

ASHTON COAL PROJECT
REHABILITATION MANAGEMENT PLAN



FEBRUARY 2023

SUMMARY TABLE

ASHTON COAL OPERATIONS PTY LIMITED		
REHABILITATION MANAGEMENT PLAN SUMMARY TABLE		
Name of Mine:	Ashton Coal Mine	
Name of Lease Holder(s):	White Mining (NSW) Pty Limited	
Name of Mine Operator:	Ashton Coal Operations Pty Limited (ACOL)	
Rehabilitation Management Plan Commencement Date:	1 August 2022	
Rehabilitation Management Plan Revision Dates and Version Numbers:	Version 1	August 2022
	Amendment 1	February 2023
Mining Lease(s) / Lease Numbers / Expiry Dates:	ML 1533	Expiry: 26/02/2024
	ML 1529	Expiry: 11/11/2030
	ML 1623	Expiry: 30/10/2029
	ML 1834	Expiry: 03/06/2033
	ML 1835	Expiry: 31/12/2023
	ML 1836	Expiry: 31/12/2023
	ML 1837	Expiry: 01/10/2043
Date of Submission:	17 February 2023	

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Title: Ashton Coal Rehabilitation Management Plan

Owner: Phil Brown

Revision Number: 1

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1. INTRODUCTION TO MINING PROJECT

1.1 History Of Operations

Ashton Coal Operations Pty Limited (ACOL) operates the Aston Coal Project (ACP), located approximately 14 kilometres (km) north-west of Singleton in the Camberwell district of the upper Hunter Valley, New South Wales (NSW) (Figure 1). The approved ACP includes:

- A now exhausted and predominantly rehabilitated North East Open Cut (NEOC), where the final void is currently utilised for coal reject storage.
- A descending multi-seam underground mine using retreating longwall mining methods (Ashton Underground Mine).
- Associated surface infrastructure for the underground mine that includes gas management and extraction infrastructure.
- A Coal Handling and Preparation Plant (CHPP), rail siding, site office and associated infrastructure.
- The Bowmans Creek Diversion which allows coal recovery from the underground mine while protecting surface water.
- Integration with the neighbouring Ravensworth Underground Mine (RUM) to allow ACOL to access and extract approved but unmined coal resources from a portion of the RUM (hereafter referred to as ACOL-operated RUM).

The ACP was granted planning approval under Development Consent (DA) 309-11-2001-i, by the Minister of Planning in October 2002. Subsequent modifications of the approval were approved in 2003, 2005, 2007, 2010, 2011, 2012, 2016 and 2022. The current approval allows for extraction of Run-Of-Mine (ROM) coal at a rate of up to 5.45 Million tonnes per annum (Mtpa) and for the undertaking of associated coal mining activities.

Exploration activities within the underground area will continue to provide base line geological and coal quality data for modelling and planning purposes. Current exploration projects at the ACP include seam continuity and splitting exploration. The ACP comprise several discrete operational areas: the NEOC, Ashton Underground Mine and CHPP and surface facilities.

The Department of Planning and Environment (DPE) approved Modification 11 to the Ashton DA 309-11-2001-i and Modification 10 to the RUM Development Consent DA 104/96 on 6 July 2022. These modifications allow for the integration of two neighbouring underground mines and enables ACOL to access and extract approved but unmined coal resources from a portion of the RUM. For operational and management purposes, this portion of the RUM will now form an integral part of the Ashton Mine Complex. The integration of the operations is described in Section 1.1.5. The general arrangement of the ACP and ACOL-operated RUM is shown in Figure 2.

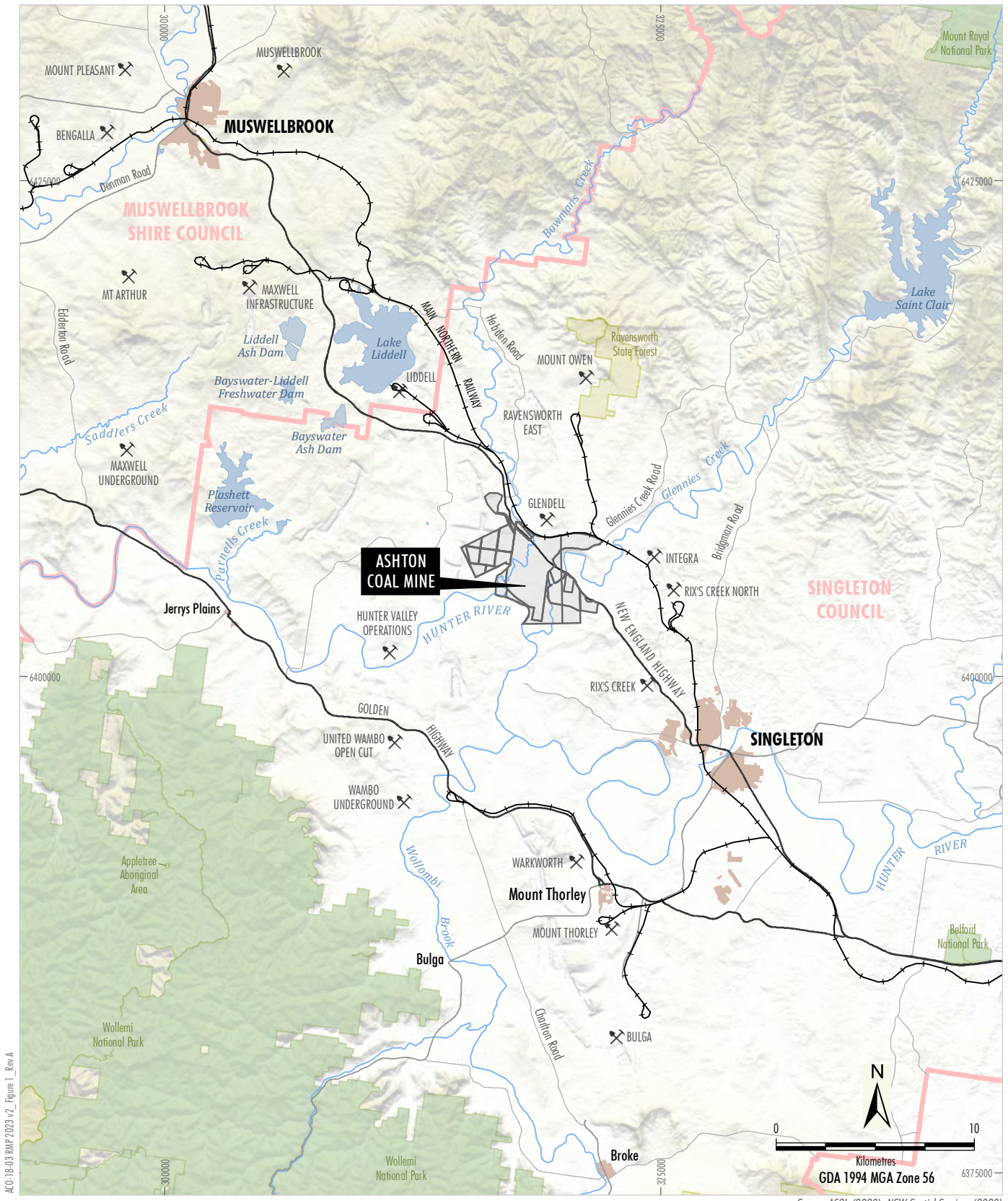
1.1.1 North East Open Cut

As of September 2011, coal extraction from the NEOC ceased, having reached the approved and economically viable limit of available coal. ACOL is approved to place coarse reject material and tailings within the NEOC. The rejects are being deposited in such a way as to allow for the later use of the void as a tailing storage and coarse reject placement as the long term operational strategy prior to final landform rehabilitation activities.

A brief history of the operations with the NEOC is in **Table 1**.

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ACO-18-03-RMP 2023 v2, Figure 1, Rev A

Source: ACOL (2023); NSW Spatial Services (2023)

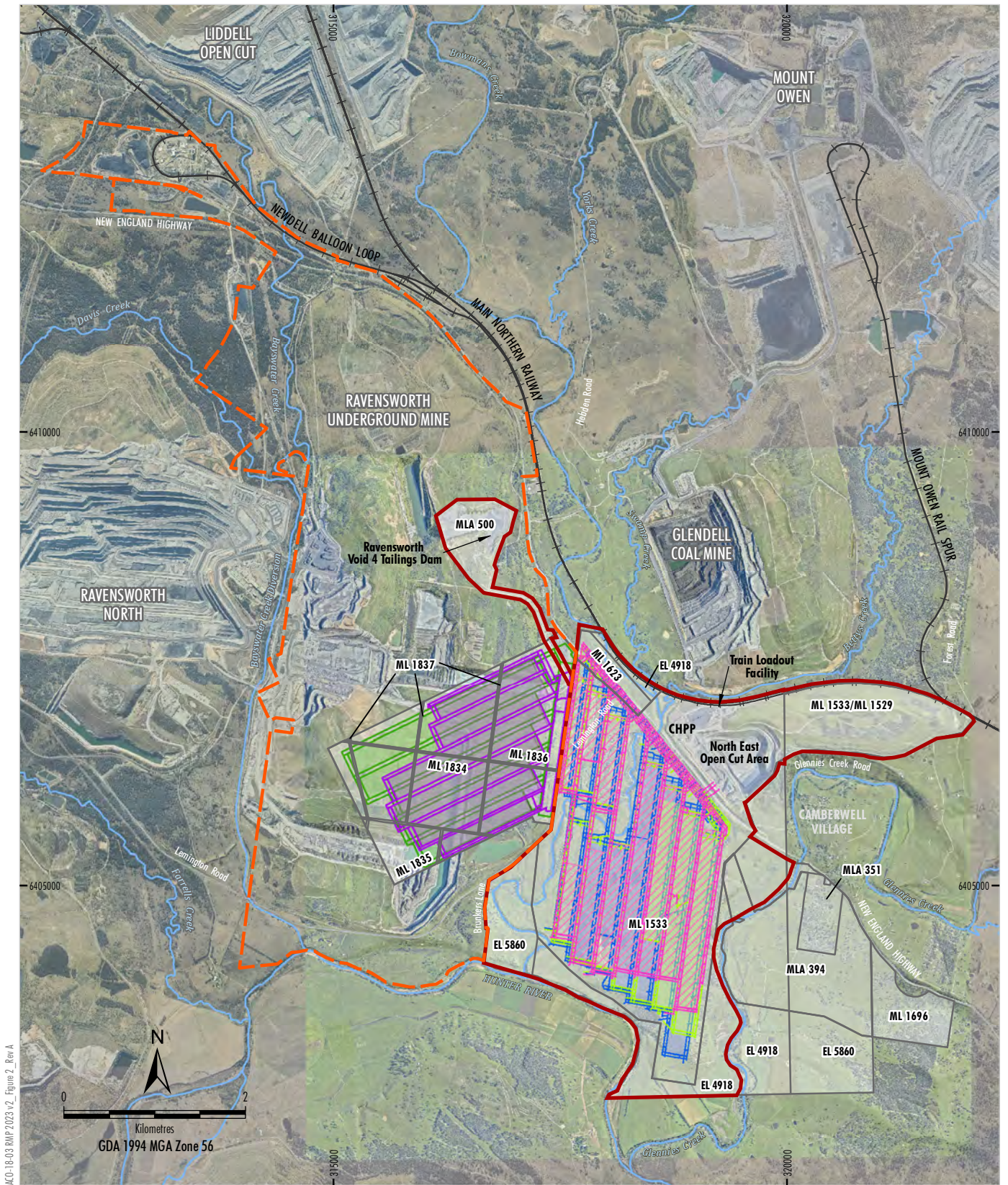
Date prepared: 28-07-2023



- LEGEND**
- Mining Operation
 - Local Government Area
 - State Forest
 - National Parks and Wildlife Estate
 - Coal - Current Titles


ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023
 Regional Location

Figure 1



ACQ-18-03 RMP 2023 v2, Figure 2, Rev A

Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)
 Date prepared: 28-07-2023

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Pikes Gully Seam Longwall Layout
 - Upper Lower Liddell Seam Longwall Layout
 - Upper Liddell Seam Longwall Layout
 - Indicative Pikes Gully Seam Longwall Layout
 - Indicative Middle Liddell Seam Longwall Layout



**ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023**

General Arrangement

Figure 2

Table 1: North East Open Cut Development and Mining

Year	Details
2003 - September	Construction commences.
2004 - January	Operations begin.
2004 - March	First ROM coal produced.
2011 - September	Mining operations at the NEOC conclude.

1.1.2 Ashton Underground Mine

The Ashton underground operations commenced in December 2005 with the first longwall coal extracted within the Pikes Gully Seam in March 2007. Construction of the Bowmans Creek Diversion was completed in November 2012 allowing extraction of coal from beneath those excised sections of Bowmans Creek. Coal extraction operations within the underground operations remain ongoing with an approved maximum production of 5.45 Mtpa.

A brief history of operations at Ashton Underground is outlined in **Table 2**.

Table 2: Ashton Underground Development and Mining

Year	Details
2005 - December	Development of underground workings commences.
2007 - March	First longwall coal extracted from underground workings within the Pikes Gully Seam.
2012 - August	First longwall coal extracted from underground workings within the Upper Liddell Seam.
2012 - November	Construction of the Bowmans Creek Diversion is completed.
2017 - July	First longwall coal extracted from underground workings within the Upper Lower Liddell Seam.

1.1.3 Coal Handling and Preparation Plant

The Ashton CHPP is located to the west of the NEOC adjacent to the New England Highway and the Main Northern rail line. ROM coal is processed through the CHPP and product coal is loaded onto trains for transport to the port at Newcastle, NSW.

The CHPP was commissioned in April 2004 and expanded during 2006/2007, increasing its capacity from 400 tonnes per hour (t/hr) to 1,000 t/hr. The CHPP continues to process coal from the Ashton Underground Mine for export through the Port of Newcastle, NSW.

1.1.4 Bowmans Creek Diversion

The Bowmans Creek Diversion was completed in November 2012. Construction involved the diversion of two sections of the Bowmans Creek (total 1.7 km) to allow additional extraction beneath the excised creek channel and its alluvium. Temporary block banks are currently positioned upstream of the excised creek channel and constructed to divert all flows up to and including the six month average recurrence interval. Specific construction works are detailed in the Bowmans Creek Diversion Environmental Assessment (EA) (ACOL, 2009).

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1.1.5 ACOL-Operated Ravensworth Underground Mine

The ACP and the Ravensworth Mine Complex are neighbouring open cut and underground coal mining complexes. The Ravensworth Mine Complex comprises the Ravensworth Operations Project and the RUM. The RUM is owned and was previously operated by Resource Pacific Pty Limited. Glencore Coal Assets Australia Pty Limited (Glencore) oversaw the management of the completed RUM.

The Ashton Underground Mine and RUM share a common mining lease boundary, and are separated (at their closest) by approximately 45 metres (m). On 6 July 2022, DPE approved Modification 11 to the ACP Development Consent DA 309-11-2001-i and Modification 10 to the RUM Development Consent DA 104/96. This enabled ACOL to access and extract approved but unmined coal resources from a portion of the RUM, with the modifications allowing for connections to be made between the two neighbouring mines via non-subsiding first workings. To facilitate this integration of operations, part of four Glencore mining leases were transferred to ACOL in December 2022 (ML 1834, ML 1835, ML 1836 and ML 1837).

Surface infrastructure required at the ACOL-operated RUM area is associated with the ventilation, gas and water management required to facilitate the underground operations. A combination of existing ventilation infrastructure at the RUM (i.e. Ventilation Shaft 5) and proposed surface infrastructure developments (e.g. goaf gas drainage boreholes and associated pipelines) would be constructed and operated during underground mining. Water from the RUM would be transferred via a combination of surface and underground pipelines (in the underground workings) and managed within the ACP water management system.

The ACOL-operated RUM longwall panels are located beneath the Ravensworth Mine Complex, Ravensworth South and AGL Void 5 open cut mining operations (Figure 2).

Mining operations and rehabilitation associated with these open cut operations are managed by Glencore and AGL, respectively. ACOL will continue to consult with Glencore and AGL to align rehabilitation described in this RMP and associated Forward Programs with that planned for Ravensworth Mine Complex and Ravensworth South.

1.1.6 Rehabilitation Previously Undertaken

Rehabilitation of the NEOC overburden emplacement commenced in 2005, with the entire rehabilitation being completed in 2012. There is currently approximately 68 hectares (ha) of rehabilitated Agricultural – Grazing areas and approximately 71 ha of Native Ecosystem areas.

As the majority of the remaining disturbed surface area (e.g. Infrastructure Areas) will be required for the life of the underground mine, there has been limited opportunity for further progressive rehabilitation. To date, minor rehabilitation activities have occurred where possible and in accordance with Ground Disturbance Permits for activities including exploration drilling, subsidence repairs, archaeological investigations and infrastructure repairs and relocations. Rehabilitation of subsidence-related impacts generally include excavation to the limit of the crack, backfilling, compaction, topsoil spreading and seeding of the impacted area.

Areas of the ACOL-operated RUM have been previously rehabilitated by Glencore in accordance with previous Glencore's Ravensworth Mine Complex and AGL's Ravensworth South Rehabilitation Management Plans (RMPs)/Mining Operations Plans (MOPs). Progressive rehabilitation continues to occur at the Ravensworth Mine Complex and Ravensworth South, with completed agricultural – grazing areas and woodland areas established in parts of the ACOL-operated RUM surface area.

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1.2 Current Development Consents, Leases and Licences

Details of the date of grant and duration of the Project Approval, authorisations and licenses issued by the relevant government agencies for the ACP and ACOL-operated RUM are provided in **Table 3**.

On 9 November 2021, ACOL and Resource Pacific Pty Ltd submitted modification applications under section 4.55(2) of the *Environmental Planning & Assessment Act 1979* which sought to allow ACOL to access the approved but unmined coal resource at the RUM through an integration of the operations.

On 6 July 2022, DPE approved Modification 11 to ACP's Development Consent DA 309-11-2001-i and Modification 10 to RUM's Development Consent DA 104/96. There were no changes to the extraction or processing rates, operating hours, workforce, surface infrastructure, disturbance footprint or transport methods at the ACP.

Table 3: Overview of Current Development Consents, Leases and Licences

Relevant Authority	Instrument	Approval/Licence No.	Date of Grant	Expiry Date
DPE	Development Approval	DA 309-11-2001-i	11/10/2002 Last modified (MOD 11): 6/07/2022	31/12/2035
		DA 104/96	20/11/1996 Last modified (MOD 10): 06/07/2022	31/12/2032
NSW Resources Regulators	Mining Lease	ML 1533	26/02/2003	26/02/2024
		ML 1529	10/09/2003	11/11/2030
		ML 1623	30/10/2008	30/10/2029
		ML 1834	14/12/2022	03/06/2033
		ML 1835	14/12/2022	31/12/2023
		ML 1836	14/12/2022	31/12/2023
		ML 1837	14/12/2022	01/10/2043
Environment Protection Authority (EPA)	Environmental Protection Licence	EPL 11879	02/09/2003	Not Applicable
WaterNSW	Water Access Licence	Various	Refer to the Ashton Coal Project Water Management Plan	

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1.3 Land Ownership and Land Use

The ACP is contained entirely within the Singleton Local Government Area and a recognised mining precinct, with the Ravensworth Mine Complex located to the west, the Mount Owen Complex located to the north, Integra Underground located to the north-east and Rix's Creek Mine located to the south-east. The land covered by the ACP is held by several owners. Land ownership for these areas has been outlined in **Table 4** and can be seen on **Figure 3**. Landownership details for the land associated with the ACOL-operated RUM area has also been included in **Table 4**.

Land use other than mining in the vicinity of the ACP and ACOL-operated RUM comprises a combination of agricultural land uses, industrial and residential areas in the village of Camberwell (**Figure 4**).

