessment Requirements for the Preliminary Documentation

DCCEEW Request Section	Preliminary Documentation Requirement	Relevant Section in Preliminary Documentation
3.1.2. Avoidance, mitigation and management measures	Provide a **consolidated list of all avoidance/mitigation measures** proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action.	Section 4.4
	For each of the mitigation measures proposed: • Discuss the likely **cost effectiveness** of proposed measures	Section 8.2
	• Provide an assessment of the **predictive effectiveness** for each protected matter	Section 4.4
	• Discuss any **statutory or policy basis** for the measures	Sections 4.2.3, 4.3.3 and 4.4
	• Discuss the relationship, if any, with measures identified in the department's **conservation advices, recovery plans and threat abatement plans**	Section 4.3.3 and Appendix A
	• Discuss the relationship, if any, with **measures proposed by state and/or local governments** relevant to minimising the impacts of the action on protected matters	Section 4.4, Attachment 4 and Appendix A
	• Identify the **roles and responsibilities** associated with implementation	Section 4.4 and Section 4.6 of Appendix E
	Provide conclusions about the **likely residual significant impacts** to each community after proposed avoidance and/or mitigation measures are considered.	Sections 4.2.4 and 4.3.4
	Provide proposed **management plans** if available. If not available, at minimum set out the framework for ongoing management, mitigation, and monitoring programs for the relevant impacts of the action.	Section 4.4 and Appendices E and F
	Clearly state and discuss and **variables or assumptions** made in the assessment.	Not applicable
	Discuss the extent to which **limited availability of relevant information** has the potential to influence the conclusions of the assessment.	Not applicable
3.1.3. Compensation measures (offsets)	If applicable, the preliminary documentation must describe the proposed offset strategy, outlining how the offsets will be achieved for each protected matter, demonstrating that the offset liability can be satisfied by the mechanisms, and specifying the expected timeframe for legal security of the offsets. Offsets will generally need to be underway prior to commencement of the proposed action.	Not applicable
3.1.4. EPBC Act Environmental Offsets	The offset strategy must: • Meet the principles specified in the EPBC Act Environmental Offsets Policy;	Not applicable
	• Directly contribute to the ongoing viability of the relevant protected matters to deliver an overall conservation outcome that improves or maintains the viability of the protected matters in the region, as compared to what is likely to have occurred under the status quo, i.e., if neither the action nor the offset had taken place; and	Not applicable
	• Compensate for the impacts over the entire duration of the proposed action (should impacts be in perpetuity, the offsets must also be delivered in perpetuity).	Not applicable
	The preliminary documentation must also provide and clearly justify the scores entered into the Offset assessment guide.	Not applicable

Table A2-1 (Continued)
Cross Reference of Assessment Requirements for the Preliminary Documentation

DCCEEW Request Section	Preliminary Documentation Requirement	Relevant Section in Preliminary Documentation
3.2. A Water resource, in relation to coal seam gas development and large coal mining 3.2.1. The hydrology relevant to the proposed action area, including surface water and groundwater	The preliminary documentation should: • provide a regional overview of the project area, including a description of the geological basin, coal resource, surface water catchments, groundwater systems and water-dependent assets.	Section 5.1
	• describe any potential third-party users of water in areas potentially affected by the proposed project, including municipal, agricultural, industrial, recreational and environmental uses of water.	Section 5.3
	The preliminary documentation must: • include a description and assessment of the impacts to water resources giving consideration to relevant departmental policies and guidelines, including the Significant Impact Guidelines 1.3: Coal seam gas and large coal mining developments – impacts on water resources.	Section 5.7
	• provide robust scientific information and supporting evidence for every assertion, assumption and/or conclusion made in the assessment of potential impacts, or lack of impacts, on water resources.	Section 5 and Appendices C and D
3.2.2. Surface water	The preliminary documentation must provide details on surface water, including: • A site-specific subsidence impact assessment and management plan (where available) or proposed management measures that will be included in the management plan.	Section 5.4 and Appendix B
	• A water quality monitoring and management plan (where available) or proposed management measures that will be included in the management plan. This should include the monitoring of analytes such as electrical conductivity, pH, turbidity, and a broad suite of metals and contaminants in line with ANZG Guidelines.	Section 5.4.4 and Appendix E
	• A quantitative site water balance description (e.g. using the Water Accounting Framework for the Australian Mineral Industry, Minerals Council of Australia 2022) specific to the proposed action should highlight all intended and approved water transfers, intakes, and discharges.	Section 5.4.3 and Appendix D
	• Confirmation that the volume of surface water take from the Hunter River and Glennies Creek is negligible. This should be reflected in the site water balance description.	Sections 5.4.2 and 5.4.3
	• An erosion plan (where available) or proposed management measures that will be included in the erosion plan for the proposed action, which must include an assessment for acid sulfate soils.	Section 5.4.4
3.2.3. Groundwater	The preliminary documentation must provide details on groundwater, including: • Clarification that the no action groundwater model simulations provided in the referral documentation take into consideration all prior historical workings including those associated with the Ravensworth Underground Mine.	Section 5.5.1 and Appendix C
	• Information and modelling results provided to NSW for modification of the Development Consent.	Section 5.5.1 and Appendix C
	• Details on the monitoring of alluvial groundwater to ensure water quality is maintained. This must include the current monitoring program and location of any new monitoring bores relative to predicted impact and water resources to confirm that actual drawdown extents are similar to those predicted and presented in the referral documentation.	Section 5.5.3

Table A2-1 (Continued)
Cross Reference of Assessment Requirements for the Preliminary Documentation

DCCEEW Request Section	Preliminary Documentation Requirement	Relevant Section in Preliminary Documentation
3.2.4. Groundwater Dependent Ecosystems	The preliminary documentation must provide a GDE assessment which includes: • an assessment of direct, indirect and consequential impacts to GDEs, including a discussion of any potential GDEs in the vicinity. You must consider both surface water and groundwater impacts to GDEs within the proposed action area and within the zone of potential drawdown (e.g. impacts due to groundwater drawdown, reduction in surface water flow, etc.);	Section 5.6.1 and 5.6.3 and Appendix C
	• desktop assessments data (e.g. searches of NSW BioNet, the Bureau of Meteorology's GDEs Atlas and Geoscience Australia's Water observations from space, etc.) used to identify potential GDEs for field assessment; and	Section 5.6.2 and Appendices A and C
	• field assessment data to confirm the outcomes of the desktop assessments.	Section 5.6.2 and Appendix A
	The GDE Assessment must: • Provide the details and results of the above database searches and field studies, including observations of the vegetation present in the area and descriptions of the soil/geology encountered. A time series of satellite imagery of the potential GDEs in the vicinity may be able to be provided. Observing the state of the vegetation over time, given the existing mining operations and corresponding groundwater drawdown, may help to demonstrate whether or not the vegetation is groundwater dependent and whether impacts to the vegetation have occurred as a result of previous mining operations.	Section 5.6
	• Sufficient evidence needs to be provided to support any conclusion that particular ecosystems are not groundwater dependent.	Section 5.6.2 and Appendix A
3.2.5. Cumulative Impacts	The preliminary documentation must: • identify and address potential and likely cumulative impacts on groundwater, groundwater dependent ecosystems and surface water from the proposed action, the existing Ashton Underground Mine and other nearby resource projects (including known potential future expansions or developments by the proponent and other proponents in the vicinity). Where relevant to the potential impact, risk assessment must be conducted and documented. The risk evaluation must also include known potential future expansions or developments by the proponent and other proponents in the vicinity of the proposed action.	Section 5.7.4 and Appendix C
	• include confirmation that there will be no additional drainage to Bowmans Creek or Bayswater Creek from the proposed action.	Section 5.4.3
3.2.6. Referral to the IESC	The preliminary documentation must include the IESC advice and a response to the IESC advice in the preliminary documentation.	Attachment 3

Table A2-1 (Continued)
Cross Reference of Assessment Requirements for the Preliminary Documentation

DCCEEW Request Section	Preliminary Documentation Requirement	Relevant Section in Preliminary Documentation
3.2.7 Avoidance, mitigation and management measures	Provide a **consolidated list of all avoidance/mitigation/management measures** proposed to be undertaken to prevent, minimise or compensate for the relevant impacts of the action.	Section 5.4.4, 5.5.3 and 5.6.4
	For each of the management and mitigation measures proposed please provide: • An assessment of the **predicted effectiveness and environmental outcomes of the proposed measures**, including details of any baseline data or proposed monitoring required to demonstrate progress towards achieving these outcomes.	Section 5.4.4, 5.5.3 and 5.6.4
	• Any **statutory or policy basis** for the proposed measures.	Sections 5.4.4, 5.5.3 and 5.6.4
	• Details of **ongoing management, including monitoring programs to support an adaptive management approach** and determine the effectiveness of the proposed measures.	Sections 5.4.4, 5.5.3 and 5.6.4
	• Information on the **timing, frequency and duration** of the measures to be implemented.	Section 2.5, 5.4.4, 5.5.3 and 5.6.4, and Section 8.6 of Appendix F
	• The name of the **agency responsible** for endorsing or approving each measure or monitoring program.	Section 5.4.4, 5.5.3 and 5.6.4, and Section 8.6 of Appendix F
	• Provide discussion, where applicable, as to how the **requirements of existing State or Commonwealth approvals** may mitigate potential impacts to water resources, noting any relevant management or monitoring plans (e.g. Receiving Environment Monitoring Program, Water Management Plan, Groundwater Management and Monitoring Plan).	Sections 3.4.1 and Sections 5.4.4, 5.5.3 and 5.6.4
	• Discuss the likely **cost effectiveness** of proposed measures.	Section 8.2
	Provide an **outline of any management plan/s** that set out the framework for management, mitigation and monitoring of relevant impacts of the proposed action, including any provisions for independent environmental auditing. This must state the **environmental objectives, performance criteria, monitoring, reporting, corrective action, responsibility and timing** for each relevant MNES environmental issue. Where a management plan is already in place that relates to the project it should be attached to the preliminary documentation.	Sections 5.4.4, 5.5.3 and 5.6.4
	Clearly state and discuss and **variables or assumptions** made in the assessment.	Appendix A of Appendix C
	Discuss the extent to which **limited availability of relevant information** has the potential to influence the conclusions of the assessment.	Section 9 of Appendix C
4. Economic and social matters	Consideration of **negative impacts** (e.g., disruption to existing community infrastructure, environmental features, and/or cultural and traditional activities).	Section 6
	Consideration of **positive impacts** (e.g., increased housing, employment, or social amenity).	Section 6
	Consideration of different **scales of impact** (e.g., local, regional, and national).	Section 6
	Estimated **capital value and ongoing economic value,** using specific dollar or other numerical values where relevant.	Section 6
	Discussion of relevant **public consultation** undertaken, including any issues raised in objection or support of the proposed action.	Sections 1.4 and 6

Table A2-1 (Continued)
Cross Reference of Assessment Requirements for the Preliminary Documentation

DCCEEW Request Section	Preliminary Documentation Requirement	Relevant Section in Preliminary Documentation
	Discussion of any **contributions** (for example, government funding, or 'gifting' of land to the NSW Government under a voluntary planning agreement, as discussed in the referral information).	Section 6
5. Environmental history of the person proposing to take the action	The preliminary documentation must provide details of any proceedings under a Commonwealth, state or territory law for the protection of the environment, or the conservation and sustainable use of natural resources, against the person proposing to take the action (or if the person is a corporation, its executive officers).	Section 7
	Preliminary documentation must also provide the environmental history of any parent body or bodies of which the person proposing to take the action is a subsidiary (and the executive officers of this parent body). If the person proposing to take the action is a corporation, details of the corporation's environmental policy and planning framework must be provided.	Section 7
6. Outcomes based conditions	Thoroughly document the baseline condition of the relevant impacted matter(s).	Sections 4.1 and 5.1
	Identify conservation objectives (outcomes) for the relevant impacted matters, preferably with reference to any applicable conservation advices, recovery plans and threat abatement plans.	Sections 3.4.1, 4 and 5 and Appendix A
	Outline how performance against specified objectives will be measured and reported.	Section 4.4, 5.4.4, 5.5.3 and 5.6.4
7. Conclusion	Provide an overall conclusion on the environmental acceptability of the proposed action, and whether proposed avoidance, mitigation and offset measures are sufficient to manage the additional impacts to the environment arising from the proposed action.	Section 8
	Include a discussion on the consistency of the proposal with principles of ecologically sustainable development of the EPBC Act	Section 8.3

ATTACHMENT 3
RESPONSE TO INDEPENDENT EXPERT SCIENTIFIC COMMITTEE ON COAL SEAM GAS AND LARGE COAL MINING DEVELOPMENT ADVICE

Table A3-1
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
1	The documentation provided to the IESC is insufficient to determine whether the decision maker can have confidence in predicted potential impacts associated with the project.	Australasian Groundwater and Environmental Consultants (AGE) (2024) has prepared the updated *Ashton-Ravensworth Integration Project Groundwater Impact Assessment* (EPBC Groundwater Assessment) that provides additional information regarding the groundwater modelling completed for the Proposed Action and further assessment of potential impacts to groundwater dependent ecosystems (GDEs). Responses to each of the Independent Expert Scientific Committee's (IESC) detailed comments are provided below. The IESC states the following regarding the basis of assessment for the Proposed Action: *The IESC notes that the information in the referral documentation does not discuss impacts associated with a no-action scenario relative to current mining, and much of the assessment documentation is limited to the difference in impacts associated with the mine layout that was approved for the RUM in 1996.* This assertion appears to relate to the Groundwater Review and Modification Report documentation prepared to support the modification to the relevant New South Wales (NSW) Development Consents (noting this documentation is listed in references cited by the IESC). This is the correct basis of comparison for the NSW modification process but not the EPBC Referral. Accordingly, AGE (2022a) prepared the *Ravensworth Underground Mine EPBC Referral – Groundwater Review* which does not rely on a comparison of the predicted impacts of the Proposed Action to the original Ravensworth Underground Mine (RUM) approval. The Proposed Action includes the underground mining of the Pikes Gully and Middle Liddell Seams using longwall mining as shown on Figure 1.1 of the updated EPBC Groundwater Assessment (AGE, 2024). The incremental groundwater drawdown due to mining of these panels is shown on Figures 7.3 to 7.5. In addition to the Proposed Action, the cumulative drawdowns shown on these figures include the following activities that are not part of the Proposed Action (e.g. being undertaken under existing EPBC Approvals or 'Not a Controlled Action' decisions): • previous mining of the Pikes Gully, Upper Liddell and Upper Lower Liddell Seams at the Ashton Underground Mine; • approved future mining of the Lower Barrett Seam at the Ashton Underground Mine; • previous mining of all seams to the Lower Barrett Seam by the Ashton North-East Open Cut; • previous mining of the Pikes Gully Seam at the RUM (i.e. north of the Proposed Action); • previous mining of all seams to the Bayswater Seam at the Ravensworth Open Cut mines; • previous mining of all seams to the Hebden Seam at the Integra Open Cut Mine; • previous and current mining of the Middle Liddell Seam at the Integra Underground Mine; and • previous and current mining of all seams to the Lower Barrett Seam at the Glendell Open Cut Mine.
2	More specific areas requiring clarification or justification with additional data and information are outlined below.	

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
3	It is unclear whether sufficient data from field observations in the project area have been used to determine groundwater flow directions. The groundwater monitoring locations shown in the documentation (Yancoal 2020a, Figure 8, p. 52) were limited to the original AUM, and are insufficient to support model results for the proposed modification that is located to the west of the area of groundwater monitoring. As model calibration was based on groundwater level monitoring from the AUM and a monthly water balance model from metered pumping data at AUM, the IESC considers additional groundwater-level monitoring across the area of proposed RUM mining is necessary to increase confidence in the calibration. Multi-level groundwater monitoring data are required in key strata, including two years of baseline data within and adjacent to the proposed longwalls, especially the western and southern sides.	The updated EPBC Groundwater Assessment (AGE, 2024) provides additional information regarding the monitoring sites used in the groundwater modelling. The groundwater monitoring locations (including RUM sites) are shown on Figure 4.3 of the updated EPBC Groundwater Assessment and summarised in Appendix D of the updated EPBC Groundwater Assessment (AGE, 2024). The groundwater model was calibrated using water level data from these monitoring sites as well as measured groundwater inflow data from the Ashton Underground Mine and RUM. AGE also considered monitoring data at additional groundwater bores to the south and west of the Proposed Action. The additional bores used to verify the calibration of the groundwater model are shown in Table 6.1 and Figure 6.1 of the updated EPBC Groundwater Assessment (AGE, 2024). Groundwater bores NPZ1, RNVW1, RNVW2 and RNVW4 are located just outside of the model domain, but to make use of the data, a location just within the model domain has been adapted, allowing a comparison of observed to modelled water levels to be made. Appendix F of the updated EPBC Groundwater Assessment (AGE, 2024) presents hydrographs that compare simulated and observed groundwater levels at the additional groundwater bores. Despite not having these bores in the calibration dataset, the model replicates the measured water levels to a sufficient level.
4	Additional work, or reporting, required is set out below. a. The sources of hydraulic data (including hydraulic conductivity, specific yield and storativity) were not reported. It is therefore unclear whether the data used were derived from site-specific data and whether hydrogeological layers were adequately represented.	The sources of hydraulic data are now discussed in Section 4.4 of the updated EPBC Groundwater Assessment (AGE, 2024).
	b. Recharge and evapotranspiration rates used in the groundwater model were also not provided. It is unclear whether site-specific data were derived and how changes to recharge rates for backfilled areas such as Narama open-cut mine and from subsidence were incorporated.	Information regarding recharge and evapotranspiration rates used in the groundwater model is now provided in Sections A4.6 and A4.7 of the Groundwater Model Report (Appendix A) of the updated EPBC Groundwater Assessment [AGE, 2024]).

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
4	c. The location of the model boundary has not been justified by the proponent. The IESC is concerned that the boundary limit chosen is inappropriate for exploring impacts associated with the project because the observed maximum drawdown contours extend past the western boundary of the model (AGE 2022a, Figure 5.4 – 5.6, pp. 20 – 22). i. Additionally, the boundary conditions applied to the project have not been described. Further detail regarding the representation of the limit domain, rivers and mined areas is required. ii. The proponent should provide additional figures that display the full extent of drawdown within the model boundary. The limited areas shown in Figures 5.4 – 5.6 (AGE 2022a, pp. 20 – 22) do not display cumulative drawdown observations for the full groundwater model, preventing cumulative impacts from being fully understood.	Additional information regarding the model extent and boundary conditions is now provided in Sections A4.5 of the Groundwater Model Report (Appendix A of the updated EPBC Groundwater Assessment [AGE, 2024]). A no-flow boundary is placed on the western side of the model. It is recognised that this boundary is not a physical boundary as the coal seams and formations within the model boundary continue beyond the boundary, but it has been assigned in the model on the basis that it is perpendicular to the regional groundwater flow and drainage into the Hunter River. When mining is well advanced on both sides of the boundary, depressed heads at depth would be similar and cross-boundary flows would be low. The Hunter Valley Operations (HVO) and Ravensworth Operations mining areas are located to the south and west of the western model boundary. The area of Project-related drawdown that extends to the western boundary of the model aligns with the Ravensworth North Open Cut and HVO North pit. The *HVO Continuation Project - Groundwater Impact Assessment* (AGE, 2022a) indicates that HVO North would extract to the base of the Barrett Seam (which is below the Pikes Gully and Upper Lower Liddell Seams, which are the target seams for the Proposed Action). Accordingly, depressurisation of the Pikes Gully and Upper Lower Liddell seams or overlying coal measures, resulting from the operation of the Proposed Action, would not extend through the HVO North area because of the depressurisation (and extraction) of the coal seam that would occur due to HVO's operations. Therefore, extending the groundwater model boundary further west would not identify any additional impacts of the Proposed Action on sensitive groundwater receptors. Use of a no-flow boundary instead of a head-dependent boundary is considered conservative on the basis that it does not allow for lateral flow of water across the model boundary to 'offset' the predicted drawdowns from the Proposed Action. Due to the extensive mining and related depressurisation that has or will occur west of the model boundary, a no-flow boundary is considered a reasonable representation of post-mining conditions (i.e. there is unlikely to be a significant hydraulic gradient towards the model boundary from the western areas once these areas are depressurised by previous and future mining operations). Dr Noel Merrick considered the model boundary for assessment of the Proposed Action and concludes: *The no-flow boundary condition is a simplification as there is likely to be flow across the boundary, sometimes to the west and sometimes to the east, depending on mining sequences in the various mines. However, the no-flow condition is probably a good assumption, on average, and a preferred assumption at equilibrium.*

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
4	d. Historical and future approved mining operations have been incorporated into the groundwater model to assist in identifying cumulative impacts and to isolate impacts associated with the modification. However, the IESC is not clear which operations have been included and is concerned that the model domain has limited the ability of the groundwater model to adequately assess cumulative impacts from surrounding mining projects (such as Hunter Valley Operations). Further clarification is needed concerning the historical and future approved mining operations considered in the model.	Information regarding the historical and future mining included in the groundwater model is now provided in Section A4.10 of the Groundwater Model Report (Appendix A of the updated EPBC Groundwater Assessment [AGE, 2024]). The following mining operations were included in the cumulative groundwater modelling: • proposed mining of the Pikes Gully and Middle Liddell Seams at RUM; • previous mining of the Pikes Gully, Upper Liddell and Upper Lower Liddell Seams at the Ashton Underground Mine; • approved future mining of the Lower Barrett Seam at the Ashton Underground Mine; • previous mining of all seams to the Lower Barrett Seam by the Ashton North-East Open Cut; • previous mining of the Pikes Gully Seam at the RUM; • previous mining of all seams to the Bayswater Seam at the Ravensworth Open Cut mines; • previous mining of all seams to the Hebden Seam at the Integra Open Cut Mine; • previous and current mining of the Middle Liddell Seam at the Integra Underground Mine; and • previous and current mining of all seams to the Lower Barrett Seam at the Glendell Open Cut Mine.
	e. Faulting does not appear to be investigated or incorporated into the groundwater assessment. However, documentation for the previous Ashton modification identifies fault zones and an igneous dyke within the project area (Yancoal 2020b, Plan No. 6). The risk of geological features influencing the groundwater regime, particularly shallow alluvium, have not been identified and characterised (see Murray and Power, 2021). Commensurate with risk, geological structures may need to be incorporated into the groundwater model and assessed to evaluate potential connectivity with shallow systems.	Additional information regarding faulting observed at the Ashton Underground Mine is now provided in Section 3.8.3 of the updated EPBC Groundwater Assessment (AGE, 2024). Discussion of faulting as it relates to the groundwater model is provided in Section A4.9 of the Groundwater Model Report (Appendix A of the updated EPBC Groundwater Assessment [AGE, 2024]). Faulting that has been observed through mining at the Ashton Underground Mine has not been significant with only minor throws of around 2 to 3 metres (m) at most, and not likely to hydraulically disconnect or impede lateral groundwater movement. To date, monitoring of groundwater levels has not indicated any direct connection between shallow groundwater near receptors and any structure across the Ashton Underground Mine, despite the amount of mining and associated dewatering that has already taken place (AGE, 2024). Historical mining in the area has resulted in the Permian formation being depressurised, reducing the flow of water from the Permian formation to the alluvial sediments relative to pre-mining conditions (in some places the hydraulic gradient has reversed with alluvial sediments becoming a source to the underlying Permian formation). Despite this reduction in water flowing to the alluvial systems, they have maintained their levels through diffuse rainfall recharge and have largely not demonstrated any impacts from the surrounding mining (AGE, 2024).

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
4	f. An independent peer review into the groundwater model was provided by Dr Noel Merrick of HydroAlgorithmics, with feedback primarily concerned with fracture model implementation. As the fracture model was not described within the groundwater assessment, it is unclear to the IESC whether the spatial extent and variability of cracking has been represented appropriately within the groundwater model.	The fracture model and associated calibration process are now discussed in Sections A4.11 and A5 of the Groundwater Model Report (Appendix A of the updated EPBC Groundwater Assessment [AGE, 2024]). Fracture height was also considered in the uncertainty analysis as discussed in Section A7 of the Groundwater Model Report (Appendix A of the updated EPBC Groundwater Assessment. An updated peer review by Dr Noel Merrick of HydroAlgorithmics of the EPBC Groundwater Assessment is provided in Attachment 5 of the Preliminary Documentation main text.
	g. The proponent has not provided a sensitivity analysis or uncertainty analysis for the groundwater model (cf. Middlemis and Peeters 2018). Such analysis should be provided to increase confidence in the groundwater assessment and risk associated with identified potential impacts. The IESC notes that the previous iteration of the model indicated the use of sensitivity analysis, with sensitivity observed to changes in hydraulic conductivity (AGE 2020e, p. 11) resulting in reductions to calibrated recharge values. Such results emphasise the need for clarification on hydraulic conductivity data and the inadequacies associated with the parameters and calibration of the groundwater model described above.	Section 9 of the updated EPBC Groundwater Assessment (AGE, 2024) and Section A7 of the Groundwater Model Report (Appendix A of the updated EPBC Groundwater Assessment) now includes an uncertainty analysis prepared in accordance with the IESC Explanatory Note *Uncertainty analysis—Guidance for groundwater modelling within a risk management framework* (Middlemis & Peeters, 2018). Section A5.2 and Appendix G of the Groundwater Model Report discuss the sensitivity of calibrated parameters in the groundwater model.
5	For the reasons discussed in Paragraph 4, the IESC is concerned that the inadequacies with the groundwater modelling and documentation reduce confidence in the impact assessment. As a result, while the project will likely contribute to cumulative impacts to groundwater resources in the region through further depressurisation of the Permian coal seams and the alluvium, the extent of these impacts on GDEs cannot be adequately assessed based on the current documentation.	As discussed in the above responses, the updated EPBC Groundwater Assessment (AGE, 2024) has provided additional information to address the IESC's concerns. The additional information and modelling supports the original findings of the EPBC Groundwater Assessment, as follows (AGE, 2022b): *Based on the modelling completed and evidence available, the Action is not expected to materially affect the availability and quality of water for any non-mining related purpose or third-party users, including environmental and other public benefit outcomes.* *In consideration of the impacts that are already occurring and are approved to occur at mining operations surrounding the RUM and the approved future mining, the proposed Action is not likely to have a significant impact on a water resource.*