Table 4: Overview of the Land Ownership Surrounding the ACP and ACOL-operated RUM Area

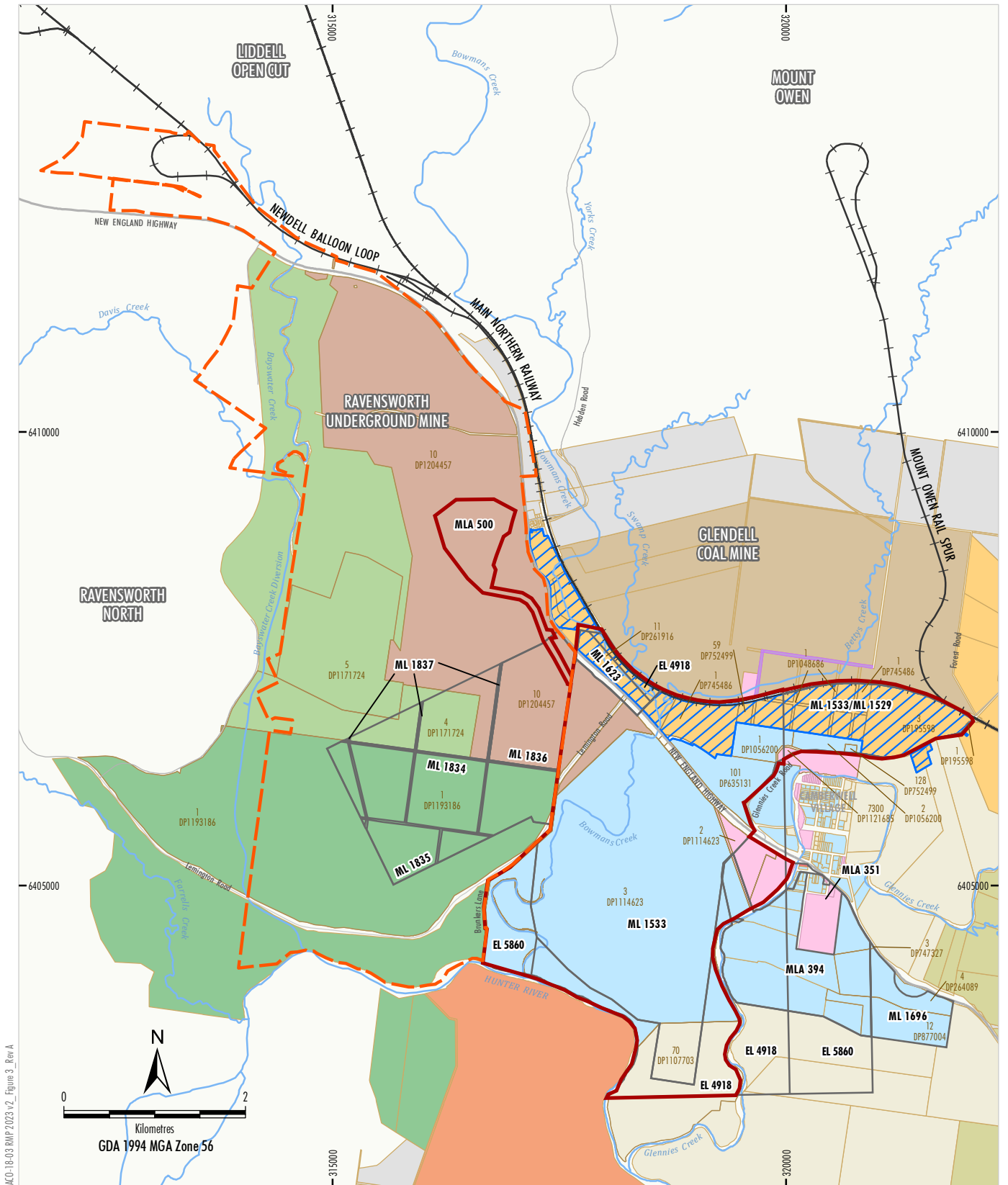
Lot/DP	Tenure	Land Ownership Schedule
ACP Area		
101/635131	Freehold	Ashton Coal Operations Pty Ltd
128/752499	Freehold	Ashton Coal Operations Pty Ltd
1/1056200	Freehold	Ashton Coal Operations Pty Ltd
2/1056200	Freehold	Ashton Coal Operations Pty Ltd
3/1114623	Freehold	Ashton Coal Operations Pty Ltd
102/738182	Freehold	Ashton Coal Operations Pty Ltd
2/1114623	Crown Land	Crown Land
1/1114623	Crown Land	Crown Land
7300/1121685	Crown Land	Crown Land
31/585169	Freehold	Glencore Coal Assets Australia Pty Limited
70/1107703	Freehold	Freehold Land
103/738182	Freehold	Freehold Land (Church)
3/195598	Freehold	Glendell Tenements Pty Ltd
11/261916	Freehold	Glendell Tenements Pty Ltd
1/745486	Freehold	Glendell Tenements Pty Ltd
59/752499	Freehold	Glendell Tenements Pty Ltd
1/1048686	Freehold	Glendell Tenements Pty Ltd
1/608457	Freehold	Glendell Tenements Pty Ltd
2/622070	Freehold	Glendell Tenements Pty Ltd
ACOL-Operated RUM Area		
1/1193186	Freehold	Renison Limited - Ravensworth Operations Pty Limited
4/1171724	Freehold	Ravensworth Operations Pty Limited
10/1204457	Freehold	Macquarie Generation
5/1171724	Freehold	Resource Pacific Pty Ltd

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AKO-18-03-RMP 2023 v2, Figure 3, Rev A

Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)

Date prepared: 28-07-2023

- | | | | |
|--|--|--|---|
| | LEGEND | | Glendell Tenements Pty Limited |
| | DA 309-11-2001-i Project Approval Boundary | | Savage Mineral Limited & Enex Foydell Limited |
| | DA 104/96 RUM Project Approval Boundary | | Coal and Allied Operations Pty Limited |
| | Coal - Current Titles | | Bloomfield Collieries; Rix's Creek Pty Ltd |
| | Railway | | Transport for NSW |
| | Watercourse | | Singleton Shire Council |
| | Land Ownership | | Crown Land |
| | Ashton Coal Operations Pty Ltd | | Privately Owned Land |
| | AGL Macquarie Generation | | Owner not Identified |
| | Renison Limited - Ravensworth Operations Pty Limited | | Glendell Land Leased to Ashton Coal |
| | Ravensworth Operations Pty Limited | | |

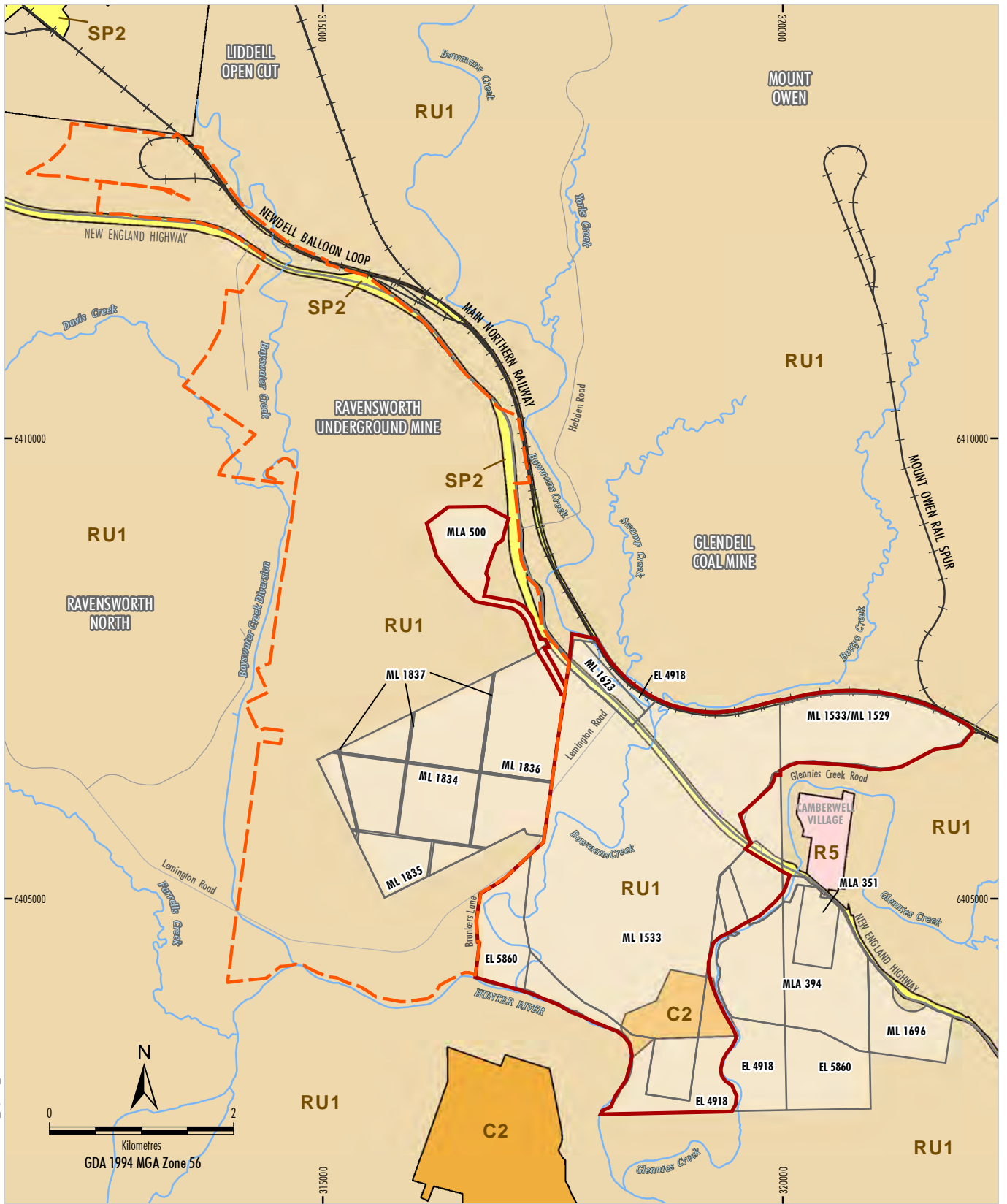


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REHABILITATION MANAGEMENT PLAN 2023

Land Ownership

Figure 3

ACO-18-03-RMP 2023 v2, Figure 4, Rev A



Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)

Date prepared: 28-07-2023

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Land Zoning**
 - C2 Environmental Conservation
 - R5 Large Lot Residential
 - RU1 Primary Production
 - SP2 Infrastructure



ASHTON COAL MINE
REHABILITATION MANAGEMENT PLAN 2023

Land Use

Figure 4

2. FINAL LAND USE

2.1 Regulatory Requirements for Rehabilitation

Rehabilitation activities at the ACP are undertaken in accordance with the relevant regulatory requirements for rehabilitation given in DA 309-11-2001-i and the associated mining leases held by ACOL. Rehabilitation activities at the ACOL-operated RUM are undertaken in accordance with the relevant regulatory requirements for rehabilitation given in Development Consent DA 104/96. The relevant regulatory requirements for rehabilitation outlined in DA 309-11-2001-i and DA 104/96 are described in **Table 5**.

Table 5: Regulatory Requirements for Rehabilitation

Condition	Requirement	Area	Section Reference															
DA 309-11-2001-i																		
Condition 27, Schedule 3	<p><i>The Applicant must implement the biodiversity offset strategy as outlined in Table 9 and as generally described in the EA (and shown conceptually in Appendix 7), to the satisfaction of the Planning Secretary.</i></p> <p><i>Table 9: Biodiversity Offset Strategy</i></p> <table border="1"> <thead> <tr> <th>Area</th> <th>Offset Type</th> <th>Minimum Size (hectares)</th> </tr> </thead> <tbody> <tr> <td><i>Southern Conservation Area</i></td> <td><i>Existing vegetation and vegetation to be established</i></td> <td><i>190</i></td> </tr> <tr> <td><i>Bowmans Creek Riparian Area</i></td> <td><i>Riparian and woodland vegetation</i></td> <td><i>60</i></td> </tr> <tr> <td><i>North East Open Cut Rehabilitation Area</i></td> <td><i>Woodland vegetation to be established</i></td> <td><i>100</i></td> </tr> <tr> <td>Total</td> <td></td> <td>350</td> </tr> </tbody> </table>	Area	Offset Type	Minimum Size (hectares)	<i>Southern Conservation Area</i>	<i>Existing vegetation and vegetation to be established</i>	<i>190</i>	<i>Bowmans Creek Riparian Area</i>	<i>Riparian and woodland vegetation</i>	<i>60</i>	<i>North East Open Cut Rehabilitation Area</i>	<i>Woodland vegetation to be established</i>	<i>100</i>	Total		350	Entire site	Sections 2.3 and 6.2
Area	Offset Type	Minimum Size (hectares)																
<i>Southern Conservation Area</i>	<i>Existing vegetation and vegetation to be established</i>	<i>190</i>																
<i>Bowmans Creek Riparian Area</i>	<i>Riparian and woodland vegetation</i>	<i>60</i>																
<i>North East Open Cut Rehabilitation Area</i>	<i>Woodland vegetation to be established</i>	<i>100</i>																
Total		350																
Condition 41, Schedule 3	<p><i>The Applicant must rehabilitate the site in accordance with the conditions imposed on the mining lease(s) associated with the development under the Mining Act 1992 and in a manner that is consistent with the rehabilitation objectives in the EA and Table 11.</i></p>	Entire Site	Section 4															

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Table 5: Regulatory Requirements for Rehabilitation (Continued)

Condition	Requirement	Area	Section Reference
DA 309-11-2001-i (Continued)			
Condition 41, Schedule 3 (Continued)	Table 11: Rehabilitation Objectives		Entire site Section 4
	Feature	Objective	
	DA Area	Safe, stable & non-polluting	
	Final Void	Safe, stable & non-polluting Minimise the size and depth of the final void as far as is reasonable and feasible. Minimise the drainage catchment of the final void as far as is reasonable and feasible. Negligible high wall instability risk.	
	Surface infrastructure	To be decommissioned and removed unless the Resources Regulator agrees otherwise.	
	Sections of Bowmans Creek within the underground mining area (except those sections of channel made redundant by diversion)	Restore pre-mining surface flow and pool holding capacity as soon as reasonably practicable. Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existed prior to mining.	
	Bowmans Creek - Eastern and Western Diversions	Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existing in the adjacent channel prior to mining.	
	Land to be restored or maintained for agricultural purposes	Restored and maintained to the same or higher land capability and agricultural suitability than prior to mining.	
	Other land affected by the development	Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: <ul style="list-style-type: none"> local native plant species (unless the Resources Regulator agrees otherwise); and a landform consistent with the surrounding environment. 	
	Built features affected by subsidence	Repair to pre-mining condition or equivalent unless: <ul style="list-style-type: none"> the owner agrees otherwise; or the damage is fully restored, repaired or compensated under the Mine Subsidence Compensation Act 1961. 	
Community	Ensure public safety. Minimise the adverse socio-economic effects associated with mine closure.		
<ol style="list-style-type: none"> These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by mining undertaken following the date of approval of Modification 6 to this consent on 24 December 2010; and to all surface infrastructure that forms part of the development, whether constructed prior to or following the approval of Modification 6. Rehabilitation of subsidence impacts and environmental consequences caused by mining which took place prior to the approval of Modification 6 may be subject to the requirements of other approvals (eg under a mining lease or a Subsidence Management Plan approval) or the Applicant's commitments. 			

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Table 5: Regulatory Requirements for Rehabilitation (Continued)

Condition	Requirement	Area	Section Reference
DA 309-11-2001-i (Continued)			
Condition 42, Schedule 3	<i>The Applicant must carry out rehabilitation progressively, that is, as soon as practicable following disturbance, to the satisfaction of the Resources Regulator.</i>	Entire site	Sections 4 and 6
Condition 43, Schedule 3	<p><i>The Applicant shall prepare and implement a Rehabilitation Management Plan for the Ashton Mine Complex in accordance with the conditions imposed in the mining lease(s) associated with the development under the Mining Act 1992. This plan must:</i></p> <p><i>(a) Deleted</i></p> <p><i>(b) be prepared in accordance with any relevant Resources Regulator guideline, and be consistent with the rehabilitation objectives in Table 11 and the documents listed in condition 2 of Schedule 2 and Appendix 4 of this consent;</i></p> <p><i>(c) build, to the maximum extent practicable, on the other management plans required under this consent; and</i></p> <p><i>(d) address all aspects of rehabilitation and mine closure, including final land use assessment, rehabilitation objectives, domain objectives, completion criteria and rehabilitation monitoring, and include:</i></p> <ul style="list-style-type: none"> <i>• an evaluation of end land use options for the final void; and</i> <i>• life of mine tailings management strategy, including an environmental risk assessment demonstrating that the emplacements can be designed, managed and rehabilitated appropriately.</i> <p><i>Note: The plan should build on the conceptual final land use and offset strategy depicted in Appendix 7.</i></p>	Entire site	This RMP
Appendix 3, Statement of Commitments 2.1	<i>Subsidence troughs will be reshaped and fill will be used where practicable to create a free-draining landform. This approach is expected to reduce the potential for surface pooling and inflow into the mine.</i>	Underground Mining Area	Section 6.3
Appendix 3, Statement of Commitments 8.3	<i>Topsoil will be separately stockpiled within designated stockpile areas and used for rehabilitating disturbed areas, post construction, where required.</i>	Entire site	Section 6.2
Appendix 3, Statement of Commitments 6a	<i>Locations of gas drainage well pads and access tracks will be developed to avoid clearing native vegetation.</i>	Entire site	Section 6.2
Appendix 3, Statement of Commitments 6b	<i>Ground disturbance will be minimised as far as practicable.</i>	Entire site	Section 6.2
Appendix 3, Statement of Commitments 6c	<i>Site inductions will include identification of native vegetation exclusion areas and designated site access routes.</i>	Entire site	Section 6.2

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Table 5: Regulatory Requirements for Rehabilitation (Continued)

Condition	Requirement	Area	Section Reference
DA 309-11-2001-i (Continued)			
Appendix 3, Statement of Commitments 8a	<i>Industry standard sediment control measures will be implemented prior to ground disturbance, including use of clean water diversions, where required.</i>	Entire site	Section 6.2 and 7
Appendix 3, Statement of Commitments 8b	<i>Long-term stockpiles will be stabilised with jute mesh or grass cover.</i>	Entire site	Section 6.2
Appendix 3, Statement of Commitments 9.1	<i>Subsidence troughs will be rehabilitated to provide a free draining surface.</i>	Underground Mining Area	Section 6.3
Appendix 3, Statement of Commitments 9.2	<i>Landscape restoration will generally be consistent with the:</i> <ul style="list-style-type: none"> • <i>The Rehabilitation Strategy described in the Response to Submissions Report.</i> • <i>Conceptual landscape design drawings presented in the EA.</i> • <i>Existing ACP Landscape and Revegetation Management Plan.</i> • <i>Existing ACP weed management protocols.</i> 	Entire site	Sections 2.3 and 6.2
Appendix 3, Statement of Commitments 9.3	<i>Flood damage to the constructed channels will be remediated to restore hydraulic and geomorphic function.</i>	Underground Mining Area	Section 10
Appendix 3, Statement of Commitments 9.4	<i>Stock proof fencing (at least 5 m from the alignment of any riparian trees) will be installed along both sides of the functioning diverted creek for its full length between the New England Highway and the Hunter River.</i>	Water Management Area	Section 6.2
Appendix 3, Statement of Commitments 9.5	<i>Stock watering troughs will be installed at strategic locations on pasture areas adjacent to the creek in the post-mine landscape, where required.</i>	Water Management Area	Section 6.2
DA 104/96			
Condition 27, Schedule 3	<i>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.</i>	ACOL-operated RUM	Section 4

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Table 5: Regulatory Requirements for Rehabilitation (Continued)

Condition	Requirement	Area	Section Reference	
DA 104/96 (Continued)				
Condition 27, Schedule 3 (Continued)	Table 3: Rehabilitation Objectives		ACOL-operated RUM	Section 4
	Feature	Objective		
	Mine site (as a whole)	Safe, stable & non-polluting		
	Surface infrastructure	To be decommissioned and removed, unless the Resources Regulator agrees otherwise		
	Portals and vent shafts	To be decommissioned and made safe and stable. Retain habitat for threatened species (eg bats), where practicable		
	Watercourses subject to subsidence impacts	Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than prior to mining		
	Land to be restored or maintained for agricultural purposes	Restored and maintained to: <ul style="list-style-type: none"> 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. 		
	Other land	Restore ecosystem function. Including maintaining or establishing self-sustaining ecosystems comprised of: <ul style="list-style-type: none"> 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. 		
	Built features damaged by mining operations	Repair to pre-mining condition or equivalent unless: <ul style="list-style-type: none"> the owner agrees otherwise; or the damage is fully restored, repaired or compensated for under the Mine Subsidence Compensation Act 1961. 		
Community	Ensure public safety Minimise the adverse socio-economic effects associated with mine closure			
Notes: <ul style="list-style-type: none"> 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 				

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Table 5: Regulatory Requirements for Rehabilitation (Continued)

Condition	Requirement	Area	Section Reference
DA 104/96 (Continued)			
Condition 28, Schedule 3	<i>The Applicant must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance.</i>	ACOL-operated RUM	Sections 4 and 6
Appendix 3, Statement of Commitments: Land Resources	<i>In accordance with RUM's Erosion and Sediment Control Plan, natural topsoil will be stripped and stockpiled for use in rehabilitation following completion of construction works.</i>	ACOL-operated RUM	Section 6.2
Appendix 3, Statement of Commitments: Land Resources	<i>All disturbed areas will be sown with a pasture seed mix as soon as possible following completion of construction and replacement of topsoil.</i>	ACOL-operated RUM	Section 6.2
Appendix 3, Statement of Commitments: Land Resources	<i>In the event that any slumping, cracking, formation of depressions and/or ponding is identified, appropriate remedial action will be undertaken.</i>	ACOL-operated RUM	Section 6.3
Appendix 3, Statement of Commitments: Land Resources	<i>Decommissioning and removal of additional surface infrastructure and subsequent rehabilitation activities will be considered and addressed during the next revision of the Conceptual Mine Closure Plan and in accordance with the Biodiversity, Rehabilitation and Land Management Plan.</i>	ACOL-operated RUM	Section 6.2.2
Appendix 3, Statement of Commitments: Air Quality	<i>Rehabilitation of disturbed areas will be undertaken promptly following completion of works.</i>	ACOL-operated RUM	Section 6.2
Appendix 3, Statement of Commitments: Flora and Fauna	<i>Any areas of disturbance outside of the permanent surface infrastructure will be promptly rehabilitated to a stable landform and revegetated commensurate with surrounding lands.</i>	ACOL-operated RUM	Section 6.2
Appendix 3, Statement of Commitments: Flora and Fauna	<i>Rehabilitated and revegetated areas will be monitored and maintained to ensure on-going stability and health.</i>	ACOL-operated RUM	Section 6.2

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Table 5: Regulatory Requirements for Rehabilitation (Continued)

Condition	Requirement	Area	Section Reference
ML 1834, ML 1835, ML 1836, ML 1837, ML 1529, ML 1533 and ML 1623 (Continued)			
Condition 4, Schedule 8A`	<p>Must prevent or minimise harm to environment</p> <p>(1) <i>The holder of a mining lease must take all reasonable measures to prevent, or if that is not reasonably practicable, to minimise, harm to the environment caused by activities under the mining lease.</i></p> <p>(2) <i>In this clause – harm to the environment has the same meaning as in the Protection of the Environment Operations Act 1997.</i></p>	Entire Site	This RMP N/A
Condition 5, Schedule 8A	<p>Rehabilitation to occur as soon as reasonably practicable after disturbance</p> <p><i>The holder of a mining lease must rehabilitate land and water in the mining area that is disturbed by activities under the mining lease as soon as reasonably practicable after the disturbance occurs.</i></p>	Entire Site	Section 6.2
Condition 6, Schedule 8A	<p>Rehabilitation must achieve final land use</p> <p>(1) <i>The holder of a mining lease must ensure that rehabilitation of the mining area achieves the final land use for the mining area.</i></p> <p>(2) <i>The holder of the mining lease must ensure any planning approval has been obtained that is necessary to enable the holder to comply with subclause (1).</i></p> <p>(3) <i>The holder of the mining lease must identify and record any reasonably foreseeable hazard that presents a risk to the holder's ability to comply with subclause (1).</i></p> <p>Note – <i>Clause 7 requires a rehabilitation risk assessment to be conducted whenever a hazard is identified under this subclause.</i></p> <p>(4) <i>In this clause –</i></p> <p>final land use <i>for the mining area means the final landform and land uses to be achieved for the mining area –</i></p> <p>(a) <i>as set out in the rehabilitation objectives statement and rehabilitation completion criteria statement, and</i></p> <p>(b) <i>for a large mine – as spatially depicted in the final landform and rehabilitation plan, and</i></p> <p>(c) <i>if the final land use for the mining area is required by a condition of development consent for activities under the mining lease – as stated in the condition.</i></p> <p>planning approval <i>means –</i></p> <p>(a) <i>a development consent within the meaning of the Environmental Planning and Assessment Act 1979, or</i></p> <p>(b) <i>an approval under that Act, Division 5.1.</i></p>	Entire Site	Section 4 Section 2.1 Section 3 N/A

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Table 5: Regulatory Requirements for Rehabilitation (Continued)

Condition	Requirements	Area	Section Reference
ML 1834, ML 1835, ML 1836, ML 1837, ML 1529, ML 1533 and ML 1623 (Continued)			
Condition 10, Schedule 8A	<p>Rehabilitation management plans for large mines</p> <p>(1) <i>The holder of a mining lease relating to a large mine must prepare a plan (a rehabilitation management plan) for the mining lease that includes the following –</i></p> <p>(a) <i>a description of how the holder proposes to manage all aspects of the rehabilitation of the mining area,</i></p> <p>(b) <i>a description of the steps and actions the holder proposes to take to comply with the conditions of the mining lease that relate to rehabilitation,</i></p> <p>(c) <i>a summary of rehabilitation risk assessments conducted by the holder,</i></p> <p>(d) <i>the risk control measures identified in the rehabilitation risk assessments,</i></p> <p>(e) <i>the rehabilitation outcome documents for the mining lease,</i></p> <p>(f) <i>a statement of the performance outcomes for the matters addressed by the rehabilitation outcome documents and the ways in which those outcomes are to be measured and monitored.</i></p> <p>(2) <i>If a rehabilitation outcome document has not been approved by the Secretary, the holder of the mining lease must include a proposed version of the document.</i></p> <p>(3) <i>A rehabilitation management plan is not required to be given to the Secretary for approval.</i></p> <p>(4) <i>The holder of the mining lease –</i></p> <p>(a) <i>Must implement the matters set out in the rehabilitation management plan, and</i></p> <p>(b) <i>If the forward program specifies timeframes for the implementation of the matters – must implement the matters within those timeframes.</i></p>	Entire Site	This RMP Section 6.2 Section 5 Section 3 Section 3 Sections 4 and 5 Section 4 Sections 4 and 5 N/A
Condition 12, Schedule 8A	<p>Rehabilitation outcome documents</p> <p>(1) <i>The holder of a mining lease must prepare the following documents (the rehabilitation outcome documents) for the mining lease and give them to the Secretary for approval –</i></p> <p>(a) <i>the rehabilitation objectives statement, which sets out the rehabilitation objectives required to achieve the final land use for the mining area,</i></p> <p>(b) <i>the rehabilitation completion criteria statement, which sets out criteria, the completion of which will demonstrate the achievement of the rehabilitation objectives,</i></p> <p>(c) <i>for a large mine, the final landform and rehabilitation plan, showing a spatial depiction of the final land use.</i></p> <p>(2) <i>If the final land use for the mining area is required by a condition of development consent for activities under the mining lease, the holder of the mining lease must ensure the rehabilitation outcome documents are consistent with that condition.</i></p>	Entire Site	Section 4 Section 4 Section 5

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2.2 Final Land Use Options Assessment

ACOL has investigated a number of potential land use options based on ACOL's Environmental Impact Statement (EIS) and consultation with key stakeholders in the community (including ACOL Community Consultative Committee [CCC]), which included habitat conservation, managed cattle grazing, cropping, viticulture, industrial estates, commercial forestry, and other commercial/community enterprises.

In accordance with the ACOL objectives for mine closure and rehabilitation, potential land uses selected were evaluated based on criteria such as:

- community and stakeholder acceptance;
- health and safety considerations;
- potential environmental impacts;
- land Use guidelines such as:
 - the Upper Hunter Synoptic Plan (Andrews, 1999); and
 - Singleton Land Use Strategy (Planning Workshop Australia 2008);
- regulatory requirements and legal liability; and
- contributions to the local economy and employment.

Based on these considerations and consultation with the local community, it was concluded that a combination of habitat conservation and managed cattle grazing was the most appropriate final land use option.

During the preparation of ACOL's previous MOPs, consultation was undertaken with the following key stakeholders:

- DPE;
- Division of Resources and Geosciences, within the Department of Planning and Environment (DRG);
- Department of Primary Industries – Water;
- EPA; and
- Office of Environment and Heritage (OEH).

This consultation included the opportunity to review and comment on the proposed final land use options described above. All issues raised through the consultation process with regard to the final landform and final land use have been considered in the preparation of this RMP.

Additional consultation regarding the proposed final land use and final landform at the ACP may be undertaken with the NSW Resources Regulator and other departmental agencies. This RMP will be updated to reflect the outcomes of any consultation undertaken.

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2.3 Final Land Use Statement

The proposed final landform has been refined from the conceptual final landform detailed in ACOL's EIS, however remains consistent with the objectives outlined within clause 12, Schedule 8A of the *Mining Regulation 2016*, rehabilitation objectives outlined in Table 11, Schedule 3 of DA 309-11-2001-i and the Biodiversity Offset Strategy required by Condition 27, Schedule 3 of DA 309-11-2001-i.

The rehabilitation objectives for the ACP and ACOL-operated RUM are aimed at blending the disturbed mined areas back into the natural landscape after mining has occurred, to reinstate the land capability of the land to at least the same condition as existed prior to mining, and to create a long term stable landform for sustainable use of the land post-mining.

The final land use will comprise of:

- Agricultural – Grazing areas;
- Native Ecosystem areas;
- Water Storage areas (Excluding Final Voids); and
- Southern Woodland Conservation Area.

The proposed final landform and final land use are depicted spatially in Section 5.

2.4 Final Land Use and Mining Domains

2.4.1 Final Land Use

Final land use domains are land management units characterised by a similar post-mining land use objective. Consistent with contemporary rehabilitation guidelines and rehabilitation planning best practice, final land use domains have been developed for the ACOL.

Final land use domains for the ACP and ACOL-operated RUM are listed in **Table 6**. Final land use domains are land management units characterised by a similar post-mining land use objective.

Table 6: Final Land Use Domains

Final Land Use Domain	Code
Native Ecosystem	A
Agricultural – Grazing	B
Water Management Areas	F
Water Storage (Excluding Final Void)	G
Other (Southern Woodland Conservation Area)	K

2.4.2 Mining Domains

Mining domains for the ACP and ACOL-operated RUM are listed in **Table 7**. These mining domains can be defined as land management units within the ACP boundary, which have been delineated based on operational and functional purpose and therefore similar geophysical characteristics.

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Table 7: Mining Domains

Mining Domains	Code
Infrastructure Area	1
Water Management Area	3
Overburden Emplacement Area	4
Underground Mining Area (SMP)	6
Other (Coarse Reject and Tailings Emplacement)	8
Other (Southern Woodland Conservation Area)	8

Table 8 provides an overview of the major infrastructure assets within each mining domain.

Table 8: Asset Register

Mining Domain	Major Assets
Domain 1: Infrastructure Area	Areas identified as 'Infrastructure' including: <ul style="list-style-type: none"> • CHPP and former open cut offices. • Rail line and siding. • Workshop. • Administration buildings. • Overall footprint of infrastructure (e.g. roadways). • Sewerage and water treatment plant. • Hardstand / laydown areas. • Underground infrastructure. • Other (e.g. gas wells, fencing, boreholes, conveyors, pipelines).
Domain 3: Water Management Area	Water Management Areas: <ul style="list-style-type: none"> • Bowmans Creek Diversion. • Bowmans Creek Riparian Zone. • Water dams/storage.
Domain 4: Overburden Emplacement Area	Areas identified as: <ul style="list-style-type: none"> • Pasture – NEOC. • Trees over Grass – NEOC.
Domain 6: Underground Mining Area (SMP)	Areas identified as the subsidence management area.
Domain 8: Other (Southern Woodland Conservation Area)	Areas identified as: <ul style="list-style-type: none"> • Southern Woodland Conservation Area.
Domain 8: Other (Coarse Reject and Tailings Emplacement)	Areas identified as: <ul style="list-style-type: none"> • Coarse rejects emplacement area. • Tailings Emplacement Facility (incorporating the NEOC void).

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3. REHABILITATION RISK ASSESSMENT

Key risks associated with proposed rehabilitation activities at the ACP and ACOL-operated RUM have been identified and assessed in a risk assessment undertaken by ACOL in July 2022 and February 2023 in accordance with clause 7, Schedule 8A of the *Mining Regulation 2016*, and in consideration of Guideline: *Rehabilitation Risk Assessment* and the Joint Australian and New Zealand Standard AS/NZS 31000:2009 *Risk Management – Principles and Guidelines* (Standards Australia).

The method used for the risk assessment encompassed the following key steps:

- identifying the rehabilitation related risks, including what could happen, when and where;
- analysing the risks using a qualitative risk approach (i.e. identifying existing controls, determining specific consequences/likelihoods and then determining the residual level of risk);
- making decisions based on the outcomes of the risk assessment about which of the risks need controls or the implementation of a mitigation strategy; and
- establishing controls to mitigate/treat the risks identified as part of the process.

The risks identified and considered during the risk assessment conducted by ACOL for the ACP and ACOL-operated RUM are outlined in Attachment 1.

For each of the key rehabilitation and mine closure risks identified, appropriate risk reduction strategies/actions were developed to adequately control the risk. Existing and additional controls and actions for the risks identified are provided in Attachment 1. Management and mitigation measures to address each risk are discussed in Sections 6.2 and 10.

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4. REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

For each mining domain and final land use domain, rehabilitation objectives have been developed in consideration of Condition 41, Schedule 3 of DA 309-11-2001-i and Condition 27, Schedule 3 of DA 104/96.

In accordance with clause 12, Schedule 8A of the *Mining Regulation 2016*, these Rehabilitation Objectives have been submitted to the NSW Resources Regulator for approval. Following approval of the Rehabilitation Objectives, the RMP will be amended to include the approved Rehabilitation Objectives.

4.1 Rehabilitation Objectives and Rehabilitation Completion Criteria

Key completion criteria for the ACP and ACOL-operated RUM have been proposed to address the Rehabilitation Objectives and incorporate outcomes from the assessment of completed rehabilitation in all final land use domains. Rehabilitation will need to achieve a standard which satisfies the NSW Resources Regulator that ACOL has met rehabilitation undertakings provided in this RMP and rehabilitation bonds can be released.

The ACP objectives, indicators and Completion Criteria for each of the final land use and mining domains are specified in **Table 9**. The RUM objectives, indicators and Completion Criteria for each of the final land use and mining domains are specified in **Table 10**.

In accordance with clause 12, Schedule 8A of the *Mining Regulation 2016*, the ACP and ACOL-operated RUM Rehabilitation Objectives have been submitted to the NSW Resources Regulator for approval. Following approval of the Rehabilitation Objectives and subsequent Rehabilitation Completion Criteria, the RMP will be amended to substitute the proposed version (**Table 9 and 10**) with the version approved by the NSW Resources Regulator in accordance with clause 11, Schedule 8A of the *Mining Regulation 2016*.

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method	
Domain A Native Ecosystem	Domain 1 Infrastructure Area	All surface infrastructure to be decommissioned and removed from domains unless the Resources Regulator agrees otherwise.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting. 	
		Goaf gas drainage bores decommissioned and sealed in accordance with industry best practice and government guidelines, as required.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting. 	
		Identify any contaminated soils and sediments associated with infrastructure areas, and remediate in accordance with the requirements of the NSW <i>Contaminated Land Management Act 1997</i> .	Presence of any contaminated soils or sediments.	Contaminated soils and sediments removed, and remediation completed.	<ul style="list-style-type: none"> Contaminated Lands Assessment. Requirements of the NSW <i>Contaminated Land Management Act 1997</i>. 	
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Annual Weed Inspection and findings reported in Annual Review. ACOL Weed Management Plan. <i>Biosecurity Act 2015</i>. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes. 	
			Distribution and number of feral animals.			<ul style="list-style-type: none"> Annual vertebrate pest survey and findings. ACOL Weed Management Plan. <i>Biosecurity Act 2015</i>. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes.
			Damage caused by feral animals.			<ul style="list-style-type: none"> Reported in Annual Review. <i>Local Land Services Act 2013</i>. Flora and Fauna (Biodiversity) Management Plan (FFMP) (ACOL, 2020a).
		Safety risks are eliminated as far as reasonably practicable.	Bushfire hazard reduction works.	Bushfire management activities undertaken in accordance with the conservation agreement.	<ul style="list-style-type: none"> Bushfire hazard reduction activities reported in Annual Review. <i>Rural Fires Act 1997</i>. 	
		Establish a vegetation profile consistent with the planned final land use.	Revegetation species mix to be broadly comparable to reference sites.	Species mix used aligns to the intended final land use.	<ul style="list-style-type: none"> Rehabilitation/planting activities reported in Annual Review including date of seeding and species mix used. DA Schedule 3, Condition 41. 	
		Ecological diversity will be maintained or enhanced.	Foliage cover.	Vegetation structure and complexity is broadly comparable to that of analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 41. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004). 	
			Tree diversity.	Diversity of maturing tree and shrub species is broadly comparable to that of analogue sites.		
			Tree density.	Density of maturing tree and shrub species is broadly comparable to that of analogue sites.		
			Tree health/condition.	Vegetation condition is broadly comparable to that of analogue sites.		
			Flowers, fruit, new to that of analogue sites. growth.			
Ecosystem function is restored.	LFA Organisation Index.	Index is broadly comparable to that of analogue sites.				
	LFA Stability Index.					
	LFA Infiltration Index.					

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain A Native Ecosystem (Continued)	Domain 1 Infrastructure Area (Continued)	The rehabilitated landform is consistent with the surrounding environment.	Overburden emplacement area is constructed in accordance with approved design.	Rehabilitated landform is consistent with the surrounding landscape. Overburden emplacement is constructed in accordance with the approved design and Development Consent requirements.	<ul style="list-style-type: none"> Topographic survey of final landform. Photographic monitoring of rehabilitated landforms.
		Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: <ul style="list-style-type: none"> local native plant species (unless the Resources Regulator agrees otherwise); and a landform consistent with the surrounding environment. 	Ecosystem Function Analysis (EFA) indices: <ul style="list-style-type: none"> LFA indices. Vegetation Dynamics results. Habitat Complexity results. 	Suitable EFA reference site selected equivalent to the target vegetation community. EFA results indicate that the vegetation is maturing and developing characteristics similar to that found in the relevant reference site (i.e. informed by stability, infiltration, nutrient cycling, vegetation dynamics, and habitat complexity).	EFA: <ul style="list-style-type: none"> LFA. Vegetation Dynamics Monitoring. Habitat Complexity Monitoring.
	Domain 4 Overburden Emplacement Area	Overburden emplacement areas designed to have a final slope of no greater than 10 degrees.	Overburden emplacement area slope angle.	Overburden emplacement area slopes are less than or equal to 10 degrees.	<ul style="list-style-type: none"> As constructed survey. Geotechnical assessment by a suitably qualified expert.
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Annual Weed Inspection and findings reported in Annual Review. ACOL Weed Management Plan. Biosecurity Act 2015. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes.
			Distribution and number of feral animals.		<ul style="list-style-type: none"> Annual vertebrate pest survey and findings. ACOL Weed Management Plan. Biosecurity Act 2015. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes.
			Damage caused by feral animals.		<ul style="list-style-type: none"> Reported in Annual Review Local Land Services Act 2013. FFMP (ACOL, 2020a).
		Safety risks are eliminated as far as reasonably practicable.	Bushfire hazard reduction works.	Bushfire management activities undertaken in accordance with the conservation agreement.	<ul style="list-style-type: none"> Bushfire hazard reduction activities reported in Annual Review. Rural Fires Act 1997.
		Establish a vegetation profile consistent with the planned final land use.	Revegetation species mix to be broadly comparable to reference sites.	Species mix used aligns to the intended final land use.	<ul style="list-style-type: none"> Rehabilitation/planting activities reported in Annual Review including date of seeding and species mix used. DA Schedule 3, Condition 41.
		Ecological diversity will be maintained or enhanced.	Foliage cover.	Vegetation structure and complexity is broadly comparable to that of analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 41. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
			Tree diversity.	Diversity of maturing tree and shrub species is broadly comparable to that of analogue sites.	
Tree density.	Density of maturing tree and shrub species is broadly comparable to that of analogue sites.				
Tree health/condition.	Vegetation condition is broadly comparable to that of analogue sites.				
	Flowers, fruit, new to that of analogue sites. growth.				

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method				
Domain A Native Ecosystem (Continued)	Domain 4 Overburden Emplacement Area (Continued)	Ecosystem function is restored.	LFA Organisation Index.	Index is broadly comparable to that of analogue sites.					
			LFA Stability Index.						
			LFA Infiltration Index.						
		The rehabilitated landform is consistent with the surrounding environment.	Overburden emplacement area is constructed in accordance with approved design.	Rehabilitated landform is consistent with the surrounding landscape. Overburden emplacement is constructed in accordance with the approved design and Development Consent requirements.	<ul style="list-style-type: none"> • Topographic survey of final landform. • Photographic monitoring of rehabilitated landforms. 				
						Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: <ul style="list-style-type: none"> • local native plant species (unless the Resources Regulator agrees otherwise); and • a landform consistent with the surrounding environment. 	EFA indices: <ul style="list-style-type: none"> • LFA indices. • Vegetation Dynamics results. • Habitat Complexity results. 	Suitable EFA reference site selected equivalent to the target vegetation community. EFA results indicate that the vegetation is maturing and developing characteristics similar to that found in the relevant reference site (i.e. informed by stability, infiltration, nutrient cycling, vegetation dynamics, and habitat complexity).	EFA: <ul style="list-style-type: none"> • LFA. • Vegetation Dynamics Monitoring. • Habitat Complexity Monitoring.
	Drainage.	Surface drainage contours are water shedding (excluding pre-existing natural ponds and purpose built dams and structures).	<ul style="list-style-type: none"> • DA Schedule 3, Condition 41. • Relevant Extraction Plan(s). • Reported in Annual Environmental Monitoring Report (AEMR) / Annual Review. 						
	Surface condition.	No significant or accelerating erosion.							
		Surface disturbance hazards.	All subsidence cracking repaired by filling or ripping in accordance with RMP. No visible subsidence cracking. Permanent subsidence cracking (i.e. they have not closed within one month of the longwall passing) repaired by filling or ripping.						
		Aboriginal archaeological sites protected.	Listed archaeological items / sites.	Rehabilitation works do not impact on archaeological sites.	<ul style="list-style-type: none"> • DA Schedule 3, Condition 34. • Heritage Management Plan (ACOL, 2020b). • Reported in AEMR / Annual Review. 				
		Maintain soil health capable of supporting eucalypt woodland and/or are comparable to woodlands that are not impacted by underground mining.	pH.	Performance Indicators are comparable to the woodland analogue sites or within desirable ranges provided by the agricultural industry.	<ul style="list-style-type: none"> • Annual Rehabilitation Monitoring Report: Laboratory analysis of soil samples. 				
	Organic Matter.								
	Phosphorous (Colwell).								
		The site will not be a source of pollutants.	Water pH.	Water leaving site is monitored in accordance with the Site Water Management Plan (SWMP).	<ul style="list-style-type: none"> • Surface Water Management Plan (within Water Management Plan [WMP]) (SWMP) (ACOL, 2020c). 				
Water electrical conductivity.									
Water turbidity.									
	Safety risks are eliminated as far as reasonably practicable.	Unauthorised access – people and livestock.	No uncontrolled entry of livestock or vehicles.	<ul style="list-style-type: none"> • DA Schedule 3, Condition 29. • Activities reported in AEMR / Annual Review. 					
Bushfire hazard reduction works.		No uncontrolled fires.	<ul style="list-style-type: none"> • Rural Fires Act 1997. • Activities reported in AEMR / Annual Review. 						
Site accessibility.		Vehicle access is restricted to nominated site access roads as far as practical.	<ul style="list-style-type: none"> • ACOL Weed Management Plan. • Noxious Weeds Act 1993. • Australian and NSW Weed Strategies. • Activities reported in AEMR / Annual Review. 						