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
6	Updates to the proponent's groundwater model are required to accurately predict project-alone and cumulative impacts to GDEs from alluvial drawdown. The IESC does not have confidence in the current impact predictions which may be underestimated. Further, no GDE assessment has been provided besides noting the locations of river red gum (Eucalyptus camaldulensis) stands. However, given the thickness and extent of the Bowmans Creek alluvium, and a depth to groundwater of approximately 7 m, riparian vegetation (e.g., Casuarina glauca, Eucalyptus tereticornis) along this watercourse may access groundwater (including facultatively). Field verification is needed of groundwater use by these potential GDEs and, if dependence is demonstrated, baseline data on ecological condition and composition of the GDEs should be collected. Alluvial groundwater is also likely to sustain flows or pools during dry periods, providing aquatic connectivity and refugia. The IESC considers that cumulative impacts to GDEs (e.g., reduced riparian vegetation health, aquatic connectivity and pool permanency) are possible and may contribute to habitat fragmentation of the region's vegetation matrix. These GDEs occur in a stressed landscape where even small incremental impacts could move regimes closer towards or over ecological tipping points.	Bowmans Creek is approximately 60 kilometres (km) in length and flows from the north into the Hunter River just south of the Study Area. From its source in the foothills of the Mount Royal Range, the first approximately 10 km is designated non-perennial with the remainder being perennial. A small non-perennial creek approximately 16 km long (Bettys Creek) joins Bowmans Creek immediately to the north-east of the Study Area. Thus, the section of Bowmans Creek that flows past the Study Area is fed by nearly 50 km of perennial stream (Hunter Eco, 2023). The combined catchment of Bowmans Creek and Bettys Creek is over 20,000 hectares (ha). The Action Area catchment feeding into Bowmans Creek to the east is approximately 180 ha, or 0.9 percent of the total Bowmans Creek catchment (Hunter Eco, 2023). A stream water level and flow rate monitoring station (Site 210130) is located on Bowmans Creek approximately mid-way between the New England Highway and the Hunter River. Daily water level data from 27 October 1993 to 11 January 2023 indicates that there are approximately equal numbers of flow days as no-flow days during this period. AGE (2024) describes that the Bowmans Creek Alluvium is typically between 7 to 15 m thick in the vicinity of the Proposed Action. The depth to water through the Bowmans Creek alluvium is variable, but is in the range of 4 to 10 m directly east of the Proposed Action (representing a saturated thickness of up 10 m in the deepest parts of the alluvium). A survey of the vegetation along the section of Bowmans Creek south of the existing diversion was conducted on 24 January 2023. The creek upstream from this point has been highly modified with eastern and western diversion channels constructed to relocate those parts of the original creek away from Ashton Underground Mine subsidence impacts. Bowmans Creek is incised to a depth of approximately 5 m in relation to the surrounding land and over 50 m wide between the tops of the bank. The trees along the creek follow a typical riparian gallery pattern generally confined to a creek bed level and steep sides. The canopy was dominated by River Oak (*Casuarina cunninghamiana*) on both sides of the creek, along with an approximately 200 m patch of 19 River Red Gums (*Eucalyptus camaldulensis*) again on both sides; there were also four scattered River Red Gums downstream to the Hunter River. The patch of River Red Gums contained a mix of ages from small saplings, through to large and very old trees up to over 1 m diameter at breast height. Overall, these trees were in healthy condition with no evidence of dieback; similarly for the River Oak. At the water edge there were patches of native Common Reed (*Phragmites australis*).