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method	
Domain A Native Ecosystem (Continued)	Domain 6 Underground Mining Area (SMP) (Continued)	Woodland condition is maintained and/or is in better than pre-mining condition.	Distribution and density of weeds.	Weed species and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Annual Weed Assessment. Activities reported in AEMR / Annual Review. 	
			Distribution and number of feral animals.	Pest/feral animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Rural Lands Protection Act 1998. FFMP (ACOL, 2020a). Reported in AEMR / Annual Review. Annual vertebrate pest survey. 	
			LFA stability.	Landscape stability and functional patch area is comparable to the woodland analogue sites.	<ul style="list-style-type: none"> Annual rehabilitation monitoring report. 	
			Landscape Organisation.			
			LFA Infiltration Index.	Performance indicator is comparable to the woodland analogue sites.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. Annual Rehabilitation Monitoring Report. 	
			LFA Nutrient Recycling Index.			
			Perennial Plant Cover (<0.5 m).	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation.		
			Total Ground Cover.			
			Native understorey abundance.			
			Exotic understorey abundance.			
			Percent ground cover provided by native vegetation: <0.5 m tall	Vegetation structure and complexity is comparable to the analogue sites.		
			Foliage cover: 0.5 – 2.0 m in height.			
			Foliage cover: 2.0 – 4.0 m in height.			
			Foliage cover: 4.0 – 6.0 m in height.			
	Foliage cover: >6.0 m.	Increase woodland vegetation connectivity according to Hunter Valley Synoptic Plan.	<ul style="list-style-type: none"> Synoptic Plan (Andrews, 1999). RMP. Activities reported in AEMR / Annual Review. 			
	Area of revegetation.					
	Number of fauna species.			<ul style="list-style-type: none"> Annual review/Annual ecological monitoring report. 		
	Domain 8 Other (Coarse Rejects and Tailings Emplacement)	A safe and stable landform, supportive of the final land use.		Area.	Revegetated woodland communities provide connectivity between remnant regional communities.	<ul style="list-style-type: none"> GIS mapping. Annual Review.
				Landform.	NEOC overburden emplacement reshaped to contours shown in RMP Plan 2 (or latest equivalent). Landform slope gradients <18 degrees.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. Mine Closure Plan. RMP. Mine survey records. Annual Review. Annual Rehabilitation Report.
				Drainage.	Sediment controls installed and operating effectively (where required).	
Re-establish a growing media which is capable of supporting a sustainable eucalypt woodland.				Rill / sheet erosion >0.3 m in width or depth.	Landform condition.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. Annual Rehabilitation Monitoring Report: Laboratory analysis of soil samples.
				Minimum of 100 mm topsoil depth.	Comparable to the woodland analogue sites or within desirable ranges provided by the agricultural industry.	
				pH.		
				Organic Matter.		
			Phosphorous.			

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain A Native Ecosystem (Continued)	Domain 8 Other (Coarse Rejects and Tailings Emplacement) (Continued)	Safety risks are eliminated as far as reasonably practicable.	No unauthorised people or livestock.	No uncontrolled entry of livestock or vehicles. Fire breaks and perimeter trails are maintained. The bushfire hazard is managed in accordance with the ACOL Environmental Management Strategy (EMS).	<ul style="list-style-type: none"> Site Safety Audit. Bushfire hazard reduction activities reported in AEMR / Annual Review.
			No bushfires.		
		Landform is stable and performing as it was designed to do.	LFA stability.	Landscape stability and functional patch area is comparable to the woodland analogue sites.	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring Report.
			Landscape Organisation.		
		Mixed eucalypt woodland habitat is developing and has attributes comparable to woodland analogue sites.	Diversity of shrubs and juvenile trees.	Vegetation contains a diversity of species comparable to that of the local remnant vegetation.	
			Total species diversity.	The total number of live plant species is comparable to the local remnant vegetation.	
			Exotic species diversity.	The total number of live exotic plant species is less than or comparable to the local remnant vegetation.	
		Vegetation density.	Density of shrubs and juvenile trees.	Vegetation contains a density of species comparable to that of the local remnant vegetation.	
		Ecosystem composition.	Tree species.	The number of tree species regardless of age comprising the vegetation community is comparable to the woodland analogue sites.	
		Vegetation structure.	Shrub species.	The number of shrub species regardless of age comprising the vegetation community is comparable to the woodland analogue sites.	
		Landform is ecologically functional and contains a sustainable and diverse eucalypt woodland habitat.	LFA Infiltration Index.	Performance indicator is comparable to the woodland analogue sites. Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation.	
			LFA Nutrient Recycling.		
			Perennial Plant Cover (<0.5 m).		
			Total Ground Cover.		
		The vegetation is maturing and/or natural recruitment is occurring at rates similar to the woodland analogue sites.	Shrubs and juvenile trees: 0 - 0.5 m in height.	The density of shrubs or juvenile trees in various height classes is comparable to the woodland analogue sites.	
			Shrubs and juvenile trees: 1.5 – 2 m in height.		
			Shrubs and juvenile trees >2 m in height.		
		Ecological diversity will be maintained or enhanced.	Foliage cover: 0.5 – 2.0 m in height.	Vegetation structure and complexity is comparable to that of analogue sites.	
			Foliage cover: >6.0 m.		
			Tree diversity.	The percentage of maturing trees and shrubs with a stem diameter >5 cm dbh which are local endemic species.	
Tree density.	Density of local endemic maturing tree and shrub species is comparable to that of analogue sites.				
Healthy trees/condition.	Vegetation condition is comparable to that of analogue sites.				
Flowers, fruit, buds.	The presence of reproductive structures is comparable to the woodland analogue sites.				

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain B Agricultural – Grazing	Domain 1 Infrastructure Area	All surface infrastructure to be decommissioned and removed from domains unless the Resources Regulator agrees otherwise.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting.
		Goaf gas drainage bores decommissioned and sealed in accordance with industry best practice and government guidelines, as required.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting.
		Identify any contaminated soils and sediments associated with infrastructure areas, and remediate in accordance with the requirements of the NSW <i>Contaminated Land Management Act 1997</i> .	Presence of any contaminated soils or sediments.	Contaminated soils and sediments removed, and remediation completed.	<ul style="list-style-type: none"> Contaminated Lands Assessment. Requirements of the NSW <i>Contaminated Land Management Act 1997</i>.
		Restored and maintained to the same or higher land capability and agricultural suitability than prior to mining.	LFA Organisation Index.	Performance indicator is broadly comparable to that of analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 29. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
			LFA Stability Index.		
	Final landform is sustainable and resilient to environmental pressures.	LFA Infiltration Index.	Field data results are used to define land capability and include: <ul style="list-style-type: none"> Climate. Soil texture. Position. Slope. Erosion. pH. Drainage. Rock. 		
		Land Capability Class.			
	Domain 4 Overburden Emplacement Area	Overburden emplacement areas designed to have a final slope of no greater than 10 degrees.	Weed species abundance and diversity.	Performance indicator is broadly comparable to that of analogue sites. Weed species abundance to be consistent or lower than benchmark value of the average of the analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 29. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
			Groundcover.		
		Restored and maintained to the same or higher land capability and agricultural suitability than prior to mining.	LFA Organisation Index.	Performance indicator is broadly comparable to that of analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 29. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
LFA Stability Index.					
LFA Infiltration Index.					
Land Capability Class.	Field data results are used to define land capability and include: <ul style="list-style-type: none"> Climate. Soil texture. Position. Slope. Erosion. pH. Drainage. Rock. 				

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain B Agricultural – Grazing (Continued)	Domain 4 Overburden Emplacement Area (Continued)	Final landform is sustainable and resilient to environmental pressures.	Weed species abundance and diversity. Groundcover.	Performance indicator is broadly comparable to that of analogue sites. Weed species abundance to be consistent or lower than benchmark value of the average of the analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 29. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
	Domain 6 Underground Mining Area (SMP)	Pasture areas impacted by mine subsidence are restored and maintained to the same or higher land capability than prior to mining.	Landform slope. Drainage. Surface condition	Consistent with surrounding landform, where practical. Surface drainage contours are water shedding (excluding pre-existing natural ponds and purpose-built dams and structures). No significant or accelerating erosion.	<ul style="list-style-type: none"> DA Schedule 3, Condition 29. DA Schedule 3, Condition 41. Relevant Extraction Plan(s). Annual Rehabilitation Monitoring Report.
		Aboriginal archaeological sites protected.	Listed archaeological items / sites.	Rehabilitation works do not impact on archaeological sites.	<ul style="list-style-type: none"> DA Schedule 3, Condition 34. Heritage Management Plan (ACOL, 2020b).
		Pasture areas impacted by mine subsidence are restored and maintained to the same or higher land capability than prior to mining.	pH. Organic Matter. Phosphorous (Colwell).	Indicators of soil health are comparable to the pasture analogue sites or within desirable ranges provided by the agricultural industry.	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring Report: Laboratory analysis of soil samples.
		The site will not be a source of pollutants.	Water pH. Water electrical conductivity. Total Suspended solids.	Water leaving site is monitored in accordance with the Site Water Management Plan (SWMP).	<ul style="list-style-type: none"> SWMP (ACOL, 2020c).
		Safety risks are eliminated as far as reasonably practicable.	Unauthorised access – people and livestock. Bushfire hazard reduction works.	No uncontrolled entry of livestock or vehicles. No uncontrolled fires.	<ul style="list-style-type: none"> DA Schedule 3, Condition 29. Rural Fires Act 1997. Bushfire hazard reduction activities reported in AEMR / Annual Review.
		Pasture areas restored and maintained to the same or higher land capability than prior to mining.	LFA stability. Landscape Organisation. Green Dry Matter Biomass. Land capability class. Stock watering troughs. Distribution and number of feral animals. Damage caused by feral animals.	Landscape stability and functional patch area is comparable to the pasture analogue sites. Pasture productivity is comparable to analogue sites. Land capability class is the same or better than pre-mining environment and/or comparable to pasture analogue sites. Stock watering troughs are installed at strategic locations on pasture areas adjacent to the creek in the post-mine landscape, where required. Pest/feral animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring Report: Land capability mapping. AEMR / Annual Review. DA Appendix 3, Item 9.5. Reported in AEMR / Annual Review. Rural Lands Protection Act 1998. FFMP (ACOL, 2020a). Reported in AEMR / Annual Review.
		Landform is ecologically functional and contains a sustainable and diverse grazing pasture.	LFA Infiltration Index. LFA Nutrient Recycling. Perennial Plant Cover (<0.5 m) Total Ground Cover. Native understorey abundance. Exotic understorey abundance. Percent ground cover provided by native vegetation <0.5 m tall.	Performance indicator is comparable to the pasture analogue sites. Ground layer contains protective ground cover and habitat structure comparable with the pasture analogue sites.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. Annual Rehabilitation Monitoring Report.

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain B Agricultural – Grazing (Continued)	Domain 8 Other (Coarse Rejects and Tailings Emplacement)	A safe and stable landform, supportive of the final land use.	<18 degrees landform slope as assessed by surveyor.	NEOC overburden emplacement reshaped to contours shown in RMP Plan 2 (or latest equivalent). Landform slope gradients <18 degrees.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41 Mine Closure Plan. RMP. Mine survey records. Annual Review. Annual Rehabilitation Report
			Review of surface drainage contours indicates landform is water shedding.	Drainage structures (drop structures, drains and dams) functioning as per design specified in the Site Water Management Plan.	<ul style="list-style-type: none"> DA Schedule 3, Condition 29 WMP (ACOL, 2020c). ACOL internal environmental inspection process.
			Rill / sheet erosion >0.3 m in width or depth.	Landform condition.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41 FFMP (ACOL, 2020a). Annual Rehabilitation Monitoring Report.
		Establish a growing media which is capable of supporting agricultural vegetation and/or are comparable to the local grazing pastures.	pH.	Comparable to the pasture analogue sites or within desirable ranges provided by the agricultural industry.	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring Report. Laboratory analysis of soil samples.
			Organic Matter.		
			Phosphorous (Cowell).		
		The site will not be a source of pollutants.	Water pH.	Water leaving site is monitored in accordance with the Site Water Management Plan (SWMP).	<ul style="list-style-type: none"> SWMP (ACOL, 2020c).
			Water electrical conductivity.		
			Total Suspended solids.		
		Landform is stable and performing as it was designed to do	LFA stability.	Landscape stability and functional patch area is comparable to the pasture analogue sites	<ul style="list-style-type: none"> RMP. DA Schedule 3, Condition 41. Annual Rehabilitation Monitoring Report.
			Landscape Organisation.		
		Establish a vegetation profile consistent with the planned final land use.	Exotic pastures have a diversity of exotic species that is comparable to or less than the pasture analogue sites.	Exotic species richness	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring Report.
			Pasture productivity is comparable to analogue sites.	Green Dry Matter Biomass	
		Land capability class is the same or better than pre-mining environment.	Land capability assessments	Land capability is comparable to analogue sites.	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring Report.
		Safety risks are eliminated as far as reasonably practicable.	No unauthorised people or livestock.	No uncontrolled entry of livestock or vehicles.	<ul style="list-style-type: none"> Site Safety Audit.
No bushfires.	Fire breaks and perimeter trails are maintained. The bushfire hazard is managed in accordance with the ACOL EMS.		<ul style="list-style-type: none"> Bushfire hazard reduction activities reported in AEMR / Annual Review. 		
Pastures are established and maintained to the same or higher land capability and agricultural suitability than prior to mining.	LFA Infiltration Index.	Performance indicator is comparable to the pasture analogue sites.	<ul style="list-style-type: none"> RMP. DA Schedule 3, Condition 41. Annual Rehabilitation Monitoring Report. 		
	LFA Nutrient Recycling				
	Perennial Plant Cover (<0.5 m)				
	Total Ground Cover				
	Land Capability Class.				

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method	
Domain F Water Management Areas	Domain 1 Infrastructure Area	All surface infrastructure to be decommissioned and removed from domains unless the Resources Regulator agrees otherwise.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting. 	
		Identify any contaminated soils and sediments associated with infrastructure areas, and remediate in accordance with the requirements of the NSW <i>Contaminated Land Management Act 1997</i> .	Presence of any contaminated soils or sediments.	Contaminated soils and sediments removed and remediation completed.	<ul style="list-style-type: none"> Contaminated Lands Assessment. Requirements of the NSW <i>Contaminated Land Management Act 1997</i>. 	
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Annual Weed Inspection and findings reported in Annual Review. ACOL Weed Management Plan. <i>Biosecurity Act 2015</i>. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes. 	
			Distribution and number of feral animals.			<ul style="list-style-type: none"> Annual vertebrate pest survey and findings. ACOL Weed Management Plan. <i>Biosecurity Act 2015</i>. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes.
			Damage caused by feral animals.			<ul style="list-style-type: none"> Reported in Annual Review. <i>Local Land Services Act 2013</i>. FFMP (ACOL, 2020a).
		Safety risks are eliminated as far as reasonably practicable.	Bushfire hazard reduction works.	Bushfire management activities undertaken in accordance with the conservation agreement.	<ul style="list-style-type: none"> Bushfire hazard reduction activities reported in AEMR/Annual Review. <i>Rural Fires Act 1997</i>. 	
			Bushfire hazard.	Fire breaks and perimeter trails are maintained. The bushfire hazard is managed in accordance with the ACOL EMS.		
		A safe and stable landform, supportive of the final land use is re-established in the new diversion channel.	Landform	Consistent with adjacent channels and/or surrounding landform, where practical.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010). FFMP (ACOL, 2020a). 	
		Diversion channels are hydrologically and geomorphologically stable.	Diversion channel stability.	No significant or increasing areas of erosion observed during annual monitoring events.	<ul style="list-style-type: none"> DA Schedule 3, Condition 23(c). WMP (ACOL, 2020c). Bowmans Creek Annual Monitoring. 	
			Rill / sheet erosion >0.3 m in width or depth.			
		Water diverted from excised channel sections.	Block banks.	Stage 2 (final) block banks constructed 12 months before mining commences in LW 106B.	<ul style="list-style-type: none"> WMP (ACOL, 2020c). 	
		Re-establish a growing media capable of supporting a sustainable riparian woodland vegetation community.	pH.	Comparable to the riparian analogue sites or within desirable ranges provided by the agricultural industry	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. DECC (2008) Vol 2E. Annual Rehabilitation Monitoring Report: Laboratory analysis of soil samples. 	
			Organic Matter.			
Phosphorous (Colwell).						

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method	
Domain F Water Management Areas (Continued)	Domain 1 Infrastructure Area (Continued)	Limit soil compaction and the spread of weeds by minimising site access by vehicles and stock.	Fencing.	Vehicle access is restricted to nominated site access roads as far as practical.	<ul style="list-style-type: none"> • Conditions of Ground Disturbance Permits. • Reported in Annual Review. 	
				Livestock grazing is restricted and/or strategic grazing management is implemented along riparian zones.		<ul style="list-style-type: none"> • ACOL Weed Management Plan. • <i>Noxious Weeds Act 1993</i>. • Australian and NSW Weed Strategies.
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weed species and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> • TSC Act – Key Threatening Processes. • Annual Weed Inspection and findings reported in AEMR / Annual Review. 	
				Pest and feral animal species, and abundance are comparable to analogue sites.		<ul style="list-style-type: none"> • <i>Rural Lands Protection Act 1998</i>. • FFMP (ACOL, 2020a). • Annual vertebrate pest survey and findings reported in AEMR / Annual Review.
		Landform is stable and performing as it was designed to do.	LFA stability.	Landscape stability and LOI is comparable to the riparian woodland analogue sites.	<ul style="list-style-type: none"> • Annual Rehabilitation Monitoring Report. 	
			Landscape Organisation.			
		Riparian woodland habitat is developing and has attributes comparable to riparian woodland analogue sites.	Diversity of shrubs and juvenile trees.	The percentage of local endemic shrubs and juvenile trees are comparable to the local riparian woodlands.	<ul style="list-style-type: none"> • Bowmans Creek Diversion Management Plan. • WMP (ACOL, 2020c). • Rehabilitation/planting activities reported in AEMR. • Annual Rehabilitation Monitoring Report. 	
			Exotic species diversity.	The total number of live exotic plant species is less than or comparable to the local riparian woodlands.		
			Density of shrubs and juvenile trees.	The density of endemic shrubs or juvenile trees with a stem diameter < 5 cm is comparable to the local riparian woodlands.		
			Tree diversity.	The number of tree species regardless of age comprising the vegetation community is comparable to the local riparian woodlands.		
			Shrub diversity.	The number of shrub species regardless of age comprising the vegetation community is comparable to the local riparian woodlands.		
			Herbs/forb diversity.	The number of herb/ forb species comprising the vegetation community is comparable to the local riparian woodlands.		
		Grass diversity.	The number of grass species comprising the vegetation community is comparable to the local riparian woodlands.			

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method	
Domain F Water Management Areas (Continued)	Domain 1 Infrastructure Area (Continued)	Land capability class is the same or better than pre-mining environment and/or comparable to pasture analogue sites. Safe and stable landforms; Diversion Channels and in-stream habitat support sustainable aquatic environments and riparian woodland habitats	Land capability class.	Bowmans Creek riparian corridor land capability class is the same or better than pre-mining environment and/or comparable to pasture analogue sites.	<ul style="list-style-type: none"> Land capability mapping. AEMR / Annual Review. 	
			Five yearly cross-sectional survey and geomorphology report.	Hydrologically and geomorphologically consistent with nearby non-mining-disturbed creeks.		<ul style="list-style-type: none"> WMP (ACOL, 2020c). Post flow assessments. Five yearly physical survey.
			Aquatic ecology report.	In stream aquatic habitat, flora and fauna meet performance criteria of the SWMP and/or are comparable to riparian analogue sites.		<ul style="list-style-type: none"> Performance criteria for Stream Health contained in the Site Water Management Plan. Aquatic ecology monitoring.
			No habitat features (natural and installed).	Habitat for native fauna is maintained or enhanced.		<ul style="list-style-type: none"> Annual ecological Monitoring report.
		Landform is ecologically functional and contains a sustainable and diverse riparian woodland.	LFA Infiltration Index.	Performance indicator is comparable to the riparian woodland analogue sites.	Ground layer contains protective ground cover and habitat structure comparable with the riparian woodland analogue sites.	<ul style="list-style-type: none"> DA Schedule 3 Condition 41. Bowmans Creek Diversion Management Plan in SWMP (ACOL, 2020c). Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010). Annual Rehabilitation Monitoring Report.
			LFA Nutrient Recycling.			
			Perennial Plant Cover (<0.5 m).			
			Total Ground Cover.			
			Native understorey abundance.			
			Exotic understorey abundance.			
			Percent ground cover provided by native vegetation: <0.5 m tall.			
		The vegetation is maturing and/or natural recruitment is occurring at rates similar to the riparian woodland analogue sites.	Shrubs and juvenile trees: 0 - 0.5 m in height.	The density of shrubs or juvenile trees in various height classes is comparable to the riparian woodland analogue sites.		
			Shrubs and juvenile trees: >2 m in height.			
		Ecological diversity will be maintained or enhanced.	Foliage cover: 0.5 – 2.0 m in height.	Vegetation structure and complexity is comparable to riparian woodland analogue sites.		
			Foliage cover >6.0 m.			
			Tree diversity.	Diversity of local endemic tree and shrub species >5cm dbh is comparable to riparian woodland analogue sites.		
				Vegetation contains a density of maturing tree and shrubs species comparable to the riparian woodland analogue sites.		
			Flowers/fruit: Trees.	The presence of reproductive structures such as buds, flowers or fruit is comparable to the riparian woodland reference sites.		
		The health of the River Red Gum population is of the same or better quality than existed pre-mining.	Tree health condition.	Results of annual monitoring demonstrate River Red Gum health is maintained or improved and is comparable to the riparian woodland analogue sites.		
			Flowers/fruit/seedlings.	The % population with reproductive structures is comparable to the riparian woodland reference sites.		
Eucalypt seedlings are present.	Evidence of natural regeneration through new growth and recruitment.					

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain F Water Management Areas (Continued)	Domain 3 Water Management Area	A safe and stable landform, supportive of the final land use is re-established in the new diversion channel.	Landform	Consistent with adjacent channels and/or surrounding landform, where practical.	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010). FFMP.
		Diversion channels are hydrologically and geomorphologically stable.	Diversion channel stability.	No significant or increasing areas of erosion observed during annual monitoring events.	<ul style="list-style-type: none"> DA Schedule 3, Condition 23(c). WMP (ACOL, 2020c). Bowmans Creek Annual Monitoring.
			Rill / sheet erosion >0.3m in width or depth.		
		Water diverted from excised channel sections.	Block banks.	Stage 2 (final) block banks constructed 12 months before mining commences in LW 106B.	<ul style="list-style-type: none"> WMP (ACOL, 2020c).
		Re-establish a growing media capable of supporting a sustainable riparian woodland vegetation community.	pH.	Comparable to the riparian analogue sites or within desirable ranges provided by the agricultural industry	<ul style="list-style-type: none"> DA Schedule 3, Condition 41. DECC (2008) Vol 2E. Annual Rehabilitation Monitoring Report: Laboratory analysis of soil samples.
			Organic Matter.		
			Phosphorous (Colwell).		
		Limit soil compaction and the spread of weeds by minimising site access by vehicles and stock.	Fencing.	Vehicle access is restricted to nominated site access roads as far as practical.	<ul style="list-style-type: none"> Conditions of Ground Disturbance Permits. Reported in Annual Review.
				Livestock grazing is restricted and/or strategic grazing management is implemented along riparian zones.	<ul style="list-style-type: none"> ACOL Weed Management Plan. Noxious Weeds Act 1993. Australian and NSW Weed Strategies. TSC Act – Key Threatening Processes. Annual Weed Inspection and findings reported in AEMR / Annual Review.
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weed species and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Rural Lands Protection Act 1998. FFMP (ACOL, 2020a). Annual vertebrate pest survey and findings reported in AEMR / Annual Review.
Distribution and number of feral animals.	Pest and feral animal species, and abundance are comparable to analogue sites.				
Damage caused by feral animals.					
Safety risks are eliminated as far as reasonably practicable.	Bushfire hazard.	Fire breaks and perimeter trails are maintained. The bushfire hazard is managed in accordance with the ACOL EMS.	<ul style="list-style-type: none"> Rural Fires Act 1997. Bushfire hazard reduction activities reported in AEMR / Annual Review. 		
Landform is stable and performing as it was designed to do.	LFA stability.	Landscape stability and LOI is comparable to the riparian woodland analogue sites.	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring Report. 		
	Landscape Organisation.				

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method	
Domain F Water Management Areas (Continued)	Domain 3 Water Management Area (Continued)	Riparian woodland habitat is developing and has attributes comparable to riparian woodland analogue sites.	Diversity of shrubs and juvenile trees.	The percentage of local endemic shrubs and juvenile trees are comparable to the local riparian woodlands.	<ul style="list-style-type: none"> Bowmans Creek Diversion Management Plan. WMP (ACOL, 2020c). Rehabilitation/planting activities reported in AEMR. Annual Rehabilitation Monitoring Report. 	
			Total species diversity.	The total number of live plant species is comparable to the local riparian woodlands.		
			Exotic species diversity.	The total number of live exotic plant species is less than or comparable to the local riparian woodlands.		
			Density of shrubs and juvenile trees.	The density of endemic shrubs or juvenile trees with a stem diameter < 5 cm is comparable to the local riparian woodlands.		
			Tree diversity.	The number of tree species regardless of age comprising the vegetation community is comparable to the local riparian woodlands.		
			Shrub diversity.	The number of shrub species regardless of age comprising the vegetation community is comparable to the local riparian woodlands.		
			Herbs/forb diversity.	The number of herb/ forb species comprising the vegetation community is comparable to the local riparian woodlands.		
			Grass diversity.	The number of grass species comprising the vegetation community is comparable to the local riparian woodlands.		
		Land capability class is the same or better than pre-mining environment and/or comparable to pasture analogue sites. Safe and stable landforms; Diversion Channels and in-stream habitat support sustainable aquatic environments and riparian woodland habitats	Land capability class.	Bowmans Creek riparian corridor land capability class is the same or better than pre-mining environment and/or comparable to pasture analogue sites.	<ul style="list-style-type: none"> Land capability mapping. AEMR / Annual Review. 	
			Five yearly cross-sectional survey and geomorphology report.	Hydrologically and geomorphologically consistent with nearby non-mining-disturbed creeks.	<ul style="list-style-type: none"> WMP (ACOL, 2020c). Post flow assessments. Five yearly physical survey. 	
			Aquatic ecology report.	In stream aquatic habitat, flora and fauna meet performance criteria of the SWMP and/or are comparable to riparian analogue sites.	<ul style="list-style-type: none"> Performance criteria for Stream Health contained in the Site Water Management Plan. Aquatic ecology monitoring. Annual ecological Monitoring report. 	
			No habitat features (natural and installed).	Habitat for native fauna is maintained or enhanced.		
		Landform is ecologically functional and contains a sustainable and diverse riparian woodland.	LFA Infiltration Index.	Performance indicator is comparable to the riparian woodland analogue sites.	<ul style="list-style-type: none"> DA Schedule 3 Condition 41. Bowmans Creek Diversion Management Plan in SWMP (ACOL, 2020c). Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010). Annual Rehabilitation Monitoring Report. 	
			LFA Nutrient Recycling.			
			Perennial Plant Cover (<0.5 m).			Ground layer contains protective ground cover and habitat structure comparable with the riparian woodland analogue sites.
			Total Ground Cover.			
			Native understorey abundance.			
			Exotic understorey abundance.			
		Percent ground cover provided by native vegetation: <0.5 m tall.				
		The vegetation is maturing and/or natural recruitment is occurring at rates similar to the riparian woodland analogue sites.	Shrubs and juvenile trees: 0 - 0.5 m in height.	The density of shrubs or juvenile trees in various height classes is comparable to the riparian woodland analogue sites.		
shrubs and juvenile trees: >2 m in height.						

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain F Water Management Areas (Continued)	Domain 3 Water Management Area (Continued)	Ecological diversity will be maintained or enhanced.	Foliage cover: 0.5 – 2.0 m in height.	Vegetation structure and complexity is comparable to riparian woodland analogue sites.	<ul style="list-style-type: none"> •
			Foliage cover: >6.0 m.		
			Tree diversity.	Diversity of local endemic tree and shrub species >5cm dbh is comparable to riparian woodland analogue sites.	
			Flowers/fruit: Trees.	Vegetation contains a density of maturing tree and shrubs species comparable to the riparian woodland analogue sites.	
		The health of the River Red Gum population is of the same or better quality than existed pre-mining.	Tree health condition.	Results of annual monitoring demonstrate River Red Gum health is maintained or improved and is comparable to the riparian woodland analogue sites.	
			Flowers/fruit/seedlings.	The % population with reproductive structures is comparable to the riparian woodland reference sites.	
			Eucalypt seedlings are present.	Evidence of natural regeneration through new growth and recruitment.	
Domain G Water Storage (Excluding Final Void)	Domain 3 Water Management Area	Pre-mining surface flow and pool holding capacity is restored as soon as reasonably practicable for sections of Bowmans Creek within the underground mining area (except those sections of channel made redundant by diversion).	Water level recession analysis.	Compared to representative sites in remaining functional sections of the creek.	<ul style="list-style-type: none"> • Compared to representative sites in remaining functional sections of the creek.
		Hydraulically and geomorphologically stable, with riparian vegetation that is the same or better than existing in the adjacent channel prior to mining.			
		Limit soil compaction and the spread of weeds by minimising site access by vehicles and stock.	Adequate fencing is installed and maintained.	Vehicle access is restricted to nominated site access roads as far as practical.	<ul style="list-style-type: none"> • FFMP (ACOL, c). • <i>Biosecurity Act 2015</i>. • Australian and NSW Weed Strategies. • BC Act – Key Threatening Processes.
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> • Annual Weed Inspection and findings reported in Annual Review. • FFMP (ACOL, 2020a). • <i>Biosecurity Act 2015</i>. • Australian and NSW Weed Strategies. • BC Act – Key Threatening Processes.
			Distribution and number of feral animals.		
			Damage caused by feral animals.	<ul style="list-style-type: none"> • Annual vertebrate pest survey and findings reported in Annual Review • FFMP (ACOL, 2020a). • <i>Biosecurity Act 2015</i>. • <i>Local Land Services Act 2013</i>. 	
Safety risks are eliminated as far as reasonably practicable.	Bushfire hazard.	Fire breaks and perimeter trails are maintained. The bushfire hazard is managed in accordance with the ACOL EMS.	<ul style="list-style-type: none"> • Bushfire hazard reduction activities reported in Annual Review. • <i>Rural Fires Act 1997</i>. 		

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain G Water Storage (Excluding Final Void) (Continued)	Domain 3 Water Management Area (Continued)	Establish vegetation profile consistent with the planned final land use.	Revegetation species mix applied in accordance with the RMP.	Species mix used aligns to the intended final land use.	<ul style="list-style-type: none"> Rehabilitation/planting activities reported in Annual Review including date of seeding and species mix used. Florabank Guidelines (1999).
			Structural complexity scores.	Groundcover includes tussock grass clumps, areas of open ground and fallen timber.	<ul style="list-style-type: none"> Reporting and monitoring protocol as per the Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010) employing a modified vegetation complexity assessment method (Newsome & Catling 1979). Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010).
				Mid-stratum is very open to sparse, > 2 m in height.	
				Over-storey structure ranges from forest (i.e. riparian corridor) to woodland (i.e. floodplain areas), with a diverse yet clumped species composition that is consistent with reference sites.	
		Structural complexity scores are broadly comparable to reference sites.			
		The riparian zone is self-sustaining and ecologically diverse.	LFA, Landscape Organisation Index, Stability Index and Infiltration Index.	LOI of 50 in rehabilitated areas.	<ul style="list-style-type: none"> Ecosystem Function Analysis (EFA) monitoring program. DA Schedule 3, Condition 41. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
			Weed species abundance and diversity.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Records of weed control activities. Ecosystem resilience reported in Annual Review.
			Groundcover.	Areas of bare ground are broadly comparable to analogue site.	<ul style="list-style-type: none"> Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010).
			Natural regeneration.	Evidence of natural regeneration through new growth and recruitment.	<ul style="list-style-type: none"> Riparian vegetation monitoring. Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010).
			Vegetation structure and composition.	Vegetation structure and complexity is broadly comparable to that of the local remnant vegetation.	
			Vegetation health/condition.	Vegetation condition is broadly comparable to that of the local remnant vegetation.	
		Vegetation is of the same or better quality than existed pre-mining.	Health of established River Red Gum individuals.	Results of monitoring or pilot study demonstrate River Red Gum health is maintained or improved.	<ul style="list-style-type: none"> Reporting and monitoring protocol as per the Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010). Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010)
			Comparative health assessments using reference sites as indicators of health.		
		Habitat for native fauna is maintained or enhanced.	Total number of threatened species observed.	Monitoring results indicate key performance indicators are maintained or recording a positive trend.	<ul style="list-style-type: none"> Annual Ecological Monitoring Report. Bowmans Creek Diversion Rehabilitation Strategy (ACOL, 2010).
Species diversity.					
Limit soil compaction and the spread of weeds by minimising site access by vehicles and stock.	Fencing.	Vehicle access is restricted to nominated site access roads as far as practical.	<ul style="list-style-type: none"> Adequate fencing is installed and maintained. FFMP (ACOL, 2020a). Biosecurity Act 2015. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes. 		
		Stock is excluded.			

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain G Water Storage (Excluding Final Void) (Continued)	Domain 3 Water Management Area (Continued)	Safe, stable and non-polluting.	Condition assessment.	No evidence of cracking, structural failure or uncontrolled water loss.	<ul style="list-style-type: none"> Condition is assessed during annual monitoring activities (NEOC) or following subsidence impacts (underground). DA Schedule 3, Condition 29.
		Rehabilitate the diverted sections of Bowmans Creek to a naturally vegetated state using appropriate endemic species to provide improved riparian and aquatic habitat compared to that which exists at present (as demonstrated by comparison to reference sites and baseline monitoring undertaken to date).	EFA indices: <ul style="list-style-type: none"> LFA indices. Vegetation Dynamics results. Habitat Complexity results. 	Suitable EFA reference site selected equivalent to the target riparian vegetation community. EFA results indicate that the riparian vegetation is maturing and developing characteristics similar to that found in the relevant reference site (i.e. informed by stability, infiltration, nutrient cycling, vegetation dynamics, and habitat complexity).	EFA: <ul style="list-style-type: none"> LFA. Vegetation Dynamics Monitoring. Habitat Complexity Monitoring.
		Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: <ul style="list-style-type: none"> local native plant species (unless the Resources Regulator agrees otherwise); and a landform consistent with the surrounding environment. 	EFA indices: <ul style="list-style-type: none"> LFA indices. Vegetation Dynamics results. Habitat Complexity results. 	Suitable EFA reference site selected equivalent to the target vegetation community. EFA results indicate that the vegetation is maturing and developing characteristics similar to that found in the relevant reference site (i.e. informed by stability, infiltration, nutrient cycling, vegetation dynamics, and habitat complexity).	EFA: <ul style="list-style-type: none"> LFA. Vegetation Dynamics Monitoring. Habitat Complexity Monitoring.
Domain K Other (Southern Woodland Conservation Area)	Domain 1 Infrastructure Area	All surface infrastructure to be decommissioned and removed from domains unless the Resources Regulator agrees otherwise.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting.
		Goaf gas drainage bores decommissioned and sealed in accordance with industry best practice and government guidelines, as required.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting.
		Identify any contaminated soils and sediments associated with infrastructure areas, and remediate in accordance with the requirements of the NSW <i>Contaminated Land Management Act 1997</i> .	Presence of any contaminated soils or sediments.	Contaminated soils and sediments removed and remediation completed.	<ul style="list-style-type: none"> Contaminated Lands Assessment. Requirements of the NSW <i>Contaminated Land Management Act 1997</i>.
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Annual Weed Inspection and findings reported in Annual Review. ACOL Weed Management Plan. <i>Biosecurity Act 2015</i>. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes.
			Distribution and number of feral animals.		
	Damage caused by feral animals.		<ul style="list-style-type: none"> Reported in Annual Review <i>Local Land Services Act 2013</i>. FFMP (ACOL, 2020a). 		
Safety risks are eliminated as far as reasonably practicable.	Bushfire hazard reduction works.	Bushfire management activities undertaken in accordance with the conservation agreement.	<ul style="list-style-type: none"> Bushfire hazard reduction activities reported in Annual Review. <i>Rural Fires Act 1997</i>. 		

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain K Other (Southern Woodland Conservation Area) (Continued)	Domain 1 Infrastructure Area (Continued)	Manage the SVCA in accordance with the Conservation Agreement.	Conservation Agreement.	Southern woodland conservation area managed in accordance with the Conservation Agreement.	<ul style="list-style-type: none"> DA Schedule 3 Condition 41. Activities reported in AEMR / Annual Review. Conservation Agreement.
		Establish a vegetation profile consistent with the planned final land use.	Revegetation species mix to be broadly comparable to reference sites.	Species mix used aligns to the intended final land use.	<ul style="list-style-type: none"> Rehabilitation/planting activities reported in Annual Review including date of seeding and species mix used. DA Schedule 3, Condition 41.
		Ecological diversity will be maintained or enhanced.	Foliage cover.	Vegetation structure and complexity is broadly comparable to that of analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 41. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
			Tree diversity.	Diversity of maturing tree and shrub species is broadly comparable to that of analogue sites.	
			Tree density.	Density of maturing tree and shrub species is broadly comparable to that of analogue sites.	
			Tree health/condition.	Vegetation condition is broadly comparable to that of analogue sites.	
			Flowers, fruit, new to that of analogue sites. growth.		
		Ecosystem function is restored.	LFA Organisation Index.	Index is broadly comparable to that of analogue sites.	
			LFA Stability Index.		
			LFA Infiltration Index.		
		The rehabilitated landform is consistent with the surrounding environment.	Overburden emplacement area is constructed in accordance with approved design.	Rehabilitated landform is consistent with the surrounding landscape. Overburden emplacement is constructed in accordance with the approved design and Development Consent requirements.	<ul style="list-style-type: none"> Topographic survey of final landform. Photographic monitoring of rehabilitated landforms.
		Enhance biodiversity value by providing habitat, forage, and contribute to movement corridors.	Area of revegetation.	Targeted revegetation where required	<ul style="list-style-type: none"> Synoptic Plan (Andrews, 1999). RMP. GIS Mapping.
	Number of fauna species.		Distribution of coarse woody debris and rocks to optimise habitat and inter connectivity across the landscape.	<ul style="list-style-type: none"> Annual review/Annual ecological monitoring report. 	
	Domain 8 Other (Southern Woodland Conservation Area)	A safe and stable landform, supportive of the final land use is re-established in areas impacted by mine subsidence.	Landform slope.	Consistent with surrounding landform, where practical.	<ul style="list-style-type: none"> DA Schedule 3 Condition 41. Activities reported in AEMR / Annual Review.
			Pooling of water.	Drainage contours deemed free draining, except for purpose built dams and structures. No unplanned pooling of water.	
			Rill / sheet erosion.	No identifiable rill or sheet erosion.	
			Surface disturbance/ hazards.	All subsidence cracking repaired by filling or ripping in accordance with the RMP. No visible subsidence cracking.	
		Rehabilitation works do not impact on sites/ areas of Aboriginal cultural heritage.	Location of listed archaeological item.	Compliance with permits.	<ul style="list-style-type: none"> DA Schedule 3, Condition 29. Activities reported in AEMR / Annual Review.

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain K Other (Southern Woodland Conservation Area) (Continued)	Domain 8 Other (Southern Woodland Conservation Area) (Continued)	Maintain soil health capable of supporting grazing woodland and/or are comparable to woodlands that are not impacted by underground mining.	pH.	Topsoil depth, structure and texture to be consistent with pre-existing environment and/or comparable to woodland analogue sites.	<ul style="list-style-type: none"> DA Schedule 3, Condition 27. Remediation activities recorded in AEMR/ Annual Review. Annual Rehabilitation Monitoring report. Laboratory analysis of soil samples.
			Organic Matter (OM).		
			Phosphorous (Colwell).		
		Manage the SVCA in accordance with the Conservation Agreement.	Conservation Agreement.	SVCA managed in accordance with the Conservation Agreement.	<ul style="list-style-type: none"> DA Schedule 3, Condition 27. FFMP (ACOL, 2020a). RMP. Conservation Agreement. Activities reported in AEMR / Annual Review.
		Limit soil compaction and the spread of weeds by minimising site access by vehicles.	Site accessibility.	Vehicle access is restricted to nominated site access roads.	<ul style="list-style-type: none"> FFMP. Conservation Agreement . Annual Weed Inspection and findings reported in AEMR / Annual Review.
				Stock is excluded from areas undergoing revegetation in accordance with the FFMP and conservation agreement.	
				Any access tracks no longer required are closed to allow natural regeneration.	
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> FFMP. Conservation Agreement . Annual vertebrate pest survey and findings reported in AEMR / Annual Review.
			Distribution and number of feral animals.		
			Damage caused by feral animals.		
		Appropriate management activities.		All activities undertaken in accordance with FFMP and conservation agreement.	<ul style="list-style-type: none"> FFMP (ACOL, 2020a). Conservation Agreement. Management activities reported in AEMR / Annual Review.
		The rehabilitated landscape is enhanced using best available practices and materials.	Nest boxes are being utilised by target species.	Nest boxes established in accordance with the conservation agreement, FFMP and vegetation clearance protocol.	<ul style="list-style-type: none"> FFMP (ACOL, 2020a). Conservation Agreement. Reported in AEMR / Annual Review.
				Nest boxes established are monitored and maintained.	
			Tree hollows are being utilised by target species.	Tree hollows relocated to southern woodland conservation area during vegetation clearing in accordance with FFMP where practical.	
Bushfire hazard reduction works.	Bushfire management activities undertaken in accordance with the conservation agreement.		<ul style="list-style-type: none"> Rural Fires Act 1997. Activities reported in AEMR / Annual Review. 		

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Table 9: ACP Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method		
Domain K Other (Southern Woodland Conservation Area) (Continued)	Domain 8 Other (Southern Woodland Conservation Area) (Continued)	Woodland condition is maintained and/or is in better than pre-mining condition.	Landscape Organisation.	Landscape stability and functional patch area is comparable to the woodland analogue sites.	<ul style="list-style-type: none"> Annual Rehabilitation Monitoring report. 		
			LFA stability Index.				
			Diversity of shrubs and juvenile trees.	The woodland contains a diversity and density of species comparable to the woodland analogue sites.			
			Total species richness.				
			Native species richness.				
			Exotic species richness.				
			Density of shrubs and juvenile trees.				
			Tree diversity.				
			Shrub diversity.				
			Herb diversity.				
		Grass diversity.					
		Woodland condition is maintained and/or is in better than pre-mining condition.		LFA Infiltration Index.	Ground layer contains protective ground cover and habitat structure comparable with the local remnant vegetation.	<ul style="list-style-type: none"> DA Schedule 3, Condition 42. FFMP (ACOL, 2020a). Conservation Agreement. Annual Rehabilitation Monitoring Report. 	
							LFA Nutrient Recycling.
							Perennial Plant Cover (<0.5 m).
							Total Ground Cover.
							Native understorey abundance.
							Exotic understorey abundance.
							Percent ground cover provided by native vegetation: <0.5 m tall.
				Shrubs and juvenile trees: 0.5 – 1 m in height.	The vegetation is maturing and/or natural regeneration is occurring.		
							Shrubs and juvenile trees: 1.5 – 2 m in height.
				Foliage cover: 0.5 – 2.0 m in height.	Vegetation structure and complexity is comparable to the analogue sites.		
				Foliage cover: 2.0 – 4.0 m in height.			
				Foliage cover: >6.0 m.			
				Tree diversity.	Diversity of endemic tree and shrub species >5 cm dbh is comparable to the analogue sites.		
				Tree density.	Density of endemic tree and shrub species >5 cm dbh is comparable to the analogue sites.		
				Healthy trees/condition.	Vegetation condition is comparable to the analogue sites.		
				Flowers, fruit, buds.	The presence of reproductive structures is comparable to the woodland analogue sites.		
Enhance biodiversity value by providing habitat, forage, and contribute to movement corridors.				Area of revegetation.	Targeted revegetation where required.		<ul style="list-style-type: none"> Synoptic Plan (Andrews, 1999). RMP. GIS Mapping.
		Number of fauna species.	Distribution of coarse woody debris and rocks to optimise habitat and inter connectivity across the landscape.	<ul style="list-style-type: none"> Annual review/Annual ecological monitoring report. 			