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
6		The gallery forest structure along Bowmans Creek is indicative of an aquatic GDE with vegetation primarily dependent on creek flow. As above, stream-flow through the section of Bowmans Creek below the inflow point from the Study Area is almost entirely from the 20,000 ha catchment (Hunter Eco, 2023). AGE (2024) has assessed potential impacts of the Proposed Action on Bowmans Creek using a numerical groundwater model. In summary (AGE, 2024): • historical mining has not impacted water levels in the alluvium; • the Proposed Action would result in less than 0.2 m of drawdown in the Bowmans Creek alluvium; and • reduction in baseflow to Bowmans Creek due to the Proposed Action is predicted to be negligible. These findings are supported by the absence of dieback and ongoing succession in the community despite previous mining in the area, including mining of the Ashton Underground Mine longwalls immediately to the east of Bowmans Creek (Hunter Eco, 2023). The existing Ashton Water Management Plan and Biodiversity Management Plan include the following monitoring and management measures relevant to the identified potential GDEs: • extensive surface water and groundwater monitoring programs (Tables 2 and 3); • groundwater and surface water trigger levels (including groundwater level triggers that relate to baseflow); • annual riparian vegetation monitoring (including of potential GDEs on Bowmans Creek); • bi-annual (spring and autumn) aquatic ecology monitoring; and • trigger action response plans in the event that triggers or performance indicators are exceeded.
7	Additional drawdown in the Bowmans Creek alluvium may have impacts on interstitial fauna and ecological processes in its hyporheic and parafluvial zones where surface water and groundwater exchange, influencing rates of microbial activity, organic matter decomposition and nutrient transformation within the saturated sediments. The Hunter River tributaries have an active hyporheic zone with a diverse invertebrate fauna that responds to altered surface water-groundwater exchange (Hancock 2006). Stygofauna are also present in the alluvium of the Hunter River and its tributaries (Hancock and Boulton 2009) and, as an obligate GDE, they are likely to be affected by groundwater drawdown. Therefore, in addition to groundwater model updates, the proponent should characterise these subterranean GDEs (methods in Doody et al. 2019) and, where possible, quantify project-specific and cumulative impacts.	An *Aquatic Ecology and Groundwater Dependent Ecosystem Assessment* was prepared by EcoLogical Australia (2022) for the HVO Continuation Project, located to the west of the Proposed Action. Numerous stygofauna surveys have been undertaken in the Hunter River alluvium and surrounds since 2000. Stygofauna are known to occur in the alluvium of the Hunter River and Bowmans Creek. The taxa collected to date are known from other parts of the Hunter Valley, although there are potentially other stygofauna taxa in the aquifers that have not been sampled (EcoLogical Australia, 2022). The Proposed Action would result in less than 0.2 m of drawdown in Bowmans Creek alluvium and would result in no measurable drawdown in the Hunter River alluvium (AGE, 2024). Therefore, potential impacts to any stygofauna populations present in the Hunter River and Bowmans Creek alluvium would be negligible. Given the very low drawdown predicted in the alluvium, it is not considered to be warranted to undertake a further assessment of stygofauna or introduce monitoring and management strategies specifically for stygofauna.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
8	If groundwater drawdown is more severe than predicted, impacts on baseflow and associated ecologically important low-flow components in Bowmans Creek may be more significant than currently assumed. The proponent should re-evaluate the effects of drawdown on the flow regime of Bowmans Creek once the concerns around the groundwater modelling have been addressed (Paragraph 4).	The Proposed Action would result in less than 0.2 m of drawdown in Bowmans Creek alluvium and would result in no measurable drawdown in the Hunter River alluvium (AGE, 2024). Therefore the Proposed Action would have a negligible impact on potential GDEs. Potential impacts on baseflow in the Hunter River and Bowmans Creek would also be negligible (AGE, 2024). As discussed above, Section 9 of the updated *EPBC Groundwater Assessment* (AGE, 2024) now includes an uncertainty analysis prepared in accordance with the IESC Explanatory Note *Uncertainty analysis—Guidance for groundwater modelling within a risk management framework* (Middlemis & Peeters, 2018). The uncertainty analysis evaluates the range and likelihood of potential impacts of the Proposed Action on the Hunter River, Bowmans Creek and Glennies Creek baseflow and alluvium. Ashton Coal Operations Pty Ltd (ACOL) operates the existing Ashton Underground Mine in accordance with an approved Water Management Plan prepared under Condition 26, Schedule 3 of Development Consent DA No. 309-11-2001-i. The existing Ashton Water Management Plan would be reviewed and updated to incorporate the Proposed Action. The existing Ashton Water Management Plan (Appendix F) includes: • groundwater monitoring at several locations in the Bowmans Creek and Hunter River alluvium; • groundwater level and quality trigger levels; and • a surface water and groundwater response plan that is implemented if a trigger level is exceeded.
9	The IESC considers the subsidence review to be fit-for-purpose and agrees with the recommendations for additional assessments of geotechnical stability of the storages and fly ash emplacement in the Void 5 dam. However, there is some additional information or work that is required.	Noted. Responses to each of the IESCs detailed comments are provided below.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
9	a. Altered hydrology resulting from cracking and surface deformation (e.g., on backfill), particularly associated with multi-seam mining effects, may contribute to ponding, reduced flow and increased erosion and sedimentation in local watercourses. Potential impacts associated with the substantial cracking and surface deformation expected above the mining area should be evaluated.	The majority of the Action Area has been disturbed by mining operations and surface water flows within the Action Area primarily drain towards the existing mine water management system for the Ravensworth Mine. Surface water flows over the area of remnant (or regrowth) vegetation in the south-east of the Action Area flow southwards into the Narama Dam (a mine water dam that is part of the Ravensworth Mine water management system) or dams established to manage runoff from existing rehabilitation areas. The findings of the Subsidence Review (SCT Operations Pty Ltd [SCT], 2021) indicates that subsidence impacts would be consistent with the findings of earlier subsidence assessments for the mining layout approved under NSW Development Consent DA 104/96. SCT (2021) also conclude that the Proposed Action would comply with the existing subsidence performance measures in NSW Development Consent DA 104/96. SCT (2021) recommend that the potential subsidence impacts of the Proposed Action are managed in accordance with the existing Statement of Commitments in NSW Development Consent DA 104/96, which details subsidence management processes, risks, geotechnical and subsidence assessments as well as surveying and visual inspections for subsidence monitoring. The Statement of Commitments includes the following requirement: *In the event that any slumping, cracking, formation of depressions and/or ponding is identified, appropriate remedial action will be undertaken.* Condition 6, Schedule 3 of NSW Development Consent DA 104/96 requires preparation of an Extraction Plan, which must be approved by the NSW Department of Planning, Housing and Infrastructure (DPHI) prior to secondary extraction. The Extraction Plan is required to include a Subsidence Monitoring Program and a Water Management Plan, including surface and groundwater impact assessment criteria and trigger levels for investigating any potentially adverse impacts on water resources or water quality.
	b. Information should be provided on the potential impacts of subsidence on ecologically important flow components (e.g., the number of zero-flow days and the frequency and duration of low-flow spells) in Bowmans Creek.	Potential subsidence impacts of the Proposed Action are not expected to affect flow in Bowmans Creek (particularly during low flow periods) as the majority of the Action Area drains into the existing mine water management system for the Ravensworth Operations Project or dams established to manage runoff from existing rehabilitation areas. Notwithstanding, the existing Ashton Water Management Plan and Biodiversity Management Plan includes a range of monitoring and management measures for Bowmans Creek, including surface water monitoring, groundwater monitoring (including monitoring representative of baseflow), riparian vegetation monitoring, bi-annual (spring and autumn) aquatic ecology monitoring and trigger action response plans in the event that impacts on Bowmans Creek and associated biodiversity values are identified.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
9	c. To characterise the movement of water at the site post-subsidence, the proponent should provide a hydraulic/flood assessment relevant to the project. Potential changes to flood behaviour due to subsidence and ponding should also be considered.	A Subsidence Review of the proposed longwall extraction was prepared by SCT (2021). The Subsidence Review indicates that subsidence impacts of the Proposed Action would be consistent with the findings of earlier subsidence assessments for the mining layout approved under NSW Development Consent DA 104/96. The Proposed Action would comply with the existing subsidence performance measures in NSW Development Consent DA 104/96 (SCT, 2021). Hunter Eco (2023) compared the pre-subsidence digital elevation model (DEM) and post-subsidence DEM and found that flow patterns would remain very similar post-mining, with flow exiting the area and entering Bowmans Creek at the same points as for pre-mining. As described above, the Statement of Commitments in NSW Development Consent DA 104/96 includes the following requirement: *In the event that any slumping, cracking, formation of depressions and/or ponding is identified, appropriate remedial action will be undertaken.* Accordingly, the Proposed Action would not materially affect the movement of water at the site post-subsidence.
	d. Potential subsidence impacts on the Narama Dam, Inpit Storage Dam and Void 5 Ash Dam, including fracturing and cracking of the base or dam wall, requires further consideration, particularly the risks of downstream impacts to surface and groundwater from potential failure. The proponent should collect data on the quality of water and sediment in storage dams, evaluate the potential aquatic environmental impacts of contaminants in seepage and/or spills and assess the environmental consequences of fly ash contamination.	SCT (2021) recommend that the potential subsidence impacts of the Proposed Action are managed in accordance with the existing Statement of Commitments in NSW Development Consent DA 104/96, which details subsidence management processes, risk, geotechnical and subsidence assessments as well as surveying and visual inspections for subsidence monitoring. The three dams identified by the IESC (Narama Dam, Ravensworth Void 5 Ash Dam and Ravensworth Mine Inpit Storage) are 'declared dams' that are operated and maintained under the *Dams Safety Act 2015*. ACOL would provide notification to Dams Safety NSW prior to longwall mining within the notification areas for the declared dams and would provide ongoing monitoring and management of these dams in accordance with the requirements of the *Dams Safety Act 2015*. A monitoring program and remediation protocols (where required) would be described in the Built Features Management Plan (BFMP), including daily visual inspections of the Narama Dam wall and Void 5 Ash Dam when mining is directly below the dam, and at a reduced frequency when mining is outside of the footprint of the dam. As recommended by SCT, a geotechnical stability assessment and detailed review of low-level subsidence movement effects on the Narama Dam wall and Void 5 Ash Dam wall would be undertaken to inform the BFMPs. Consistent with the conditions of NSW Development Consent DA 104/96, agreement from the dam owner, consent from Dams Safety NSW and approval of the BFMP by the NSW Planning Secretary will be required prior to longwall mining in proximity to these dams. Further, ACOL would be required to meet the Performance Measures listed of NSW Development Consent DA 104/96 (refer Attachment 4) under the Extraction Plan and BFMPs. Consequently, the risk of dam failure and subsequent downstream impacts due to the Proposed Action is considered very low.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
9	e. The subsidence review acknowledges the potential for spontaneous combustion to occur throughout mining operations due to the interaction of subsidence-based cracking with combustible backfill above the mining area (SCT 2021, p. 22). The proponent should provide information on the potential aquatic environmental impacts of contaminants that may be produced or mobilised by spontaneous combustion.	Spontaneous combustion is a critical hazard for underground coal mines as it has the potential to ignite coal seam gas within the mining environment. ACOL manages the risk of spontaneous combustion in accordance with its Principal Hazard Management Plan for Spontaneous Combustion. Management of spontaneous combustion is based on four key principles: prevention, detection, control and incident management. To address the potential for spontaneous combustion impacts, the existing Principal Hazard Management Plan for Spontaneous Combustion including the Trigger Action Response Plan (TARP) would be updated prior to commencement of the Proposed Action area. This would include consideration of the following monitoring and management measures: • visual inspections when mining beneath or in close proximity to the existing waste rock emplacement overlying the longwall panels; • use of thermal imaging monitoring to identify any hot spots, as appropriate; • surface water management controls to be implemented in case of a spontaneous combustion incident (in accordance with TARPs); • land remediation measures (e.g. backfill and grading of area) to manage any potential heating event; and • clear definition of roles, responsibilities, notifications and training.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
10	Given the proximity of other coal-mining projects, the IESC notes that most impacts from the project on groundwater resources and other water-dependent assets are likely to be cumulative. Cumulative impacts on hydrological regimes, water quality, GDEs, aquatic biota and EPBC Act-listed species have not been adequately described to enable a detailed assessment of potential impacts. An ecohydrological conceptual model should be developed to help identify potential impact pathways and quantify the likely local and cumulative extents of the project's impacts on water resources and water-dependent assets.	Information regarding the historical and future mining included in the groundwater model is now provided in Section A4.10 of the Groundwater Model Report (Appendix A of the updated EPBC Groundwater Assessment [AGE, 2024]). The following mines have been included in the cumulative assessment: • previous mining of the Pikes Gully, Upper Liddell and Upper Lower Liddell Seams at the Ashton Underground Mine; • approved future mining of the Lower Barrett Seam at the Ashton Underground Mine; • previous mining of all seams to the Lower Barrett Seam by the Ashton North-East Open Cut; • previous mining of the Pikes Gully Seam at the RUM; • previous mining of all seams to the Bayswater Seam at the Ravensworth Open Cut mines; • previous mining of all seams to the Hebden Seam at the Integra Open Cut Mine; • previous and current mining of the Middle Liddell Seam at the Integra Underground Mine; and • previous and current mining of all seams to the Lower Barrett Seam at the Glendell Open Cut Mine. The Pikes Gully and Upper Lower Liddell Seams (which are the target seams for the Proposed Action) subcrop in the Ashton Mine lease area, immediately east of the Proposed Action. This prevents drawdown from the Proposed Action propagating east and contributing to cumulative impacts. Previous and future mining areas associated with Ravensworth Operations and HVO North are located west of the Proposed Action. Accordingly, depressurisation of the Pikes Gully and Upper Lower Liddell seams or overlying coal measures, resulting from operation of the Proposed Action, would not extend west through these mined areas. The ecohydrological conceptual model is shown on Figure 5.1 of the updated EPBC Groundwater Assessment (AGE, 2024). The Proposed Action would result in less than 0.2 m of drawdown in Bowmans Creek alluvium and would result in no measurable drawdown in the Hunter River alluvium and would therefore have a negligible contribution to cumulative impacts (AGE, 2024). The *HVO Continuation Project - Groundwater Impact Assessment* (AGE, 2022a) presents predicted groundwater drawdowns for the HVO Continuation Project (including HVO North and HVO South). Predicted groundwater drawdowns in the Hunter River alluvium due to the operation of the HVO Continuation Project do not coincide with the areas of predicted drawdown due to the Proposed Action.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
11	Although the proponent does not propose to have any controlled water releases, the IESC notes that water from the RUM will be piped back to the Ashton water management infrastructure. Uncontrolled releases may occur from the Ashton Process Water Dam into Bettys Creek (Yancoal 2020a p. 15), especially under climate and operational conditions that may differ from the past ten years. The proponent should consider the potential environmental impacts on aquatic biota and riparian vegetation of any spills. This is especially relevant given that the process water is untreated and its water quality is not monitored or reported.	The Proposed Action does not include (emphasis added): *existing or proposed activities at the Ashton Coal Project, including the receipt, handling and processing of RUM coal at the Ashton Coal Handling and Processing Plant and* ***receipt of water and gas transferred from the RUM and its management at the Ashton Coal Project*** Accordingly, any potential uncontrolled releases from the Ashton Coal Project are not relevant to the Proposed Action. Notwithstanding, a site water balance was undertaken by HEC (2021) to evaluate the effects of the ACOL-operated portion of the RUM (i.e. the Proposed Action) on the Ashton Underground Mine water management system. HEC (2021) concluded that the ACOL-operated portion of the RUM would not result in any significant changes in forecast external raw water requirements or overflow risk from site storages.
12	Until the limitations of the groundwater assessment and provided documentation (as discussed in the response to Question 1) are addressed so that the project's potential individual and cumulative impacts are clearer, the IESC considers that the proponent cannot reliably identify the most effective strategies to avoid, mitigate or reduce their likelihood, extent and significance. Assuming these limitations have been addressed and the relevant impacts have been identified, the following paragraphs suggest mitigation, monitoring and/or management measures, along with several refinements to proposed management plans and TARPs that would enhance timely responses and their effectiveness.	Responses to each of the IESC's detailed comments regarding the groundwater assessment and associated documentation are provided above. Responses to each of the IESC's recommended mitigation, monitoring and management measures are provided below.
13	To ensure that predicted impacts are appropriately considered, the updated water management plan must align with impacts associated with the proposed modification. Trigger levels for groundwater drawdown should consider the additional drawdown anticipated for the modification.	ACOL are required to prepare an Extraction Plan, which must be approved by NSW DPHI prior to secondary extraction. The Extraction Plan is required to include a Water Management Plan, including groundwater impact assessment criteria and trigger levels for investigating any potentially adverse impacts on water resources or water quality. Trigger levels for groundwater drawdown would be developed as part of the Extraction Plan and will reflect the drawdown predicted for the Proposed Action.
14	The groundwater level and quality monitoring bores associated with RUM are not shown in the documentation. It is therefore unclear to the IESC whether there is sufficient monitoring within the modification area, which is essential for ensuring that effective management strategies are in place. It is also not clear whether current monitoring at RUM occurs at a sufficient frequency or includes a complete suite of analytes.	Groundwater level and monitoring bores are now shown on Figure 4.3 of the updated EPBC Groundwater Assessment (AGE, 2024). The Ashton Water Management Plan (ACOL, 2020a) would be reviewed and updated to incorporate the Proposed Action. This would include revising the Water Management Plan to incorporate groundwater management for the Proposed Action, which ACOL would take responsibility over.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
15	The proponent has included an assessment of cumulative drawdown impacts, but clarification is needed that all cumulative impacts have been considered. The cumulative assessment should include a discussion of all impacts to water resources due to drawdown, including GDEs, riparian vegetation and surface waters.	Refer to response to IESC Comments 7 and 10.
16	It is not possible to comment on the efficacy of any mitigation strategies on surface water resources as no information has been provided on the impacts of subsidence on ecologically important flow components (e.g., the number of zero-flow days and the frequency and duration of low-flow spells) in Bowmans Creek.	Refer to response to IESC Comments 9a, 9b and 9c.
17	The proponent has provided TARPs for several environmental values including water quality, aquatic biota, terrestrial GDEs and threatened fauna. These TARPs were developed for the existing Ashton mine operations. The IESC is satisfied that the monitoring regimes associated with these TARPs are generally adequate for capturing potential impacts from the project, but that further detail should be provided in the response plans, particularly if metals are only monitored annually and response times rely on consecutive exceedances. Example mitigation strategies were included in some, but not all, response measures. The proponent should develop example mitigation strategies for all plausible and material impacts, including specific strategies for remediating riparian vegetation dieback in the event of cumulative alluvial drawdown. The proponent should also compare stream health data with groundwater level and water quality data to allow for a more complete analysis of potential impact pathways. As riparian vegetation along Bowmans Creek has major connectivity value, it is unlikely that offsetting could meaningfully compensate for the loss of this habitat.	ACOL operates the existing Ashton Underground Mine in accordance with an approved Water Management Plan prepared under Condition 26, Schedule 3 of Development Consent DA No. 309-11-2001-i and an approved Biodiversity Management Plan prepared under Condition 28, Schedule 3 of Development Consent DA No. 309-11-2001-i. The existing Ashton Water management Plan and Biodiversity Management Plan would be reviewed and updated to incorporate the Proposed Action. This would include a comprehensive review of the TARPs. The Water Management Plan is required to be updated in consultation with the NSW Resources Regulator, Singleton Council and NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW) Water. The Biodiversity Management Plan is required to be updated in consultation with NSW Biodiversity Conservation Division and Singleton Shire Council. Both plans must be submitted to the NSW DPHI following consultation with the relevant agencies. In addition to the above, Condition 6, Schedule 3 of NSW Development Consent DA 104/96 requires preparation of an Extraction Plan, which must be approved by the NSW DPHI prior to secondary extraction. The Extraction Plan is required to include a Subsidence Monitoring Program and a Water Management Plan, including surface and groundwater impact assessment criteria and trigger levels for investigating any potentially adverse impacts on water resources or water quality.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
18	The IESC agrees (GSS 2012, pp. v and 54, citing SCT 2012; SCT 2021 p. 23) that the significance of impacts of subsidence on fly-ash and tailings dams should be evaluated, and if necessary, pore pressure monitored as part of an assessment of geotechnical stability. One option may be to substantially dewater the tailings dam to mitigate the potential impacts of subsidence (SCT 2021 p. 52).	The Ravensworth Void 5 Ash Dam is a 'declared dam' that is operated and maintained under the Dams Safety Act 2015. There would be no changes proposed to this declared dam as a result of the Proposed Action. ACOL would provide notification to Dams Safety NSW prior to longwall mining within the notification area and would provide ongoing monitoring and management of the water storage in accordance with the requirements of the *Dams Safety Act 2015*. In accordance with Condition 3, Schedule 3 of Development Consent DA 104/96, ACOL must ensure mining does not cause any exceedance of the built features performance measure for dams *"Always safe"* and *"Damage must be fully repaired or replaced, or else fully compensated"*. The Void 5 Ash Dam wall was designed and constructed to withstand subsidence from the RUM, which was approved and in operation prior to construction of the dam wall. Subsequently, part of Void 5 Ash Dam was undermined during the previously completed Pikes Gully coal seam in the RUM (i.e. immediately to the north of the Proposed Action). The Proposed Action is not expected to cause any significant ground movements at the dam wall and no significant impacts to the dam wall. SCT (2021) concluded that impacts are expected to be manageable with appropriate mitigation and/or remediation, where required. Notwithstanding, as recommended by SCT, a geotechnical stability assessment and detailed review of subsidence movement effects on the Void 5 Ash Dam wall will be undertaken to inform the BFMP. As described in the response to IESC 9.a, agreement from the dam owner, consent from Dams Safety NSW and approval of the BFMP by the NSW Planning Secretary will be required prior to longwall mining in proximity to the Void 5 Ash Dam. Further, ACOL would be required to meet the Performance Measures listed in Tables 4 and 5 under the Extraction Plan and BFMP. Consequently, the risk of dam failure and subsequent downstream impacts due to the Proposed Action is considered very low. A monitoring program and remediation protocols (where required) would be described in the BFMP, including daily visual inspections of the dam when mining is directly below the dam, and at a reduced frequency when mining is outside of the footprint of the dam.

Table A3-1 (Continued)
Response to Independent Scientific Committee on Coal Seam Gas and Large Coal Mining Development Advice

ID	IESC Comments	Response
19	The proponent has indicated that subsidence management at the site will be undertaken in accordance with the existing 2013 RUM Subsidence Management Plan (SMP) for DA 104/96 Mod 9 (Yancoal 2022d p. 17 and 27) and has committed to incorporate any necessary revisions (Yancoal 2022 p. 34). As this document has not been provided, the IESC is unable to comment on its adequacy but notes that the revision should specifically address impacts associated with the project, as detailed in Paragraph 5. The ACP subsidence TARP has also been adopted for the site (Yancoal 2022h p. 1). Triggers in this TARP are largely reactive to impacts already observed well beyond predicted values, and the IESC suggests that the proponent adopts a site-specific TARP with an appropriate early-warning management system to ensure impacts are managed before potentially adverse effects are realised.	Condition 6, Schedule 3 of NSW Development Consent DA 104/96 requires preparation of an Extraction Plan which must be approved by the NSW DPHI prior to secondary extraction. The Extraction Plan is required to include a Subsidence Monitoring Program and a Water Management Plan, including surface and groundwater impact assessment criteria and trigger levels for investigating any potentially adverse impacts on water resources or water quality. The Subsidence Monitoring Program must be prepared in consultation with the NSW Resources Regulator and the Water Management Plan must be prepared in consultation with NSW DCCEEW Water. The Extraction Plan will be progressively updated in advance of secondary extraction and will include specific monitoring programs and TARPs for defined sets of longwall panels.

ATTACHMENT 4
CONDITIONS OF DEVELOPMENT CONSENT 104/96 RELEVANT TO THE PROPOSED ACTION

Table A4-1
NSW Development Consent Conditions Relevant to the Proposed Action

<table>
<tr><th>Schedule</th><th>Development Consent 104/96 Condition</th><th>Relevance to the Proposed Action</th></tr>
<tr><td>Sch. 2</td><td>TERMS OF APPROVAL
2. The Applicant must carry out the development generally in accordance with the:
(a) EAs;
(b) EA (Mod 9), Modification Report (MOD 10) and the Development Layout Plans in Appendix 2;
(c) statement of commitments; and
(d) conditions of this consent.
Notes:
• The general layout of the development is shown in Appendix 2.
• The statement of commitments is reproduced in Appendix 3.
• The EAs are listed in Appendix 4.</td><td>The conditions of consent and various environmental assessment documents place constraints on the development, and also outline management, mitigation and monitoring requirements and commitments relevant to MNES.</td></tr>
<tr><td>Sch. 2</td><td>LIMITS ON APPROVAL
5. Mining operations under this approval may take place on the site until 31 July 2024 except for mining operations undertaken generally in accordance with Modification Report (MOD 10) which may take place until 31 December 2032.</td><td>Constrains the mining operations period consistent with that proposed by the Action.</td></tr>
<tr><td>Sch. 3</td><td>Performance Measures – Natural and Heritage Features
1. The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 1, to the satisfaction of the Planning Secretary.
Table 1: Subsidence Impact Performance Measures
<table>
<tr><td colspan="2">Watercourses</td></tr>
<tr><td>Bowmans Creek and Bayswater Creek</td><td>No greater subsidence impact or environmental consequences than predicted in the EAs</td></tr>
<tr><td>Bowmans Creek and Bayswater Creek alluvium</td><td>No greater subsidence impact or environmental consequences than predicted in the EAs</td></tr>
<tr><td>Hunter River and its alluvium</td><td>Negligible environmental consequences</td></tr>
<tr><td colspan="2">Biodiversity</td></tr>
<tr><td>Threatened species, threatened populations, or endangered ecological communities</td><td>Negligible environmental consequences</td></tr>
<tr><td colspan="2">Heritage</td></tr>
<tr><td>Aboriginal heritage sites</td><td>No greater subsidence impact or environmental consequences than approved under a permit issued under section 90 of the National Parks and Wildlife Act 1974</td></tr>
</table>
Notes
• The Applicant will be required to define more detailed performance indicators for each of these performance measures in the various management plans that are required under this consent (see condition 6 below).
• The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of approval of modification 9.
• Any breach of this condition is taken to be breach of this consent, and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation, notwithstanding that offsets may be agreed or implemented under condition 2 below.</td><td>Establishes environmental outcomes to be achieved for watercourses and biodiversity, which are relevant to protecting MNES.</td></tr>
</table>

Table A4-1 (Continued)
NSW Development Consent Conditions Relevant to the Proposed Action

Schedule	Development Consent 104/96 Condition	Relevance to the Proposed Action
Sch. 3	2. If the Applicant exceeds the performance measures in Table 1 and the Planning Secretary determines that: (a) it is not reasonable or feasible to remediate the impact or environmental consequence; or (b) remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence; then the Applicant must provide a suitable offset to compensate for the impact or environmental consequence, to the satisfaction of the Planning Secretary. Note: Any offset required under this condition must be proportionate with the significance of the impact or environmental consequence.	Requires ACOL to provide a suitable offset where the Performance Measures cannot be achieved and it is not reasonable and feasible to remediate the impact or environmental consequence, or remediation cannot be undertaken satisfactorily.
Sch. 3	**Extraction Plan** 6. The Applicant must prepare and implement an Extraction Plan for any second workings on site, to the satisfaction of the Planning Secretary. The plan must: (a) be prepared by suitably qualified and experienced persons whose appointment has been endorsed by the Planning Secretary; (b) be approved by the Planning Secretary before the Applicant carries out any of the second workings covered by the plan; (c) include detailed plans of existing and proposed first and second workings and any associated surface development; (d) include detailed performance indicators for each of the performance measures in Tables 1 and 2; (e) provide revised predictions of the conventional and non-conventional subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since the approval of modification 9; (f) describe the measures that would be implemented to: • ensure compliance with the performance measures in Tables 1 and 2; and • manage or remediate subsidence impacts and/or environmental consequences; (g) include a contingency plan that expressly provides for adaptive management where monitoring indicates that there has been an exceedance of any performance measure in Tables 1 and 2, or where any such exceedance appears likely; (h) include the following in consultation with the Resources Regulator: • a Subsidence Monitoring Program to: o provide data to assist with the management of the risks associated with subsidence; o validate the subsidence predictions; o analyse the relationship between the predicted and resulting subsidence effects and predicted and resulting impacts under the plan and any ensuing environmental consequences; and o inform the contingency plan and adaptive management process; • a Coal Resource Recovery Plan that demonstrates effective recovery of the available resource; • a Built Features Management Plan, which has been prepared in consultation with Dams Safety NSW, TfNSW and the owners of potentially affected features, which: o includes measures to manage the potential impacts and consequences of subsidence on any built features; and o includes provisions for reviewing the final terminating position of longwalls close to the New England Highway in response to subsidence monitoring; • a Public Safety Management Plan to ensure public safety in the mining area; and • appropriate revisions to the Rehabilitation Management Plan required under the project approval for the Ravensworth Operations Project (MP 09_0176);	Requires the preparation of key environmental management plans to ensure compliance with the abovementioned Performance Measures, and manage or remediate subsidence impacts and/or environmental consequences, if they were to occur.

Table A4-1 (Continued)
NSW Development Consent Conditions Relevant to the Proposed Action

Schedule	Development Consent 104/96 Condition	Relevance to the Proposed Action
Cont.	(i) include a: • Water Management Plan, which has been prepared in consultation with DPE Water, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on surface water resources, groundwater resources and flooding, and which includes: o surface and groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on water resources or water quality; o a program to monitor and report groundwater inflows to underground workings; and o a program to predict, manage and monitor impacts on any groundwater bores on privately-owned land; • Biodiversity Management Plan, which has been prepared in consultation with BCD and the Resources Regulator, which: o includes a program of works to ensure that overall terrestrial and aquatic biodiversity values are the same or better than existed in the locality prior to longwall mining; o provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on aquatic and terrestrial flora and fauna; • Land Management Plan, which has been prepared in consultation with any affected public authorities, to manage the potential impacts and/or environmental consequences of the proposed second workings on land in general; • Heritage Management Plan, which has been prepared in consultation with Heritage NSW and relevant Aboriginal stakeholders, which includes a program/procedures for: o minimising disturbance to Aboriginal sites as far as is reasonable and feasible, particularly in relation to the RUM-OS1 site; o salvage, excavation and/or management of Aboriginal sites and potential archaeological deposits within the project disturbance area, including the RUM-OS1 site; o protection and monitoring of Aboriginal sites outside the project disturbance area, including provisions to protect the undisturbed portion of the RUM-OS1 site from activities associated with the development; o managing the discovery of any new Aboriginal objects or skeletal remains during the development; and o ongoing consultation and involvement of the Aboriginal communities in the conservation and management of Aboriginal cultural heritage on the site; and (j) include a program to collect sufficient baseline data for future Extraction Plans. Note: An SMP approved by the Resources Regulator prior to 1 January 2014 is taken to satisfy all requirements of this condition, even if it is subsequently modified and approved prior to the carrying out of the approved second workings.	

Table A4-1 (Continued)
NSW Development Consent Conditions Relevant to the Proposed Action

Schedule	Development Consent 104/96 Condition	Relevance to the Proposed Action
Sch. 3	**Water Management Plan** 23. The Applicant must prepare and implement a Water Management Plan for the development to the satisfaction of the Planning Secretary. This plan must be prepared in consultation with DPE Water, and be submitted to the Planning Secretary for approval by the end of October 2013. The plan must include: (a) a Site Water Balance, which must: • include details of: o sources and security of water supply; o water use on site; o water management on site; o any off-site water transfers; and • investigate and implement all reasonable and feasible measures to minimise water use by the development; (b) an Erosion and Sediment Control Plan, which must: • identify activities that could cause soil erosion, generate sediment or affect flooding; • describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters, and manage flood risk; • describe the location, function, and capacity of erosion and sediment control structures and flood management structures; and • describe what measures would be implemented to maintain the structures over time; (c) a Surface Water Management Plan, which must include: • detailed baseline data on surface water flows and quality in creeks and other waterbodies that could potentially be affected by the development; • surface water and stream health impact assessment criteria including trigger levels for investigating any potentially adverse surface water impacts; • a program to monitor and assess: o surface water flows and quality; o impacts on water users; o stream health; and o channel stability; (d) a Groundwater Management Plan, which must include: • detailed baseline data of groundwater levels, yield and quality in the region, and privately owned groundwater bores, that could be affected by the development; • groundwater impact assessment criteria including trigger levels for investigating any potentially adverse groundwater impacts; • a program to monitor and assess: o groundwater inflows to the mining operations; o impacts on regional aquifers; o impacts on the groundwater supply of potentially affected landowners; o impacts on the Hunter River, Bayswater Creek and Bowmans Creek alluvial aquifers; and o impacts on any groundwater dependent ecosystems and riparian vegetation;	Requires the preparation of a Water Management Plan to monitor and manage potential impacts to water resources.

Table A4-1 (Continued)
NSW Development Consent Conditions Relevant to the Proposed Action

Schedule	Development Consent 104/96 Condition	Relevance to the Proposed Action
Cont.	(e) a Surface and Ground Water Response Plan, which must include: • a response protocol for any exceedances of the surface water and groundwater assessment criteria; • measures to prevent, minimise or offset groundwater leakage from alluvial aquifers caused by the development, particularly when mining within 150 metres of any such alluvials; • measures to compensate landowners of privately-owned land whose basic landholder rights is adversely affected by the development; and • measures to mitigate and/or offset any adverse impacts on groundwater dependent ecosystems or riparian vegetation.	
Sch. 3	**Aboriginal Cultural Heritage Management Plan** 26. The Applicant must prepare and implement an Aboriginal Cultural Heritage Management Plan for the project to the satisfaction of the Planning Secretary. This plan must: (a) be prepared in consultation with Heritage NSW, the Aboriginal community, and be submitted to the Planning Secretary for approval by the end of December 2013; (b) include a program/procedures for: • minimising disturbance to Aboriginal sites as far as is reasonable and feasible, particularly in relation to the RUM-OS1 site; • salvage, excavation and/or management of Aboriginal sites and potential archaeological deposits within the project disturbance area, including the RUM-OS1 site; • protection and monitoring of Aboriginal sites outside the project disturbance area, including provisions to protect the undisturbed portion of the RUM-OS1 site from activities associated with the development; • managing the discovery of any new Aboriginal objects or skeletal remains during the development; and • ongoing consultation and involvement of the Aboriginal communities in the conservation and management of Aboriginal cultural heritage on the site.	Requires the preparation of an Aboriginal Cultural Heritage Management Plan to monitor and assess potential impacts to Aboriginal cultural heritage.