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Table 10: ACOL-operated RUM Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method	
Domain A Native Ecosystem	Domain 1 Infrastructure Area	All surface infrastructure to be decommissioned and removed from domains unless the Resources Regulator agrees otherwise.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting. 	
		Portals and vent shafts decommissioned and sealed in accordance with industry best practice and government guidelines, as required.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting. 	
		Identify any contaminated soils and sediments associated with infrastructure areas, and remediate in accordance with the requirements of the NSW <i>Contaminated Land Management Act 1997</i> .	Presence of any contaminated soils or sediments.	Contaminated soils and sediments removed, and remediation completed.	<ul style="list-style-type: none"> Contaminated Lands Assessment. Requirements of the NSW <i>Contaminated Land Management Act 1997</i>. 	
		Invasive species, weeds and feral animals are effectively controlled or eliminated from site.	Distribution and density of weeds.	Weeds and pest animal species, and abundance are comparable to analogue sites.	<ul style="list-style-type: none"> Annual Weed Inspection and findings reported in Annual Review. ACOL Weed Management Plan. <i>Biosecurity Act 2015</i>. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes. 	
			Distribution and number of feral animals.			<ul style="list-style-type: none"> Annual vertebrate pest survey and findings. ACOL Weed Management Plan. <i>Biosecurity Act 2015</i>. Australian and NSW Weed Strategies. BC Act – Key Threatening Processes.
			Damage caused by feral animals.			<ul style="list-style-type: none"> Reported in Annual Review. <i>Local Land Services Act 2013</i>. Flora and Fauna (Biodiversity) Management Plan (FFMP) (ACOL, 2020a).
		Safety risks are eliminated as far as reasonably practicable.	Bushfire hazard reduction works.	Bushfire management activities undertaken in accordance with the conservation agreement.	<ul style="list-style-type: none"> Bushfire hazard reduction activities reported in Annual Review. <i>Rural Fires Act 1997</i>. 	
		Establish a vegetation profile consistent with the planned final land use.	Revegetation species mix to be broadly comparable to reference sites.	Species mix used aligns to the intended final land use.	<ul style="list-style-type: none"> Rehabilitation/planting activities reported in Annual Review including date of seeding and species mix used. DA Schedule 3, Condition 41. 	
		Ecological diversity will be maintained or enhanced.	Foliage cover.	Vegetation structure and complexity is broadly comparable to that of analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 41. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004). 	
			Tree diversity.	Diversity of maturing tree and shrub species is broadly comparable to that of analogue sites.		
			Tree density.	Density of maturing tree and shrub species is broadly comparable to that of analogue sites.		
			Tree health/condition.	Vegetation condition is broadly comparable to that of analogue sites.		
			Flowers, fruit, new to that of analogue sites. growth.			
		Ecosystem function is restored.	LFA Organisation Index.	Index is broadly comparable to that of analogue sites.		
LFA Stability Index.						
LFA Infiltration Index.						

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Owner: Phil Brown
Revision Number: 1

Table 10: ACOL-operated RUM Proposed Rehabilitation Objectives and Rehabilitation Completion Criteria (Continued)

Final Land Use Domain	Mining Domains	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification or Validation Method
Domain A Native Ecosystem (Continued)	Domain 1 Infrastructure Area (Continued)	The rehabilitated landform is consistent with the surrounding environment.	Overburden emplacement area is constructed in accordance with approved design.	Rehabilitated landform is consistent with the surrounding landscape. Overburden emplacement is constructed in accordance with the approved design and Development Consent requirements.	<ul style="list-style-type: none"> Topographic survey of final landform. Photographic monitoring of rehabilitated landforms.
		Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: <ul style="list-style-type: none"> local native plant species (unless the Resources Regulator agrees otherwise); and a landform consistent with the surrounding environment. 	Ecosystem Function Analysis (EFA) indices: <ul style="list-style-type: none"> LFA indices. Vegetation Dynamics results. Habitat Complexity results. 	Suitable EFA reference site selected equivalent to the target vegetation community. EFA results indicate that the vegetation is maturing and developing characteristics similar to that found in the relevant reference site (i.e. informed by stability, infiltration, nutrient cycling, vegetation dynamics, and habitat complexity).	EFA: <ul style="list-style-type: none"> LFA. Vegetation Dynamics Monitoring. Habitat Complexity Monitoring.
		Aboriginal archaeological sites protected.	Listed archaeological items / sites.	Rehabilitation works do not impact on archaeological sites.	<ul style="list-style-type: none"> DA Schedule 3, Condition 34. Heritage Management Plan (ACOL, 2020b). Reported in AEMR / Annual Review.
Domain B Agricultural – Grazing	Domain 1 Infrastructure Area	All surface infrastructure to be decommissioned and removed from domains unless the Resources Regulator agrees otherwise.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting.
		Goaf gas drainage bores decommissioned and sealed in accordance with industry best practice and government guidelines, as required.	Relevant infrastructure decommissioned and removed (as agreed via consultation).	Complete removal of relevant infrastructure.	<ul style="list-style-type: none"> Visual monitoring and reporting.
		Identify any contaminated soils and sediments associated with infrastructure areas, and remediate in accordance with the requirements of the NSW <i>Contaminated Land Management Act 1997</i> .	Presence of any contaminated soils or sediments.	Contaminated soils and sediments removed, and remediation completed.	<ul style="list-style-type: none"> Contaminated Lands Assessment. Requirements of the NSW <i>Contaminated Land Management Act 1997</i>.
		Restored and maintained to the same or higher land capability and agricultural suitability than prior to mining.	LFA Organisation Index.	Performance indicator is broadly comparable to that of analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 29. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004).
			LFA Stability Index.		
			LFA Infiltration Index.		
		Land Capability Class.	Field data results are used to define land capability and include: <ul style="list-style-type: none"> Climate. Soil texture. Position. Slope. Erosion. pH. Drainage. Rock. 		
Final landform is sustainable and resilient to environmental pressures.	Weed species abundance and diversity.	Performance indicator is broadly comparable to that of analogue sites. Weed species abundance to be consistent or lower than benchmark value of the average of the analogue sites.	<ul style="list-style-type: none"> Annual Farmland Report. DA Schedule 3, Condition 29. CSIRO Methodology for Ecosystem Function Analysis (Tongway, 2004). 		
	Groundcover.				
Aboriginal archaeological sites protected.	Listed archaeological items / sites.	Rehabilitation works do not impact on archaeological sites.	<ul style="list-style-type: none"> DA Schedule 3, Condition 34. Heritage Management Plan (ACOL, 2020b). Reported in AEMR / Annual Review.		

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4.2 Rehabilitation Objectives and Rehabilitation Completion Criteria – Stakeholder Consultation

As described in Section 2.2, extensive consultation was undertaken during the preparation of ACOL's previous MOPs.

This consultation is considered relevant to the preparation of this RMP as the overarching final land use and Rehabilitation Objectives have remained generally consistent.

Ongoing consultation with the community and relevant stakeholders occurs via personal contact and public meetings. ACOL has committed to a community program which includes activities that aim to reduce the impact of mining on the residents of Camberwell.

In accordance with the NSW Resources Regulator's (2021) *Form and Way: Rehabilitation Management Plan for Large Mines*, additional consultation will be undertaken with the NSW Resources Regulator, CCC, Singleton Council and WaterNSW prior to the Rehabilitation Completion Criteria being finalised and submitted for approval. This RMP and the Rehabilitation Completion Criteria described in Section 4.1 will be amended to reflect the outcomes of this consultation.

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5. FINAL LANDFORM AND REHABILITATION PLAN

5.1 Final Landform and Rehabilitation Plan – Electronic Copy

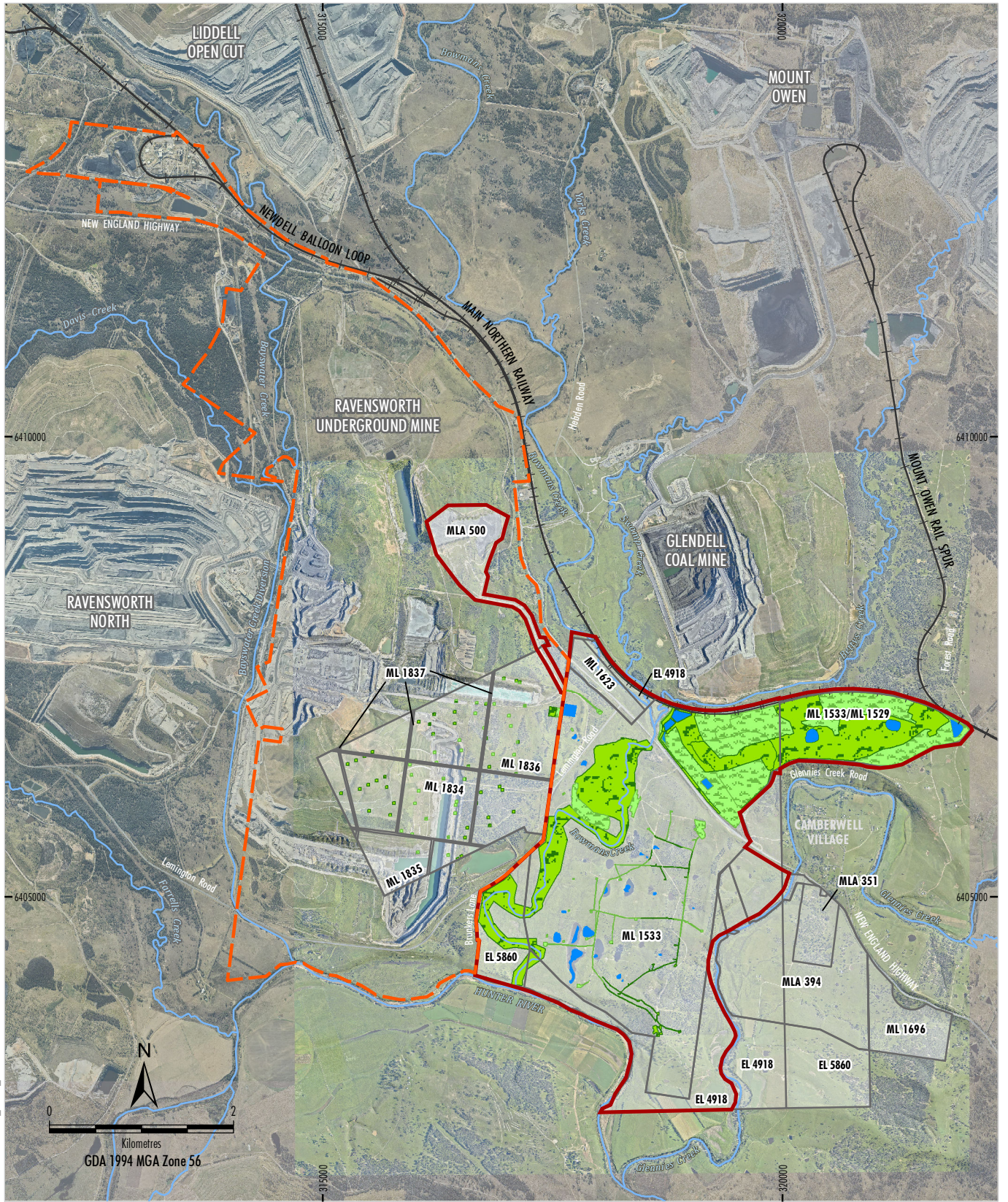
A Final Landform and Rehabilitation Plan has been prepared to show the proposed final land use (Plan 1) and final landform (Plan 2) at the end of the ACP's and ACOL-operated RUM's life. These plans are generally in accordance with the details of the EIS, the DA 309-11-2001-i and subsequent assessments.

In accordance with clause 12, Schedule 8A of the *Mining Regulation 2016*, the ACP Final Land Use and Rehabilitation Plan has been submitted to the NSW Resources Regulator for approval. Following approval of the Final Land Use and Rehabilitation Plan, this RMP will be amended to substitute the proposed version (Plans 1 and 2) with the version approved by the NSW Resources Regulator in accordance with clause 11, Schedule 8A of the *Mining Regulation 2016*.

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ACO-18-03-RMP-2023-v2_PLAN1_Rev A



Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)

Date prepared: 28-07-2023

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Final Land Use Domains
 - Agricultural – Grazing
 - Infrastructure
 - Native Ecosystem
 - Water Storage (Excluding Final Void)



**ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023**

**Final Land Use Domains
 and Landform Features**

ACO-18-03 RMP 2023 v2 PLAN 2 Rev A



- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Final Landform Contours
 - Index Contour (20 m interval)
 - Intermediate Contour (5 m interval)

Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)

Date prepared: 28-07-2023



**ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023**

Final Landform Contours

6. REHABILITATION IMPLEMENTATION

6.1 Life of Mine Rehabilitation Schedule

Areas that are disturbed by the ACP and ACOL-operated RUM will be progressively rehabilitated following mining activities in accordance with Condition 42, Schedule 3 of DA 309-11-2001-i and Condition 28, Schedule 3 of DA 104/96. Under DA 309-11-2001-i, operations at the ACP are approved until 31 December 2035. While, operations at the ACOL-operated RUM are approved until 31 December 2032 under DA 104/96.

Rehabilitation at the ACP and ACOL-operated RUM is expected to be minimal until cessation of mining activities as the majority of disturbance is required for the life of the mine. Rehabilitation of subsidence impacts of the Underground Mining Area will continue to be undertaken on a case-by-case basis during mining operations.

In previously rehabilitated areas, ongoing maintenance activities will include controlling weeds and pests, repairing landforms, re-seeding and application of maintenance fertilisers as required. Specific maintenance activities will be identified via the annual rehabilitation monitoring program (Section 8) and opportunistic inspections of rehabilitated areas.

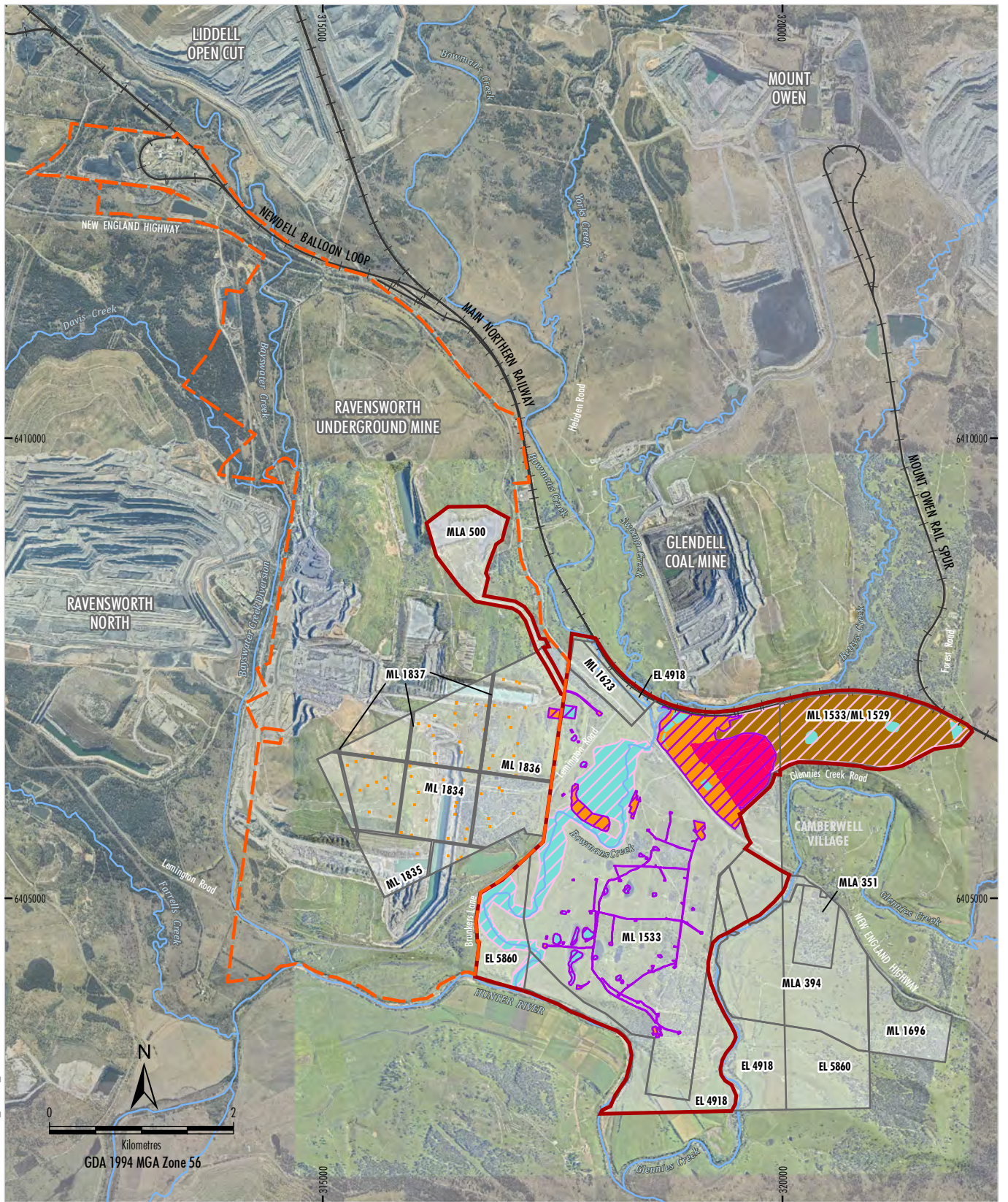
Plans 3A to 3E outline the proposed rehabilitation schedule over the life of the ACP and ACOL-operated RUM, from the commencement of this RMP (i.e. 1 August 2022) until achievement of the rehabilitation completion criteria and relinquishment of ML 1834, ML 1935, ML 1836, ML 1837, ML 1533, ML 1529 and ML 1623.

In developing the rehabilitation schedule, several assumptions were made to ensure that rehabilitation is undertaken progressively and as soon as reasonably practicable, including:

- No major changes to mining schedules due to market conditions or other reasons.
- Mining infrastructure (e.g. NEOC Void, offices, access tracks, etc.) will be required for the life of the mine (i.e. until 2035). As such, rehabilitation of the majority rehabilitation will occur following mine closure.
- There are no extreme weather events that would prohibit landform establishment or rehabilitation progression (e.g. severe and prolonged dry or wet periods).