Table A4-1 (Continued)
NSW Development Consent Conditions Relevant to the Proposed Action

<table>
<tr><th>Schedule</th><th>Development Consent 104/96 Condition</th><th>Relevance to the Proposed Action</th></tr>
<tr><td>Sch. 3</td><td>
Rehabilitation Objectives
27. The Applicant must rehabilitate the site in accordance with the provisions under the Mining Act 1992 and must be generally consistent with the proposed rehabilitation activities described in the documents listed in condition 2 of Schedule 2. This rehabilitation must comply with the objectives in Table 3.
Table 3: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Mine site (as a whole)</td><td>Safe, stable & non-polluting</td></tr>
<tr><td>Surface infrastructure</td><td>To be decommissioned and removed, unless the Resources Regulator agrees otherwise</td></tr>
<tr><td>Portals and vent shafts</td><td>To be decommissioned and made safe and stable.
Retain habitat for threatened species (eg bats), where practicable</td></tr>
<tr><td>Watercourses subject to subsidence impacts</td><td>Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than prior to mining</td></tr>
<tr><td>Land to be restored or maintained for agricultural purposes</td><td>Restored and maintained to:
• the same or higher land capability and agricultural suitability than prior to mining; and
• a landform consistent with the surrounding environment, including no greater than minor changes to flooding characteristics or ponding.</td></tr>
<tr><td>Other land</td><td>Restore ecosystem function, including maintaining or establishing self-sustaining eco-systems comprised of:
• local native plant species (unless the Resources Regulator agrees otherwise); and
• a landform consistent with the surrounding environment, including no greater than minor changes to flooding characteristics or ponding.</td></tr>
<tr><td>Built features damaged by mining operations</td><td>Repair to pre-mining condition or equivalent unless:
• the owner agrees otherwise; or
• the damage is fully restored, repaired or compensated for under the Mine Subsidence Compensation Act 1961.</td></tr>
<tr><td>Community</td><td>Ensure public safety. Minimise the adverse socio-economic effects associated with mine closure</td></tr>
</table>
Notes:
• These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by mining taking place after the date of approval of modification 9; and to all surface infrastructure part of the development, whether constructed prior to or following the date of this approval.
• Rehabilitation of subsidence impacts and environmental consequences caused by mining which took place prior to the date of approval of modification 9 may be subject to the requirements of other approvals (eg under a mining lease or an Subsidence Management Plan approval) or the Applicant's commitments.
• The Rehabilitation Management Plan, required under the approval for the Ravensworth Operations Project, must be prepared in a manner that is consistent with the rehabilitation objectives in Table 3.
• Some aspects of the surface infrastructure associated with the development are used as shared infrastructure across the Ravensworth mine complex. As such, those items of surface infrastructure may be rehabilitated at closure of the Ravensworth Operations Project. This will be reflected in the relevant Rehabilitation Management Plans.
</td><td>Requires ACOL to rehabilitate the site in accordance with the Mining Act 1992 and establishes rehabilitation objectives to be achieved for the ACOL-operated portion of the RUM.</td></tr>
</table>

Table A4-1 (Continued)
NSW Development Consent Conditions Relevant to the Proposed Action

Schedule	Development Consent 104/96 Condition	Relevance to the Proposed Action
Sch. 4	**Adaptive Management** The Applicant must assess and manage development-related risks to ensure that there are no exceedances of the performance measures or associated performance indicators and impact assessment criteria in schedule 3. Any exceedance of these performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these performance measures has occurred, the Applicant must, at the earliest opportunity: (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur; (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and c) implement remediation measures as directed by the Planning Secretary, to the satisfaction of the Planning Secretary	Requires ACOL to implement an adaptive management process for the ACOL-operated portion of the RUM.
Sch. 4	**Community Consultative Committee** 4. The Applicant must operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Planning Secretary. This CCC must be operated in accordance with the Department's *Community Consultative Committee Guidelines: State Significant Development* (2019), or its latest version. With the agreement of the CCC Chairs and the approval of the Planning Secretary, matters associated with the relevant parts of the Ashton Mine Project, as shown in Figures 4 and 5 of Appendix 2, may be dealt with by the Ravensworth Underground Mine CCC. Notes: • The CCC is an advisory committee. The Department and other relevant agencies are responsible for ensuring that the Applicant complies with this consent. • In accordance with the guideline, the Committee must include an independent chair and appropriate representation from the Applicant, Council, recognised environmental groups and the local community. • The CCC may be combined with any similar CCC for the Ravensworth Operations Project.	Requires ACOL to regularly consult with the local community about the ACOL-operated portion of the RUM.

ATTACHMENT 5
ASHTON-RAVENSWORTH INTEGRATION PROJECT – GROUNDWATER PEER REVIEW

Ref: HA2023/10

HydroAlgorithmics Pty Ltd
ABN 25 163 284 991

PO Box 4282, Hawker ACT 2614
Phone +61 (0)404 001 780

info@hydroalgorithmics.com
www.hydroalgorithmics.com

Date: **28 March 2024**

To: **Phillip Brown**
Ashton Coal Operations Pty Ltd
Glennies Creek Road
Camberwell NSW 2330

From: **Dr Noel Merrick**

Re: **Ashton-Ravensworth Integration Project - Groundwater Peer Review**

1. Introduction

This memorandum provides a peer review of the Groundwater Impact Assessment (GIA) and associated modelling for the Ashton-Ravensworth Underground Mine Integration Project. The GIA has been prepared by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) for Ashton Coal Operations Pty Ltd (Ashton) under the project management of Resource Strategies Pty Ltd.

The Ashton and Ravensworth mines are neighbouring approved coal mines in the Hunter Valley, New South Wales (NSW), near Singleton. Ashton intends to extend its Ashton Underground Mine (AUM) to enable access and mining of approved longwall panels in the Pikes Gully (PG) Seam and Middle Liddell (MLD) Seams at the Ravensworth Underground Mine (RUM). The coal resources would be accessed from the AUM via new non-subsiding first workings developed between the two mining areas.

The proposed mining of the RUM PG and MLD Seams was approved under RUM Development Consent DA 104/96. The Proposed Action involves shortening and narrowing of longwall panels so that the mining footprint would reduce in extent. Consequently, the smaller extent of proposed mining is expected to reduce groundwater impacts compared to the currently approved RUM layout.

The Proposed Action has received State Approval but, as it has been determined a Controlled Action, it requires further assessment under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) reviewed the EPBC Referral and provided advice (dated 14 December 2022) which made a number of recommendations that called for additional groundwater modelling and reporting.

2. Previous Review

State Approval was based on an assessment by AGE (2021):

- *"Ashton-Ravensworth Integration Modification Groundwater Review. Letter report to Ashton Coal Operations Pty Ltd, 8 November 2021".*

That assessment was reviewed by Dr Noel Merrick of HydroAlgorithmics (2021):

- *"Ashton-Ravensworth Integration Modification - Groundwater Peer Review. Letter report HA2021/15 to Ashton Coal Operations Pty Ltd, 8 November 2021".*

The stated conclusion of the peer review was:

- *"Based on the evidence presented, supporting information provided by AGE and the modelling conducted, I concur with the overarching report conclusion that the Modification would not result in any additional groundwater impacts compared to those already approved for Ravensworth Underground Mine and Ashton Underground Mine."*

3. Documentation

A peer review by Dr Noel Merrick of AGE (2023) *Ashton Ravensworth Integration Project EPBC Groundwater Assessment. Project ASH5001.003 Report for Ashton Coal Operations Pty Ltd.* v3.01 was completed by Dr Noel Merrick on 28 September 2023. The expanded assessment (reviewed in this report) was prepared by AGE in response to the abovementioned IESC advice.

AGE revised the Groundwater Assessment in March 2024 to address comments from the Commonwealth Department of Climate Change, Energy, the Environment and Water (advice provided 15 December 2023). The revised Groundwater Assessment subject to this peer review is:

1. *AGE, 2024. Ashton Ravensworth Integration Project EPBC Groundwater Assessment. Project ASH5001.003 Report for Ashton Coal Operations Pty Ltd. v3.02, 21 March 2024. 80 pages + 7 Appendices.*

This report includes as Appendix A:

2. *Groundwater modelling details. 39 pages.*

Document #1 has the following major sections:

1. Introduction
2. Regulatory framework
3. Environmental setting
4. Hydrogeology
5. Conceptual model and causal pathways
6. Numerical groundwater model
7. Model predictions
8. Groundwater impact assessment
9. Uncertainty analysis
10. Groundwater monitoring management
11. Conclusions
12. References

The Appendices are:

A. Groundwater modelling details
B. Compliance with government policy
C. Calibration hydrographs
D. Summary of GWMP monitoring sites
E. Probability distributions
F. Ravensworth bore hydrographs
G. Relative sensitivity of calibrated parameters

Document #2 has the following major sections:

1. Model objectives
2. Model software
3. Model history
4. Model structure
5. Model calibration
6. Model predictions
7. Uncertainty analysis
8. Model classification

4. Review Methodology

While there are no standard procedures for peer reviews of entire groundwater assessments, there are two accepted guides to the review of groundwater models: the Murray-Darling Basin Commission (MDBC) Groundwater Flow Modelling Guideline[1] (MDBC Guideline), issued in 2001, and guidelines issued by the National Water Commission (NWC) in June 2012 (Barnett *et al.*, 2012[2]). Both guides also offer techniques for reviewing the non-modelling components of a groundwater impact assessment.

The NWC National Guidelines were built upon the original MDBC guide, with substantial consistency in the model conceptualisation, design, construction and calibration principles, and the performance and review criteria, although there are differences in details.

The NWC guide promotes the concept of "model confidence level", which is defined using a number of criteria that relate to data availability, calibration, and prediction scenarios. The NWC guide is almost silent on coal mine modelling and offers no direction on best practice methodology for such applications. There is, however, an expectation of more effort in uncertainty analysis, although the guide is not prescriptive as to which methodology should be adopted.

Guidelines on uncertainty analysis for groundwater models were issued by the IESC in February 2018 in draft form and finalised in December 2018[3]. An updated

[1] MDBC (2001). Groundwater flow modelling guideline. Murray-Darling Basin Commission. URL: www.mdbc.gov.au/nrm/water_management/groundwater/groundwater_guides
[2] Barnett, B, Townley, L.R., Post, V., Evans, R.E., Hunt, R.J., Peeters, L., Richardson, S., Werner, A.D., Knapton, A. and Boronkay, A. (2012). *Australian Groundwater Modelling Guidelines*. Waterlines report 82, National Water Commission, Canberra.
[3] Middlemis H and Peeters LJM (2018) *Uncertainty analysis—Guidance for groundwater modelling within a risk management framework*. A report prepared for the Independent Expert Scientific Committee on Coal Seam GIAs and Large Coal Mining Development through the Department of the Environment and Energy, Commonwealth of Australia 2018.

Explanatory Note on uncertainty analysis was issued by the IESC in July 2023[4]. This recent document advises that a model's fitness for purpose should no longer be based on the NWC guide's confidence classification scheme, and that the fatal flaws checklist in the NWC Guide be no longer used.

This review has been conducted at arms'-length at the end of the modelling process through reviewing several versions of complete reports. Comments were offered on each revision for amendment and consideration in the preparation of the final report. One video-conference was held with the modelling team on 7 September 2021 during the peer review of the initial model/assessment to support the State modification of Development Consent DA 104/96 for the RUM.

5. Checklists

The MDBC Guideline and NWC groundwater guides include useful checklists for peer review. This groundwater assessment has been reviewed according to the 37-question Review Checklist in MDBC (2001). This checklist has questions on (1) The Report; (2) Data Analysis; (3) Conceptualisation; (4) Model Design; (5) Calibration; (6) Verification; (7) Prediction; (8) Sensitivity Analysis; and (9) Uncertainty Analysis.

The checklist assessment is provided in **Table 1**. Supplementary comments are offered in Sections 6, 7 and 8.

6. Report Matters

The GIA report is a well-structured document of about 120 pages of text and figures, excluding a count of tables and graphics in Appendices other than the technical modelling report in Appendix A. The GIA report is structured appropriately with sufficient detail and disclosure of methods and results. The graphics are all of high quality and designed to ease understanding by readers. The report serves well as a standalone document, with no undue dependence on earlier work.

The GIA report, however, is missing an Executive Summary but does include a brief Conclusions section with a sufficient summary of the findings of the GIA. The technical modelling report does not have a Conclusions chapter.

The other Appendices contain information on compliance with government policy, calibration hydrograph comparison, groundwater monitoring site details, and probability distributions for the uncertainty analysis.

Progressive review comments on factual and editorial matters, on both the main text and the technical report, have been considered by AGE and have been accommodated in revisions of the reports.

[4] Peeters LJM and Middlemis H (2023) 2023. Information Guidelines Explanatory Note: Uncertainty analysis for groundwater modelling, A report prepared for the Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development through the Department of Climate Change, Energy, the Environment and Water, Commonwealth of Australia, 2023.

The objectives of the groundwater model are stated at a high level in the main text (Section 6.1) (Document #1) and in detail in the technical report (Document #2) in the form of six dot points, in terms of prediction of the following (Section 6.2) (Document #1):

- *drawdown in groundwater levels in saturated proximal Quaternary alluvium and in the Permian coal measures as a result of mining;*
- *the volume of groundwater directly intercepted by mining from the coal measures, and the indirect take from Quaternary alluvium and surface water features;*
- *change to alluvial fluxes and baseflow;*
- *impact on private bores;*
- *drawdown impact to potential* GDEs; *and*
- *individual water sources water licensing requirements.*

All objectives have been met and are reported satisfactorily. Overall, there are no significant matters of concern in the reports as to structure or depth of coverage, and there is a clear focus on regulatory requirements.