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Owner: Phil Brown
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ACQ-18-03 RMP 2023 v2, PLAN 3A, Rev A

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Mining Domain Types**
 - Infrastructure Area
 - Coarse Reject and Tailings Emplacement
 - Overburden Emplacement Area
 - Water Management Area
 - Rehabilitation Phase**
 - Active Mining
 - Ecosystem and Land Use Establishment

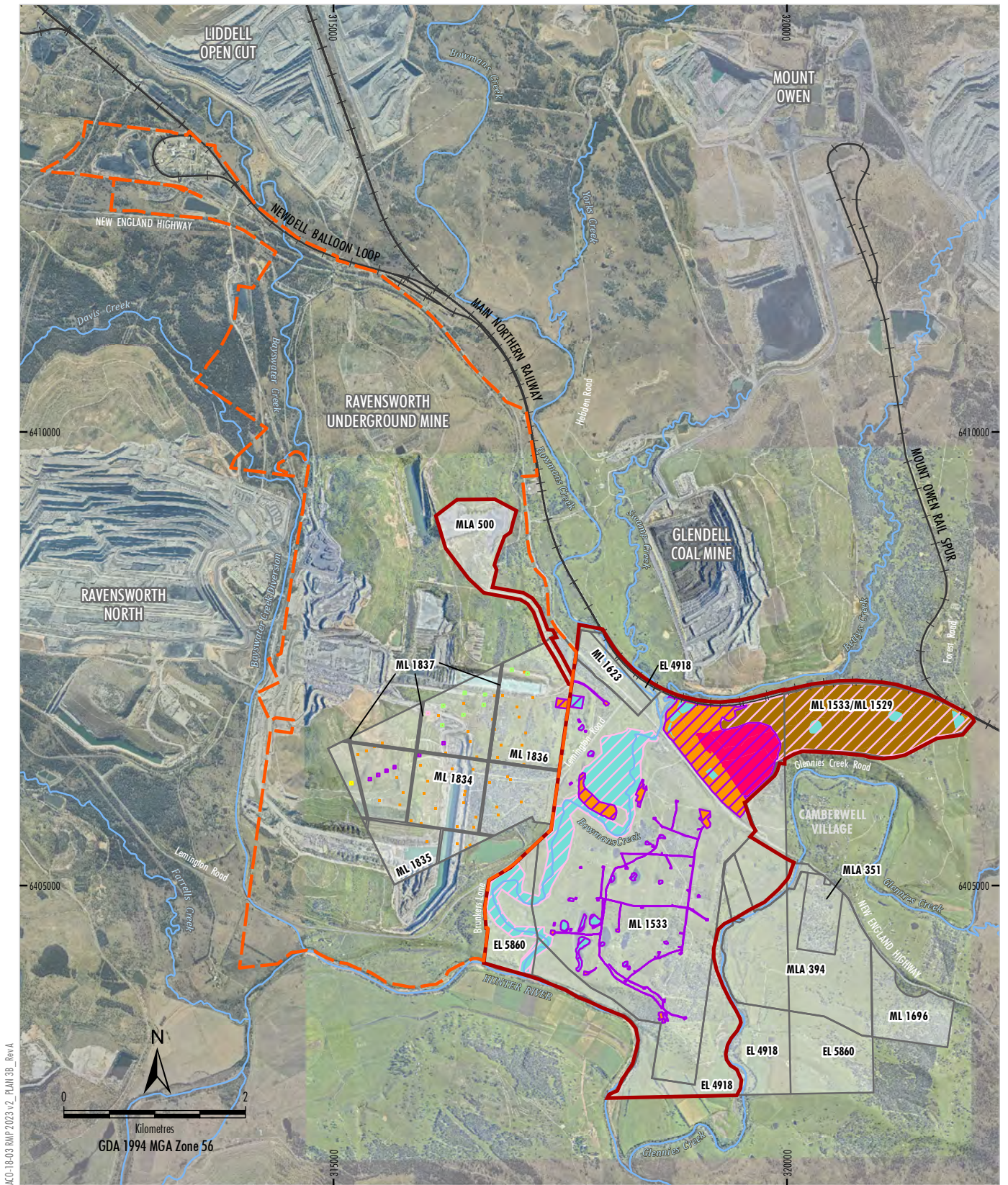
Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)

Date prepared: 28-07-2023



**ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023**

Life of Mine Rehabilitation Schedule
 RMP Commencement (2023)



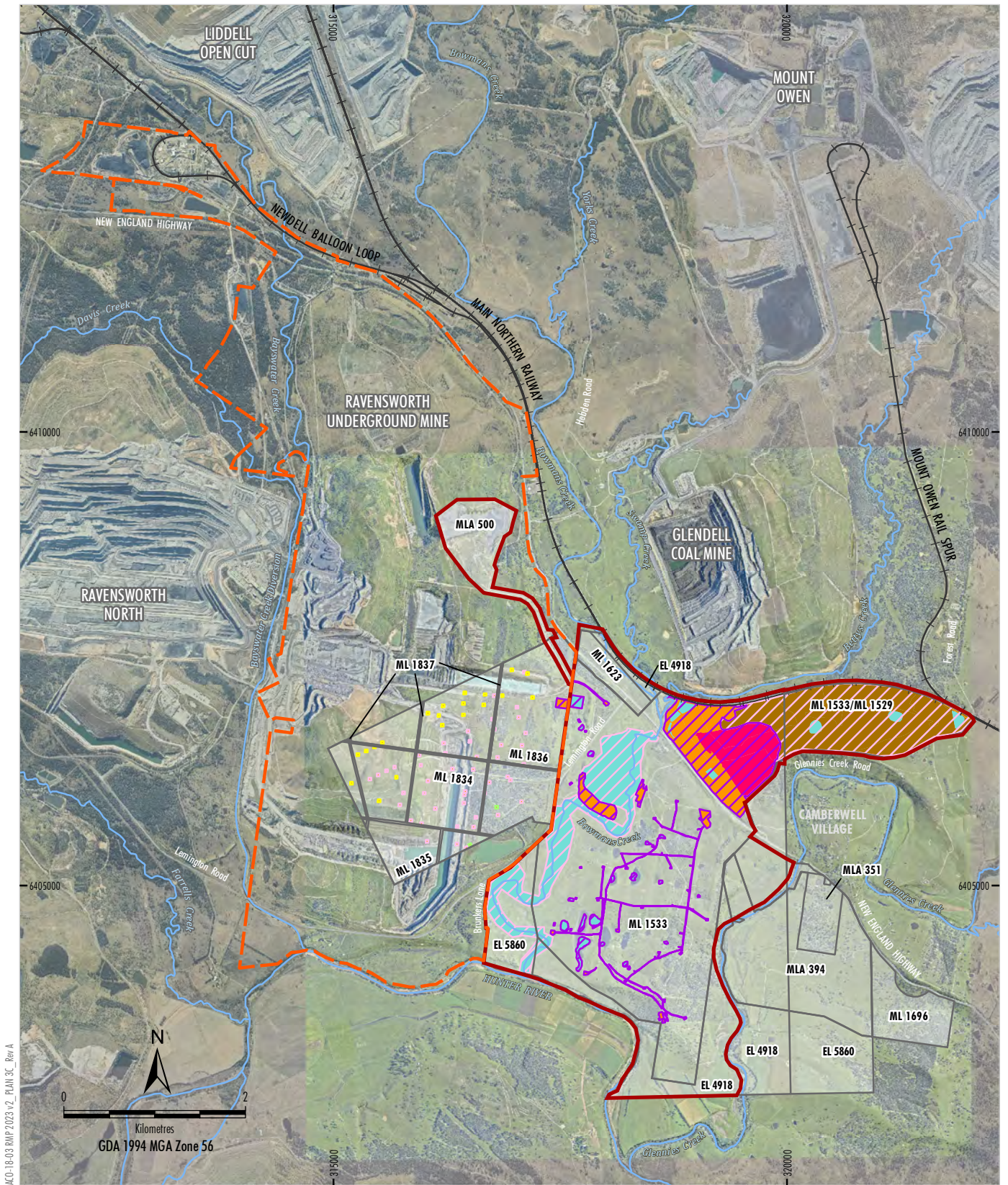
ACQ-18-03 RMP 2023 v2, PLAN 3B, Rev A

Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)
 Date prepared: 28-07-2023

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Mining Domain Types**
 - Infrastructure Area
 - Coarse Reject and Tailings Emplacement
 - Overburden Emplacement Area
 - Water Management Area
 - Rehabilitation Phase**
 - Active Mining
 - Ecosystem and Land Use Development
 - Ecosystem and Land Use Establishment
 - Landform Establishment



ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023
 Life of Mine Rehabilitation Schedule
 Year 5 (2028)



ACQ-18-03-RMP-2023 v2 - PLAN 3C - Rev A

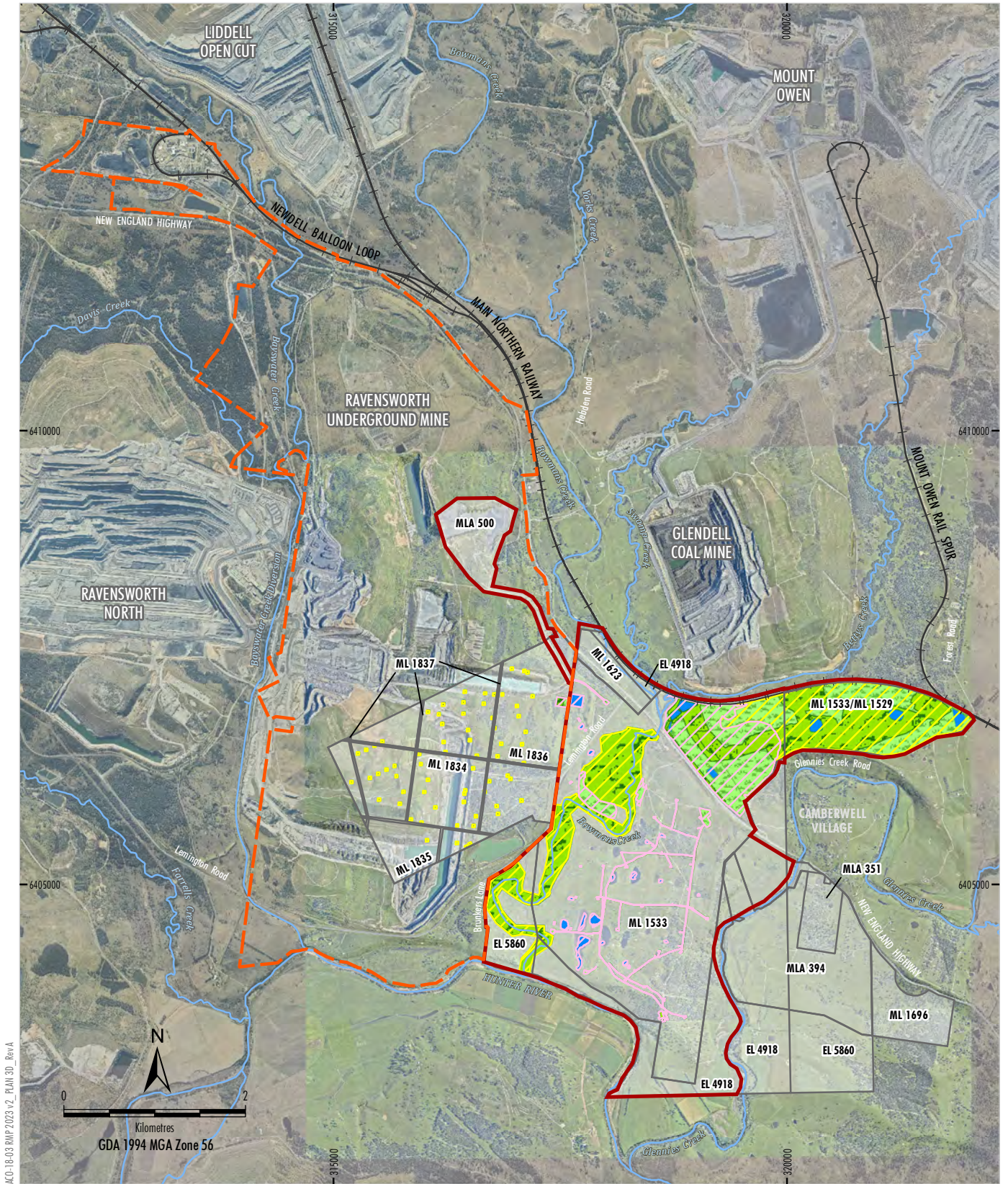
Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)
 Date prepared: 28-07-2023

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Mining Domain Types**
 - Infrastructure Area
 - Coarse Reject and Tailings Emplacement
 - Overburden Emplacement Area
 - Water Management Area
 - Rehabilitation Phase**
 - Active Mining
 - Ecosystem and Land Use Development
 - Ecosystem and Land Use Establishment
 - Landform Establishment



**ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023**

Life of Mine Rehabilitation Schedule
 Year 10 (2033)



ACQ-18-03 RMP 2023 v2, PLAN 3D, Rev A

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Final Land Use Domains
 - Agricultural – Grazing
 - Infrastructure
 - Native Ecosystem
 - Water Storage (Excluding Final Void)
 - Rehabilitation Phase
 - Ecosystem and Land Use Development
 - Ecosystem and Land Use Establishment

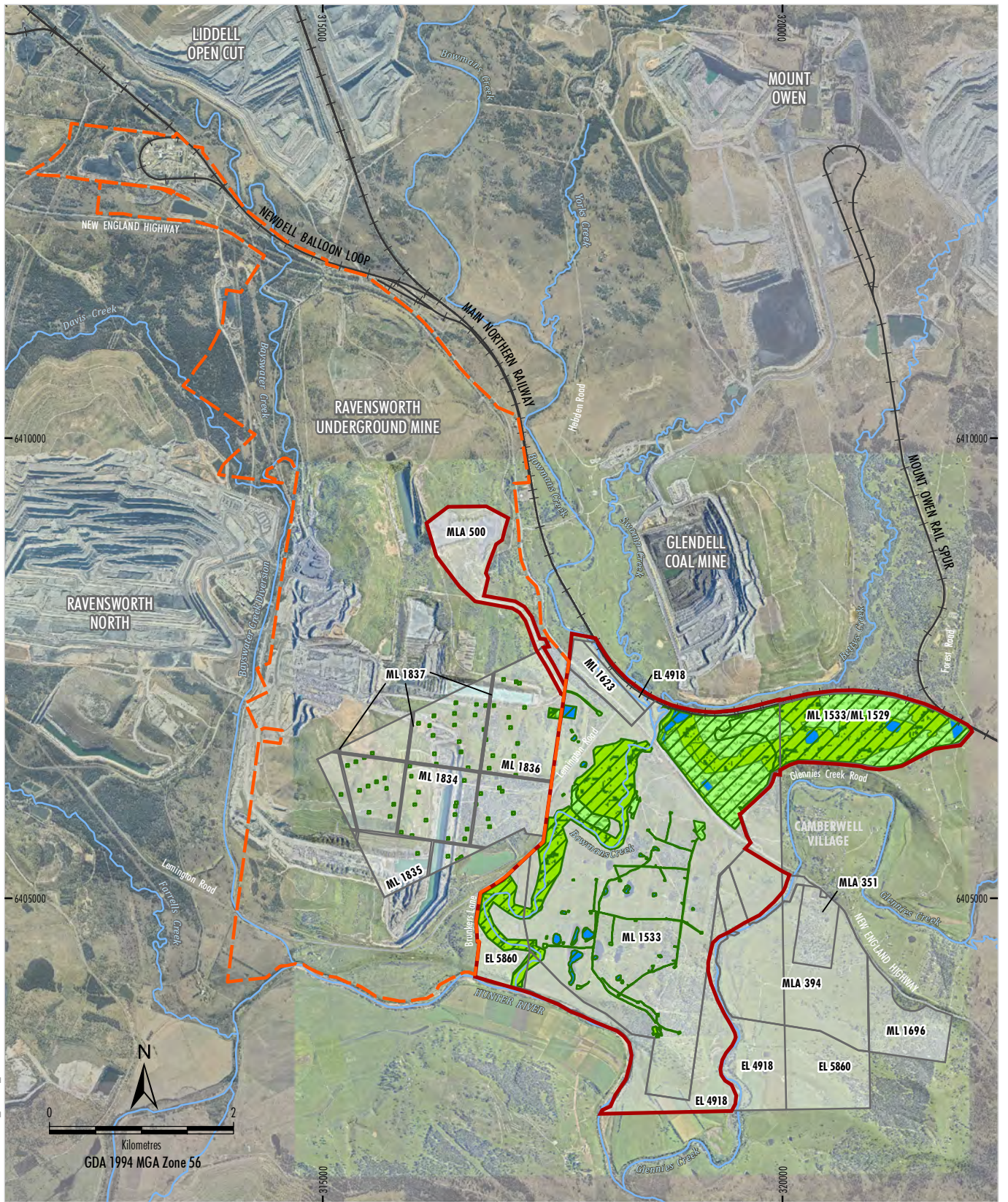
Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)

Date prepared: 28-07-2023



**ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023**

Life of Mine Rehabilitation Schedule
 Year 15 (2038)



ACQ-18-03 RMP 2023 v2, PLAN 3E - Rev A

Source: ACOL (2023); RUM (2023); NSW Spatial Services (2023)
 Orthophoto Mosaic: Ashton Coal (Dec 2021); Ravensworth (2021)
 Date prepared: 28-07-2023

- LEGEND**
- DA 309-11-2001-i Project Approval Boundary
 - DA 104/96 RUM Project Approval Boundary
 - Coal - Current Titles
 - Railway
 - Watercourse
 - Final Land Use Domains
 - Agricultural – Grazing
 - Infrastructure
 - Native Ecosystem
 - Water Storage (Excluding Final Void)
 - Rehabilitation Phase
 - Rehabilitation Completion (sign-off)



**ASHTON COAL MINE
 REHABILITATION MANAGEMENT PLAN 2023**

Life of Mine Rehabilitation Schedule
 Year 20 (2043)

6.2 Phases of Rehabilitation and General Methodologies

The final land use objectives will be achieved through a series of rehabilitation phases as defined in the NSW Resources Regulator's (2021) *Form and Way – Rehabilitation Management Plan for Large Mines* and detailed below:

- **Active** – The NSW Resources Regulator's (2021) *Form and Way – Rehabilitation Management Plan for Large Mines* states that in the context of rehabilitation, land associated with mining domains is considered 'active' for the period following disturbance until the commencement of rehabilitation.
- **Phase 1: Decommissioning** – Removal of infrastructure associated with mining activities including preparation plants, hard stand areas, buildings, contaminated materials and hazardous materials. This phase of rehabilitation may also include studies and assessments associated with decommissioning and demolition of infrastructure or works carried out to make safe or 'fit for purpose' built infrastructure to be retained for future uses following lease relinquishment.
- **Phase 2: Landform Establishment** – This phase of rehabilitation consists of the processes and activities required to construct the approved final landform (as per the development consent and, for large mines, the approved Final Landform and Rehabilitation Plan). In addition to profiling the surface of rehabilitation areas to the approved final landform profile this phase may include works to construct surface water drainage features, encapsulate problematic materials such as tailings, and prepare a substrate with the desired physical and chemical characteristics (that is, rock raking or ameliorating sodic materials). The landform design and construction part of this phase incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology.
- **Phase 3: Growing Media Development** – This phase of rehabilitation consists of activities required to establish the physical, chemical and biological components of the substrate required to establish the desired vegetation community (including short-lived pioneer species). This phase may include spreading the prepared landform with topsoil and/or subsoil and/or soil substitutes, applying soil ameliorants to enhance the physical, chemical and biological characteristics of the growth media, and actions to minimise loss of growth media due to erosion. Additional characterisation of materials (e.g. subsoils, topsoils, organic additives and overburden surface) is usually required in this phase to cross check data from the earlier phases.
- **Phase 4: Ecosystem and Land Use Establishment** – This phase of rehabilitation consists of the processes to establish the approved final land use following construction of the final landform. For vegetated land uses this rehabilitation phase includes establishing the desired vegetation community (e.g. seeding or tube stocking) and implementing land management activities such as weed control. This phase of rehabilitation may also include habitat augmentation such as installation of nest boxes.
- **Phase 5: Ecosystem and Land Use Development** – This phase of rehabilitation consists of the activities to manage maturing rehabilitation areas on a trajectory to achieving rehabilitation objectives, completion criteria and the Final Landform and Rehabilitation Plan. Completion criteria for this phase will include components of floristic structure, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape.
- **Phase 6: Rehabilitation Completion** – This final phase of rehabilitation occurs where a rehabilitation area has achieved the final land use for the mining area as stated in the approved rehabilitation objectives and the approved rehabilitation completion criteria and spatially depicted in the approved Final Landform and Rehabilitation Plan. Rehabilitation areas may be classified as complete when the NSW Resources Regulator has determined in writing that rehabilitation has achieved the final land use following submission of the relevant application by the lease holder.

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The phases listed above, and methodologies (where relevant) are discussed in more detail in the following sub-sections.

6.2.1 Active Mining Phase

a. Soils and Materials

Although there is limited new disturbance expected over the remaining life of the ACP and ACOL-operated RUM, general soil resource management practices would include stripping and stockpiling of soil resources for the use in rehabilitation. The suitability of the material is the function of the physical, chemical and biological characteristics of the soil. The combination of these factors will impact the depth of the soil removed and the handling of the differing layers of this material for rehabilitation and involve the following:

- topsoils from the native tree covered areas will be stripped and stored separately from the areas of pasture or weed infestation;
- it is not recommended to use soils with high salinity readings for top dressing. If this cannot be avoided, salt tolerant species will be planted;
- topsoil handling will be minimised therefore maintaining the soils chemical, physical and biological characteristics;
- where possible topsoil will be directly respread; and
- stockpiles will be located away from drainage lines and will be stabilised.

b. Flora

Vegetation Clearance / Disturbance Protocol

A Vegetation Clearance/Disturbance Protocol (Appendix C of the Biodiversity Management Plan [BMP]) has been developed to minimise risk of impacts on threatened species.

Where possible, vegetation clearance will be scheduled to incorporate seasonal habitat requirements of bats and other mammals by avoiding hibernation and breeding periods.

As described within the Vegetation Clearance/Disturbance Protocol, where possible hollow branches will be relocated to the Voluntary Conservation Area (VCA) to provide a supplementary habitat resource for hollow dependent fauna such as gliders and microchiropteran bats. The VCA consists of remnant woodland habitat set aside as a conservation area, in accordance with Condition 27, Schedule 3 of DA 309-11-2001-i.

Woody debris from smaller trees will be placed along the bunds or in small piles or strips within woodland areas to increase shelter and foraging opportunities for native fauna including the threatened Grey-crowned Babbler, Hooded Robin and Speckled Warbler.

Any vegetative material cleared from the site, including fallen trees and understorey species, should be utilised wherever possible for mulch and ground cover, in areas where topsoils have been respread.

Habitat trees will be inspected for fauna immediately before and after felling. Animals found prior to or during clearing activities will be released to surrounding suitable habitat. Injured animals found prior to or during clearing activities will be cared for in accordance with the Animal Ethics and Care Committee permit. If necessary, the Wildlife Information and Rescue Service will be contacted for first aid advice or assistance.

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Trees that have been felled will be stockpiled and placed in areas to be revegetated to provide cover for small terrestrial vertebrates.

Seed Collection and Propagation

Seed collection is undertaken by ACOL in accordance with the Conservation Agreement and BMP. Management measures include:

- Collecting seed in the conservation area only if seed of the particular species and genotype is not available elsewhere, or if the seed collected is intended for seedlings that will be planted within the conservation area or adjacent to the conservation area.
- Licences are required for collection of material of protected plants listed under Section 131 (Schedule 13) of the *National Parks and Wildlife Act 1974*.
- Where seed collection involves species listed in the *Biodiversity Conservation Act 2016* (BC Act), the relevant licence or prior written permission from the Planning Secretary should be obtained.

Threatened Flora Management

The VCA is known habitat of the River Red Gum (*Eucalyptus camaldulensis*) that is listed as endangered under the BC Act. Management measures are consistent with the Conservation Agreement using ACOL Environmental Management Plan(s) that constitute the Plan of Management for the site. No area of this community will be removed as part of the ACP. Bi-annual monitoring of the River Red Gum populations is undertaken, including visual surveys of ground disturbance, tree health and community health.