7. Data Matters

The geology, though complex, is reasonably well known as a result of the extensive mining and exploration history in this part of the Hunter Valley. It is illustrated by maps of outcropping geology, alluvial definition (i.e; extent, thickness and saturation), structural faults and a conceptual cross-section. However, structure contours and thickness maps are not provided. As there is no significant faulting evident within the study area, it is reasonable for faults not to be included in the conceptual model or the numerical groundwater model. Local faults intercepted during mining to date have not made water, and had no more than a few metres throw. There are a few faults about 1-3 kilometres (km) strike length at the north-western and eastern boundaries, which would be expected to have throws in the order of 100 metres (m), but they would have negligible effect on groundwater conditions relevant to the Proposed Action.

Assessment of the Proposed Action has benefitted from considerable effort conducted by earlier investigators for neighbouring groundwater assessments with regard to resolution of different interpretations of alluvial extent.

The Project is supported by a very extensive existing network of over 100 groundwater monitoring sites including seven (7) vibrating wire piezometer (VWP) installations. An additional 34 bores are relied upon for model calibration from the adjoining monitoring networks of Glendell Mine and Ravensworth Open Cut Mine. Routine sampling has led to an extensive database of groundwater quality in alluvial and non-alluvial formations.

Cause-and-effect analysis of groundwater hydrographs has been limited to correlations of alluvial groundwater levels with rainfall, with more response evident in Bowmans Creek Alluvium than Glennies Creek Alluvium. However, the hydrographic comparison in Appendix C indicates many mining effects in bores in non-alluvial formations.

The depth to the water table in the Bowmans Creek Alluvium between AUM and RUM is 4 - 10 m, as shown in Figure 4.1 (Document #1). This suggests some potential for groundwater dependence of vegetation. The GDE Atlas maps vegetation along Bowmans Creek as having either high or low potential for groundwater interaction. A cited survey by Hunter Eco (2023) confirmed that River Red Gums (*Eucalyptus camaldulensis)* are the only terrestrial GDEs in the vicinity of the RUM and AUM, and a gallery forest structure along Bowmans Creek is indicative of an aquatic GDE with vegetation primarily dependent on creek baseflow.

Groundwater flow directions are described rather than illustrated, given the complexity of groundwater systems (other than alluvium) being highly disturbed by regional mining.

Hydraulic conductivity estimates for modelling are informed by extensive prior field investigations in the Hunter Valley. Hydraulic conductivity variations with depth, to 400 m, are charted separately for coal and interburden in Figure 4.4 (Document #1).

A clear and defensible description of hydrogeological conceptualisation is promoted in Section 5 (Document #1) for end-of-mining conditions, illustrated by a detailed schematic cross-section (Figure 5.1) which indicates the key natural and mining-induced processes, and environmental receptors. Deep permanent fracturing and shallow transient cracking due to progressive underground mining are included in the conceptualisation, with an expectation of the Lemington Conglomerate (about 90 m above the PG Seam) providing a constraint on fracture height.

8. Model Matters

The numerical groundwater model used and updated by AGE is a mature model, having been constructed in 2015 and updated several times since then. The model software is a combination of MODFLOW-USG (Panday *et al.,* 2017) for simulation, AlgoMesh for grid design, and PEST HP (Watermark Numerical Computing, 2021) for calibration.

The major update for this Project was the introduction of a fracture zone into the RUM area. I provided feedback to AGE on the fracture model implementation during a video-conference on 7 September 2021. Following this meeting, AGE provided evidence showing that my comments were incorporated into the model satisfactorily and the resulting fracture zone parameters are considered to be reasonable, based on my experience. Details are provided in Section A 4.11 (Document #2). The Ditton-Merrick formula has been used for fracture height, but without the correction for multi-seam effects. To offset this, the t' term (effective stratum thickness at the top of the fracture zone) has been determined by calibration, then modified to match inflows recorded at the AUM. Layers affected by deep fracturing are listed in Table A 8 (layers 3-13, where layer 8 is PG Seam and layer 14 is MDL Seam).

In Section A 8 of Document #2, the model is classified "as a Confidence Class 2 groundwater model, with many Class 3 elements". As noted earlier, the use of this classification scheme is now discouraged (Peeters and Middlemis, 2003).

The model extent is limited to the west, with a little more than 1 km from the western boundary to the most northerly RUM Middle Liddell longwall panel. A no-flow boundary is specified as the boundary condition. Usually, a boundary would be placed farther west to minimise edge effects. Predicted drawdowns in coal seams are shown in Figures A 10 to A 13 (Document #2) (cumulative maximum drawdown) and in Figures 7.4 and 7.5 (Document #1) (Project maximum drawdown). As all non-alluvial drawdown extents reach the western boundary, edge effects are potentially occurring in the model. However, consideration must be given to groundwater conditions on the far side of the western boundary, where Ravensworth North Open Cut Mine and Hunter Valley Operations (HVO) north pit are active mining areas.

Figure 1 overlays the predicted Project maximum drawdown for the MLD Seam (model layer 14) on an image of district mining areas; the model boundary is marked by a dashed red line. **Figure 2** overlays the predicted cumulative maximum drawdown for the MLD Seam on the corresponding drawdown map from the more expansive Glendell model[5]. These overlays have been independently produced by the peer reviewer and confirm overlays produced by AGE. It is clear from the overlay that the drawdowns from the two models are consistent in the vicinity of the boundary of the smaller model. It follows that extension of the model farther west would have given no advantage, and that drawdowns predicted by the model would not be materially affected by edge conditions.

The no-flow boundary condition is a simplification as there is likely to be flow across the boundary, sometimes to the west and sometimes to the east, depending on mining sequences in the various mines. However, the no-flow condition is probably a good assumption, on average, and a preferred assumption at equilibrium.

Calibration has been performed for the period December 1969 to December 2020 for both groundwater levels and mine inflows. Performance statistics of 7.9 percent (%) Root mean square (RMS) and 14.2 mRMS are acceptable for such a complex mining precinct. The scattergram (Figure A 4) is generally linear across a wide range from -60 metres Australian Height Datum (mAHD) to +60 mAHD, with significant scatter at a few sites. A performance statistic of 13% RMS for mine inflows (very rarely attempted) is excellent.

[5] AGE, 2019, Groundwater Impact Assessment Glendell Continued Operations Project. Project G1874C Final report prepared for Mount Owen Pty Limited, 10 October 2019

The model was run in verification mode from January 2021 to mid-2023 to check if the model is still calibrated on an extended dataset. The performance statistics of 6.8% RMS and 15.4 mRMS suggest that model parameterisation is robust.

Subsequent to the calibration, data from a further six VWPs and two bores to the south and west of the RUM has been considered by AGE to further assess how well model predictions match measured water levels. Four of the monitoring sites are located just outside of the model domain, but to make use of the data, AGE assigned a surrogate location just within the model domain. Modelled predictions match sufficiently well with measured water levels at the four bores within the model domain and at the four surrogate locations assigned by AGE.

A comprehensive IESC-compliant Type-3 uncertainty analysis has been undertaken by means of a *monte carlo* technique, using 224 alternative calibrated realisations out of a trial set of 400 selections. The rejected 44% of models either failed to converge or had a performance statistic greater than 12% RMS. A convergence test, as encouraged by the IESC Explanatory Note on Uncertainty Analysis in Groundwater Modelling, is undertaken for PG seam inflow and Bowmans Creek baseflow decline. This demonstrates that an ensemble of about 100 models is sufficient for reliable probability estimates, for this Proposed Action.

Full prior and posterior distributions (in log-space) are disclosed in Appendix E, showing good consistency between priors and posteriors. As the zone numbers associated with each adjustable parameter are not mapped to layers or formations, a reader cannot check the assumed ranges for individual formations.

The reviewer notes in Table A 15 that an upper limit of 1.3×10^{-5} m^{-1} has been applied for specific storage. Known in the industry as the “Rau limit”, it should be stressed here that this limit has been proven wrong in a recent paper by Chowdury *et al*. (2022)[6]. Modellers should no longer apply the *Rau limit* as a constraint. It appears this limit must have been relaxed for parameter ss_z9 as its maximum value is approximately 4×10^{-5} m^{-1}.

[6] Chowdury, F., Gong, J., Rau, G.C. and Timms, W.A., 2022. Multifactor analysis of specific storage estimates and implications for transient groundwater modelling. Hydrogeology Journal 30, 2183-2204.

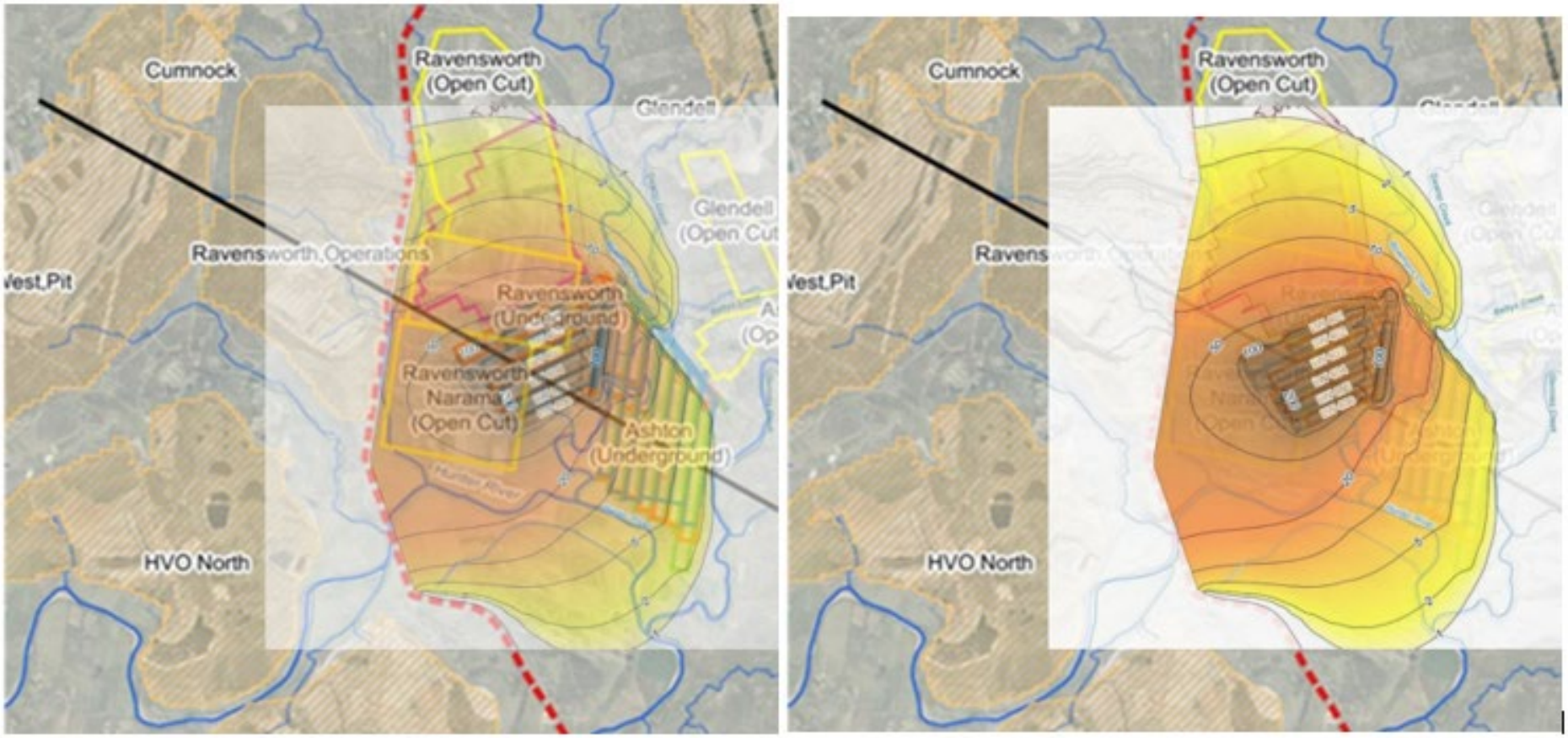


Figure 1. Overlay of predicted Project maximum drawdown in the Middle Liddell Seam on landform imagery

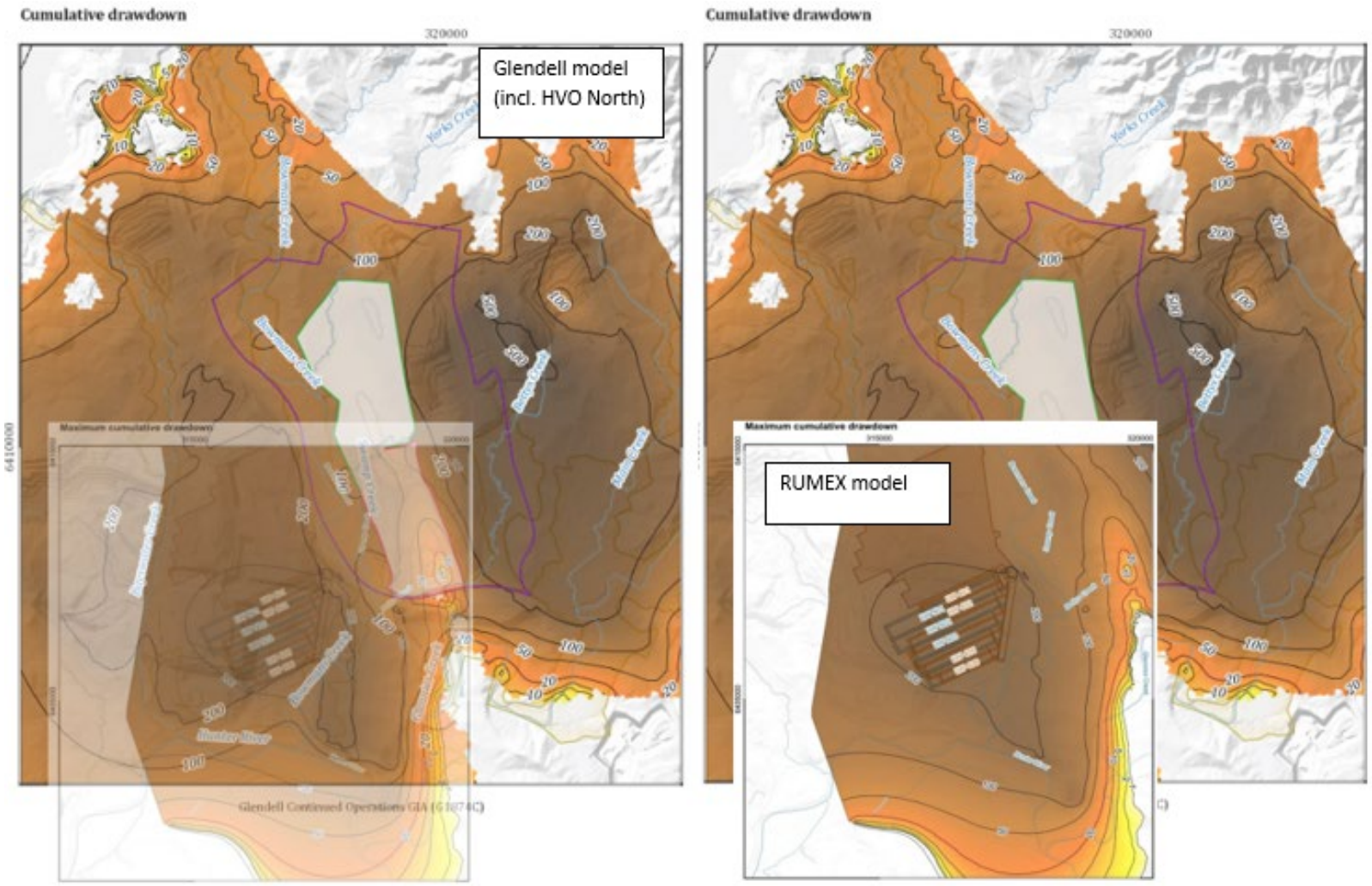


Figure 2. Comparison of predicted cumulative maximum drawdown in the Middle Liddell Seam by overlapping models

9. Conclusion

The assessment methodology used by AGE and findings presented in the GIA are considered to be appropriate.

The groundwater modelling has been conducted competently. The proximity of the western boundary to the Proposed Action is considered by this reviewer to not have any material effect on the prediction of drawdown effects on GDEs.

The reviewer endorses the stated conclusions in Section 11 of the GIA report:

- *"In consideration of the impacts that are already occurring and are approved to occur at open cut and underground mining operations surrounding the Proposed Action and the approved future mining associated with these developments, the impacts of the Proposed Action on a water resource have been assessed as not being significant."*

- *"The Proposed Action is not predicted to result in an impact that is of sufficient scale or intensity as to significantly reduce the current or future utility of the water resource for third party users, including environmental and other public benefit outcomes."*

Table 1. Model Appraisal

Q.	QUESTION	Not Applicable or Unknown	Score 0	Score 1	Score 3	Score 5	Score	Max. Score (0, 3, 5)	COMMENT
1.0	**THE REPORT**								**Main report and technical modelling report (App.A)**
1.1	Is there a clear statement of project objectives in the modelling report?		Missing	Deficient	Adequate	Very Good			6 items (A 1)
1.2	Is the level of model complexity clear or acknowledged?		Missing	No	Yes				Model classification table (A 8) – *no longer required according to July 2023 Uncertainty Analysis Explanatory Note (IESC)*
1.3	Is a water or mass balance reported?		Missing	Deficient	Adequate	Very Good			Steady-state; transient calibration average; transient prediction average.
1.4	Has the modelling study satisfied project objectives?		Missing	Deficient	Adequate	Very Good			All 6 objectives are addressed.
1.5	Are the model results of any practical use?			No	Maybe	Yes			
2.0	**DATA ANALYSIS**								
2.1	Has hydrogeology data been collected and analysed?		Missing	Deficient	Adequate	Very Good			Extensive permeability and groundwater datasets; good knowledge of surrounding mining areas.
2.2	Are groundwater contours or flow directions presented?		Missing	Deficient	Adequate	Very Good			Only: depth to water in alluvium; and saturated thickness in alluvium. General flow directions are described in other formations.
2.3	Have all potential recharge data been collected and analysed? (rainfall, streamflow, irrigation, floods, etc.)		Missing	Deficient	Adequate	Very Good			SILO Rainfall 1990 to 2022. Flow in Bowman's Creek.
2.4	Have all potential discharge data been collected and analysed? (abstraction, evapotranspiration, drainage, springflow, etc.)		Missing	Deficient	Adequate	Very Good			No abstraction by bores, only other mines. Evaporation 1990 to 2022. Three major creeks.

2.5	Have the recharge and discharge datasets been analysed for their groundwater response?		Missing	Deficient	Adequate	Very Good			Compared with CRD in Bowmans Creek Alluvium and Glennies Creek Alluvium. More rainfall correlation in former. No obvious mining influence. No hydrographs shown away from alluvium, other than App.C 2010-2026; many evident mining effects there.
2.6	Are groundwater hydrographs used for calibration?			No	Maybe	Yes			226 in App.C.
2.7	Have consistent data units and standard geometrical datums been used?			No	Yes				
3.0	**CONCEPTUALISATION**								
3.1	Is the conceptual model consistent with project objectives and the required model complexity?		Unknown	No	Maybe	Yes			
3.2	Is there a clear description of the conceptual model?		Missing	Deficient	Adequate	Very Good			Main report: Section 5.
3.3	Is there a graphical representation of the modeller's conceptualisation?		Missing	Deficient	Adequate	Very Good			Figure 5.1
3.4	Is the conceptual model unnecessarily simple or unnecessarily complex?			Yes	No				
4.0	**MODEL DESIGN**								
4.1	Is the spatial extent of the model appropriate?			No	Maybe	Yes			Western border is 1 to 2.5 km from nearest proposed RUM mining. Nevertheless, the proximity of the western boundary to the RUM is considered by this reviewer to not have any material effect on the prediction of drawdown effects on GDEs. Refer to discussion on model boundary location within this peer review letter.
4.2	Are the applied boundary conditions plausible and unrestrictive?		Missing	Deficient	Adequate	Very Good			GHB on N and S edges allows for interflows. No-flow to E supported by outcrop limit of lowermost seam. No-flow to W will be valid when mining is well advanced and depressurisation fields merge either side of the boundary.
4.3	Is the software appropriate for the objectives of the study?			No	Maybe	Yes			MODFLOW-USG plus AlgoMesh. PEST is used to automate calibration.

5.0	**CALIBRATION**								**Dec.1969 to Dec.2020**
5.1	Is there sufficient evidence provided for model calibration?		Missing	Deficient	Adequate	Very Good			Statistics. Scatter diagram. Hydrographs (App.C).
5.2	Is the model sufficiently calibrated against spatial observations?		Missing	Deficient	Adequate	Very Good			No way to compare contours (heavily disturbed by other mining). The only indicator is the scatter diagram (Fig.A 4) which shows similar performance across the full range of observed water levels from -50 to 70 mAHD.
5.3	Is the model sufficiently calibrated against temporal observations?		Missing	Deficient	Adequate	Very Good			See App.C. Quiescent trends are honoured. Most mining trends are replicated but some are not.
5.4	Are calibrated parameter distributions and ranges plausible?		Missing	No	Maybe	Yes			Consistent with many related studies.
5.5	Does the calibration statistic satisfy agreed performance criteria?		Missing	Deficient	Adequate	Very Good			Groundwater levels: 7.85 %RMS (OK); absolute RMS 14.2 m. Mine inflows: 13 %RMS (very good)
5.6	Are there good reasons for not meeting agreed performance criteria?		Missing	Deficient	Adequate	Very Good			One problematic bore (L213-275) that came to light during verification of model calibration.
6.0	**VERIFICATION**								**Jan.2021 to mid-2023**
6.1	Is there sufficient evidence provided for model verification?		Missing	Deficient	Adequate	Very Good			Groundwater levels: 6.77 %RMS (OK); absolute RMS 15.4 m.
6.2	Does the reserved dataset include stresses consistent with the prediction scenarios?		Unknown	No	Maybe	Yes			
6.3	Are there good reasons for an unsatisfactory verification?		Missing	Deficient	Adequate	Very Good			One bore (L213-275) shows deteriorating performance since 2020 on the scatter plot; reason not yet known.
7.0	**PREDICTION**								**To 2136**
7.1	Have multiple scenarios been run for climate variability?		Missing	Deficient	Adequate	Very Good			Average steady climate. One climate change scenario with reduced rainfall and higher ET potential.

7.2	Have multiple scenarios been run for operational /management alternatives?		Missing	Deficient	Adequate	Very Good			Single mine plan – normal practice.
7.3	Is the time horizon for prediction comparable with the length of the calibration / verification period?		Missing	No	Maybe	Yes			Calibration: Dec.1969 – Jan.2020. Prediction: 2022-2032-2136.
7.4	Are the model predictions plausible?			No	Maybe	Yes			
8.0	**SENSITIVITY ANALYSIS**								**Replaced by Uncertainty Analysis**
8.1	Is the sensitivity analysis sufficiently intensive for key parameters?		Missing	Deficient	Adequate	Very Good			
8.2	Are sensitivity results used to qualify the reliability of model calibration?		Missing	Deficient	Adequate	Very Good			
8.3	Are sensitivity results used to qualify the accuracy of model prediction?		Missing	Deficient	Adequate	Very Good			
9.0	**UNCERTAINTY ANALYSIS**								***Monte carlo***

9.1	If required by the project brief, is uncertainty quantified in any way?		Missing	No	Maybe	Yes			Calibration-constrained *monte carlo* analysis. Of 400 potential realisations, 224 achieved <12 %RMS calibration. Adjustable parameters: Kx, Kz, Sy, Ss, rain recharge, river Kz, frac-zone beam thickness. Prior and posterior distributions are shown in Appendix E. Outputs of interest in App.A: (1) mine inflow (Pikes Gully Seam); (2) baseflow decline in Bowman's Creek; (3) Cumulative drawdown. Convergence demonstrated with about 100 model realisations. Further Quantities of Interest (QoI) in Main Report: (3) total mine inflow; (4) Hunter River Alluvium take; (5) Glennies Creek Alluvium take; (6) Bowman's Creek Alluvium take; (7) baseflow decline in Hunter River; (8) baseflow decline in Glennies Creek; (9) P(drawdown) in alluvium/regolith; (10) P(drawdown) in Pikes Gully Seam; (11) P(drawdown) in Middle Liddell Seam. Three climate change scenarios are done.
NEW	As required by IESC, is qualitative uncertainty summarised?		Missing	Deficient	Adequate	Very Good			Section A7
	TOTAL SCORE								PERFORMANCE: %

ATTACHMENT 6
ENVIRONMENT AND COMMUNITY RELATIONS POLICY

YANCOAL POLICY – Environment and Community Relations

Objective

Yancoal is committed to operating as an environmentally and socially responsible corporate entity. We will strive to be a valued and respected member of the communities in which we operate.

Scope

This policy applies to all Yancoal owned and managed business units and operations.

Statement

Yancoal accepts its responsibility to conduct its operation in a lawful and environmentally sound manner and to work in consultation with the community and other stakeholders.

We will:

- Identify, understand, assess and manage potential environmental impacts and community issues.
- Implement, validate and maintain an effective documented environment and community relations management system.
- Strive for continual improvement in environmental performance.
- Provide the resources and training to our employees necessary to achieve our objectives.
- Deliver outcomes that meet or exceed our environmental licences and approvals, and bring a positive benefit to the communities in which we operate.
- Comply with applicable legislation and regulations.
- Foster positive relationships with regulatory agencies and community stakeholders.
- Be accountable for our actions.
- We will strive for excellence in environmental management and in the establishment of strong, trusting and sustainable community relationships.

Signed: _____

David Moult
Yancoal Chief Executive Officer

Date: Last reviewed and approved by the board meeting on 28 February 2022