Threatened flora management will be undertaken in accordance with the BMP and aim to improve structural diversity and increase habitat size for long-term viability in the area.

Biodiversity Offset Areas

To offset the ecological and archaeological impacts of the project and provide for the conservation of an important archaeological area, an area in the south-east of the ACP above the Ashton Underground Mine was established to be conserved in perpetuity. This area is referred to as the Southern Woodland Conservation Area, Southern Conservation Area, VCA or the Conservation Area (CA). An agreement with DPE under the *National Parks and Wildlife Act 1974* was registered for the area on 16 September 2010.

The CA is 65.45 ha within part of Lot 3 DP 1114623, which is under ACOL ownership and is bound by Glennies Creek in the east, the Hunter River in the west and a private land holder to the south.

To promote habitat connectivity and fauna movement, the CA is augmented by approximately 125 ha of revegetation corridors and 66 ha of Bowmans Creek riparian corridor. Although not subject to any instrument of long term protection, management of these areas is consistent with the conservation measures implemented for the CA.

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Weed Management

ACOL is required under the *Biosecurity Act 2015* to control listed noxious weeds on their land. Active weed control treatment is regularly completed across approximately 385 ha of land owned by ACOL, targeting African Boxthorn (*Lycium ferocissimum*), African Olive (*Olea europaea subsp. cuspidata*), Coolatai Grass (*Hyparrhenia hirta*), Galenia (*Galenia pubescens*), Lantana (*Lantana camara*) Mimosa Bush (*Vachellia farnesiana*), Mother of Millions (*Kalanchoe daigremontiana*), Oleander (*Nerium oleander*), Prickly Pear (*Opuntia stricata*), St John's Wort (*Hypericum perforatum*), Sweet Briar (*Rosa rubiginosa*), Tiger Pear (*Opuntia aurantiaca*) and general weeds around infrastructure and disturbed areas

In accordance with the BMP, weed management includes:

- ACOL using its best endeavours to control and where possible remove all non-indigenous plants and fauna from the VCA;
- ACOL taking such reasonable measures in relation to non-indigenous plants and fauna as specified in the Conservation Agreement (and repeated below) that includes:
 - carrying out weed control using the appropriate control methods to ensure that they do not compromise the integrity of the conservation values identified;
 - control and monitoring of weed growth will be as determined by the BMP subject to the conditions of the Conservation Agreement, and the guidelines below;
 - ensure methods of weed control do not damage cultural heritage values;
 - Glyphosate based herbicide may be used by direct application to cut surfaces (cut and paint or scrape and paint methods);
 - spraying of a glyphosate based herbicide can be used. This should be limited to according to the directions on the label and ensuring that there is no off-target damage;
 - weeds can be removed by hand ensuring that all plant parts that can reproduce are removed and that soils do not become prone to erosion;
 - other weed control methods may be used with prior written permission of the Planning Secretary;
 - ensure control programs are commenced when timing and extent of weed removal will minimise adverse effects on wildlife (weeds may provide protection or habitat for native fauna). Removal of African boxthorn should not be undertaken during nesting periods for small birds which may nest in the plants;
 - continue to check for weed invasion and regrowth and treat any outbreaks;
 - check adjacent areas for invasive plant species and remove, or control their spread; and
 - not allow the removal of any biological or inorganic component of the conservation area.

Aquatic Habitats

Bowmans Creek is approximately 56 km long and the headwaters are located in the Little Brothers Range, at an elevation of about 650 m Australian Height Datum (AHD). The lower section of the creek within the ACP is 4.5 km long located between the New England Highway and the Hunter River confluence. There is variable flow in this section of the creek and it is generally perennial, although surface flows can cease during severe droughts.

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Aquatic fauna and habitat, stream health and water quality are monitored at established locations along Bowmans Creek and Glennies Creek in order to detect any possible mining or diversion related impact over the life of the mine.

As described in Section 1.1.4, construction of the Bowmans Creek Diversion involved the diversion of two sections of the Bowmans Creek (totalling 1.7 km) to allow additional extraction beneath the excised creek channel and its alluvium and was completed in November 2012.

Pre-mining aquatic monitoring has been completed and provides measurable baseline data to assess:

- Impacts on existing communities along the creeks from subsidence and potential breakout points along the channel.
- Impacts to dish, fish passage macroinvertebrates, water quality and aquatic habitat.

There is a potential for water ponding from subsidence to benefit the aquatic environment. Management measures such as planting of fringing and emergent aquatic vegetation and stabilisation of bed control structures at the up and down-stream ends of the ponds are included.

Any off-stream ponds created by subsidence which could provide habitat will be actively enhanced with riparian shade vegetation, plus fringing and emergent aquatic vegetation planting. It is also proposed to control stock access to the impoundments.

The value of remaining aquatic environments for native wildlife including amphibians and birds can be improved by restricting access by stock to parts of larger stock dams. This will allow aquatic and fringing vegetation to develop, increasing the value of the habitat. This will allow a smaller number of aquatic habitats to compensate for a potential loss of poorer quality habitats.

c. Fauna

Feral Fauna Management

Predation of the threatened species will be managed through a Feral Animal Control Program. Due to the low density of feral animals, management activities will be centred on a baiting program supplemented by culling by professional shooters, where required. Baiting is typically the preferred feral animal control by surrounding landholders allowing for better coordination of control programs within the district. The program will be annual, prior to the breeding cycle of foxes (*Vulpes vulpes*) and is implemented as required. Trapping is also employed for fox, dogs and pigs where either population densities warrant such methods or baiting and shooting has not been effective.

Fauna Habitat Augmentation

The objective of habitat augmentation is to avoid loss of habitat for fauna and enhance habitat where possible. Nest boxes have been installed within the VCA in accordance with the Biodiversity Offset Management Plan.

A number of threatened species, particularly woodland bird species, have been identified within the VCA. The habitat presents for the Grey-crowned Babbler, Hooded Robin and Speckled Warbler, in particular, will be managed throughout the site. Long-term objectives are to create a mosaic of agricultural land and wildlife habitat.

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Pursuant to the Conservation Agreement and BMP, ACOL will implement the following management practices:

- Installation of habitat boxes for native fauna in strategic locations where suitable hollows for native fauna are limited or absent. Locations and number to be determined as per the BMP and recommendations made in the bi-annual fauna monitoring reports.
- Implement any reasonable measures included in recovery plans or other management guidelines for any threatened species or communities which or may be found in the VCA.
- Implement any reasonable measures to mitigate any alteration of habitat following subsidence due to longwall mining to minimise negative effects on the conservation area and in accordance with the Extraction Plan and the development consent.
- Provision of nest boxes in accordance with the conservation agreement, BMP and Vegetation Clearance/Disturbance Protocol.
- Tree hollows will be relocated to Southern Woodland Conservation Area during vegetation clearing in accordance with Flora and Fauna Management Plan (FFMP) (written generally with respect to the NEOC, that is now completed).

Threatened Fauna Management

The VCA is known habitat of the Grey-crowned Babbler, Hooded Robin and Speckled Warbler and will be managed consistent with the Conservation Agreement using ACOL Environmental Management Plan(s) that constitute the Plan of Management for the site. This habitat is expected to improve as the woodland naturally regenerates and provides structural diversity through all strata levels, additional areas are revegetated where necessary with species that are typical of the area and as weeds and feral grazers/predators are managed. Any increase in habitat size and structural diversity also contributes to the long-term viability of the local breeding populations of these vulnerable species.

Domestic Animals and Livestock Management

The objective of livestock management within the VCA is for the purpose of reducing fuel loads with respect to bushfire hazard reduction and also for weed management where warranted.

Pursuant to the Conservation Agreement, ACOL will manage livestock within the VCA as follows:

- Mustering of livestock with the use of working dogs and horses.
- Controlled grazing may be used as a hazard reduction tool to reduce fuel loads in the conservation area as deemed necessary, and with the following guidelines.
- Grazing should be initially excluded from the conservation area to encourage the natural regeneration of indigenous plants and to encourage the growth of a shrub layer.
- Grazing must be excluded from areas of revegetation.
- Grazing may be desirable to reduce seeding of particular weed species.
- Where native grasses and ground covers are present, rotational grazing should be used. Graze with high numbers for short periods and allow long rest periods to ensure flowering and reseedling to occur of native ground layer species.
- Stock should be removed during peak flowering times, that is in spring or early summer, being September through to the end of January.

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- Groundcover should be maintained above 80 percent (%).
- Should stock be identified as introducing weeds into the conservation area, stock should be put in a holding yard or weed free paddock for 2 full days (48 hours) prior to entering conservation area. This will reduce the spread of weeds from dung.
- Stock to be removed from Conservation Area if unacceptable levels of erosion or damage are apparent.
- Guidelines to be outlined in the Ashton Coal Conservation Area Plan of Management based on the recommendations coming from the FFMP and associated regular flora and fauna monitoring.

d. Rock/Overburden Emplacement

Previously, the NEOC area was utilised as an emplacement area for overburden material. Since cessation of open cut mining operations, the NEOC area (excluding the NEOC Void) has been rehabilitated to a Native Ecosystem area.

Monitoring of the NEOC rehabilitation area includes assessment of areas rehabilitated to mixed woodland habitat (formerly “Trees Over Grass”) and exotic pastures. Rehabilitation of the NEOC overburden emplacement commenced in 2005, with rehabilitation being completed in 2012. There is currently approximately 68 ha of rehabilitated exotic pasture and approximately 71 ha of native trees and shrubs.

e. Waste Management

Waste segregation and recycling is encouraged through providing appropriate recycling facilities. Materials that are available for recycling are collected and recycled off-site.

Materials that cannot be recycled are disposed of at a licensed landfill. Licenced contractors remove waste off-site to licensed landfills that may accept the category of waste.

Three on-site sewage management systems are used to service the underground mine bathhouse and administration facilities, the CHPP facilities, and the NEOC Workshop and bathhouse.

Wastes generated on-site includes but is not limited to:

- Hazardous (Recycled) – sludge, effluent, empty drums, lead acid batteries, oil filters, oily water, waste grease and waste oil.
- Non-Hazardous (Recycled) – paper and cardboard, confidential documents, scrap steel and timber.
- Hazardous (Disposal) – medical and sanitary waste, oily rags, hydraulic hose and chemical anchors.
- Non-Hazardous (Disposal) – diesel particulate filters and mixed solid waste.

f. Geology and Geochemistry

The geophysical and geochemical risks related to waste emplacements and the management measures relevant to rehabilitation are discussed in Sections 6.2.1g and 6.2.1h.

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g. Material Prone to Spontaneous Combustion

Spontaneous combustion potential is considered low for the ACP and ACOL-operated RUM, however the Liddell Seam has a propensity for spontaneous combustion. The ventilation system has therefore been designed to satisfy possible spontaneous combustion conditions. Relevant design procedures will be employed wherever a seam is known or suspected to be prone to spontaneous combustion. These are based around the following:

- Minimisation of pressure differentials within the ventilation circuits. The major design factors are to provide sufficient main entry development headings, as well as driving and maintaining roadways of sufficient cross-sectional area. Both of these factors assist by reducing the overall mine resistance.
- Minimisation of coal fracturing, to avoid leakage paths and heating sites.
- Segregation of goaf areas to provide extinctive atmospheres. This generally entails the provision of separating barrier pillars between groups of longwall panels.

There are two coal stockpiling activities associated with the ACP, these being the ROM coal on the floor of Arties pit, and the product coal stockpile. Generally, the risk of spontaneous combustion increases with the length of time in which the coal is left stockpiled. The ROM coal is fed to the CHPP on a continual basis, with the CHPP washing coal 24 hours per day. Therefore, the coal is not left to stand in the stockpile for an extended period of time.

The product coal is not left stockpiled for an extended period of time. The primary philosophy to manage spontaneous combustion in the product stockpile is to maintain stock rotation, with the philosophy of first on, first off. The action of reclaiming coal for train loading is sufficient to cool the coal down to prevent ignition.

ACOL has not had any issues relating to spontaneous combustion in the past. A 2011 SGS Minerals report found the percentage of combustibles in ACP coal rejects is generally below 27 %, and spontaneous combustion is not a great concern. In addition to this, the method of rejects emplacement including compaction from dozer tracking reduces the risk of spontaneous combustion further. Visual monitoring has occurred over the life of the ACP with no signs of heating to date. Whilst the risk of spontaneous combustion is considered low it has occurred at the Ravensworth Void 4 Tailings Dam which ACOL utilises to deposit tailings from its CHPP operations. ACOL monitors and manages spontaneous combustion at the Void 4 Tailings Dam in accordance with the Tailings Emplacement Operations Management Plan. There are four main components in the management on spontaneous combustion:

- prevention;
- detection;
- control; and
- incident management.

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The primary focus is prevention but the other components are addressed through:

- recognition of the interaction between spontaneous combustion and ventilation;
- standards for the stockpiling of materials with a propensity to spontaneous combustion;
- procedures to be adopted in changes to mine design or stockpile management techniques;
- procedures for the inspection and monitoring of materials with a propensity for spontaneous combustion, together with reporting requirements;
- housekeeping requirements;
- action response plans where a potential heating is identified;
- clear definitions of roles, responsibilities and training; and
- regular audits and reviews to ensure the continued effectiveness of the management measures.

h. Material Prone to Generating Acid Mine Drainage

Acid mine drainage is not considered to be a concern at the site. An acid rock drainage assessment was conducted in 2008 at the ACP where waste samples from the NEOC, CHPP and underground operations were geochemically tested. They were found to contain significant amounts of pyrite (an acid forming mineral) but this was offset by an excess buffering capacity so that CHPP waste materials were overall considered Non Acid Forming with a high factor of safety. As an ongoing precautionary measure, groundwater seepage and drainage from emplaced materials will be periodically tested for signs of acid rock drainage.

i. Coarse Rejects and Tailings Management

ROM coal from the Ashton Underground Mine is processed through the CHPP which results in the production of product coal, coarse rejects and fine rejects (tailings).

Currently, tailings are disposed of in the Ravensworth Void 4 Tailings Dam and coarse rejects are disposed of in the NEOC void. Once the Ravensworth Void 4 Tailings Dam reaches capacity, tailings will be co-disposed of in the NEOC void. Tailings disposal techniques employed at the ACP have the capacity to support underground mining for the life of the mine.

Tailings are currently processed through a thickener and are pumped to the Ravensworth 4 Tailings Dam, where they are treated with coagulants and allowed to settle. Water is decanted from the tailings dam and pumped back to the process water dam for reuse on site. As it is located outside the ACP mine site, the management and rehabilitation of the Ravensworth Void 4 Tailings dam is dealt with separately to this RMP and detailed in an approved Tailings Emplacement Operations Management Plan.

The NEOC Void has been designed to allow the utilisation of the void for tailings emplacement which is proposed following the exhaustion of the Ravensworth 4 Tailings Dam. The design was undertaken to ensure the efficient dewatering of tailings and maximum water recovery. The Tailings Emplacement Operations Management Plan identifies actions required prior to tailings emplacement within the NEOC void to ensure its safe construction and operation, maximise water reclaim efficiency and optimise total storage capacity.

The emplacement process will utilise existing available equipment including rear dump haul trucks, D10 dozer, grader and water cart. Emplacement will continue until the specified stages have been filled to the finished surface level.

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j. Erosion and Sediment Control

Erosion and sedimentation control will be undertaken in accordance with the Erosion and Sediment Control Plan (ESCP), a component of the Water Management Plan (WMP).

The objective of the ESCP is to set out strategies to control soil erosion and sediment generation close to the source and thereby minimise the potential for mine activities to adversely affect downstream water quality.

The WMP details a range of management safeguards, practices and controls and ameliorative actions to be carried out in mitigating erosion and sediment impacts. Measures to manage erosion and sediment control during ground disturbance activities include:

- diverting clean water around construction areas;
- capturing runoff from disturbed areas within a sediment dam for treatment;
- installing sediment fencing, hay bales, or other suitable controls down slope of disturbed areas to inhibit sediment laden runoff or divert runoff away from the remediated area until sufficient ground cover has been established;
- surfacing infrastructure pad areas and access tracks with an appropriate road base material, where required;
- stabilising stockpiles that will be left for any length of time with jute mesh, hydromulch and or grass cover;
- regular inspection and monitoring;
- immediately remediating erosion; and
- promptly rehabilitating disturbed areas no longer required for ongoing operations.

The ESCP was developed on principles outlined in the Landcom (2004) guidelines. These principles have been implemented to minimise soil erosion and the potential for transport of sediment off-site. Specific measures used include:

- inclusion of disturbance management and rehabilitation conditions on Ground Disturbance Permits;
- contour drains and rock-armoured drop structures on the NEOC overburden emplacement;
- collection drains at the toe of the NEOC overburden emplacement and around the perimeter of the NEOC and administration areas;
- direction of runoff from disturbed areas to mine water storages;
- a levee bank constructed between the Settling Dam/Process Water Dam and Bettys Creek;
- repair of subsidence induced surface cracking or instability implemented in a timely fashion following occurrence by regrading, ripping or infilling followed by revegetation, using equipment suitably sized for the task;
- coal stockpiling on prepared / stabilised pads;
- drill sumps are contained on-site and not allowed to spill;
- drill pads will have silt fence established around the downslope perimeter, with the pads themselves sheeted with road base material (low fines fill);
- sealing of high traffic roads;

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- maintenance of unsealed roads to avoid erosion, with table drain outlets directed to well grassed areas;
- use of downslope/downstream silt fences hay bale filters or natural grass filters (Landcom, 2004) associated with loose material stockpiles and new surface excavation or disturbance;
- upslope diversions and downslope sediment dam used to divert and collect runoff around the gas drainage plant; and
- shaping and revegetation of stockpiles at the Bowmans Creek Diversion.

Erosion and sediment control is therefore focussed on maintenance of existing controls, managing surface water drainage and controlling minor disturbance associated with surface infrastructure projects.

Habitat enhancement plantings, particularly within the narrow casuarina woodland areas, will also be considered. Plantings will include a high proportion of shrubs, native grasses, and reeds to aid with erosion control.

k. Ongoing Management of Biological Resources for Use in Rehabilitation

Management of biological resources (e.g. topsoil stockpiles and salvaged habitat features) are described in Section 6.2.1a, 6.2.1b and 6.2.1c.

l. Mine Subsidence

Mine subsidence impacts are managed through the preparation (and approval) of Extraction Plans (EPs). The EPs define the monitoring and management of subsidence effects from second workings and guide specific land management outcomes for the lands impacted by the underground mine.

The EPs outline revised subsidence predictions, a system of ongoing monitoring and management actions for specific surface and subsurface items. The objectives of the EPs are to ensure adequate protection of natural and built features from direct and indirect subsidence impacts. Predicted subsidence impacts to built features are addressed through the Built Features Management Plan (BFMP) and supporting Asset Management Plans (AMPs) which together, form part of the EP.

The BFMP identifies management objectives and asset owners potentially impacted by subsidence whilst the AMPs detail specific monitoring, management, incident response and reporting actions to mitigate potential subsidence impacts. The EPs outline objectives relevant to subsidence impacts, and detail specific monitoring, management, incident response and reporting activities relevant to underground operations during the life of the mine.

Management of subsidence impacts relevant to underground operations include:

- provisions to repair persistent subsidence impacts (e.g. surface cracking) through ripping or filling; and
- drainage works and rehabilitation of subsidence troughs on areas elevated above the floodplain as necessary to maintain a free draining landscape.

Mine subsidence impacts are identified via the Subsidence Monitoring Program prepared by ACOL.

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m. Management of Potential Cultural and Heritage Issues

The Heritage Management Plan (HMP) has been prepared to address the management and mitigation of potential impacts on Aboriginal cultural and historical heritage across the surface area of the ACP and ACOL-operated RUM. The HMP combines the management strategies developed in consultation with the Aboriginal and Historical Heritage Community and the requirements of the associated Aboriginal Heritage Impact Permits (AHIP), Development Consent and EPs into one document.

In 2011, ACOL gained two AHIPs covering the whole of the underground mine. These permits set out conditions for mining related impacts to Aboriginal heritage sites. Potential impacts to heritage sites may arise from:

- subsidence cracking resulting from underground mining;
- remediation of subsidence cracks;
- knick points and riling caused by changes in slope which modifies erosion patterns;
- the formation of ponds caused by subsidence depressions; and
- the development of surface infrastructure used to facilitate underground mining operations.

Indigenous heritage items located at the ACP are managed in accordance with approved AHIPs. Under the HMP, where required, artefacts at risk of harm will be recovered prior to being impacted. Sites identified for conservation (e.g. Waterhole Site and Glennies Creek Site) will be maintained in accordance with the HMP and relevant AHIP. In accordance with Condition 34, Schedule 3 of DA 309-11-2001-i, the protection, monitoring and management of Aboriginal sites within the VCA is also described in the HMP.

Management of Aboriginal and cultural heritage items are undertaken in accordance with the HMP and include:

- fencing around sites identified to be of high scientific and cultural significance will be maintained and monitored for potential subsidence impacts;
- sites identified for conservation will be maintained;
- personnel involved in disturbance works will be suitably trained, inducted and aware of the cultural significance of the area;
- the Environment and Community Relations Superintendent will be notified in the event an object believed to be of archaeological or cultural origin is discovered;
- archaeological due diligence inspections will be undertaken for new impact areas not covered by an AHIP; and
- projects involving ground disturbance require a Ground Disturbance Permit to be completed before commencing.

Four European heritage sites have been identified in proximity to the ACP (St Clements Anglican Church, Camberwell Community hall, Camberwell Glennies Creek Underbridge and a Historical Grave). These will not be impacted by underground mining at the ACP and no specific management measures are recommended other than to secure the sites and prevent injury following subsidence as per the BFMP and Public Safety Management Plan.

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n. Exploration Activities

No exploration activities are scheduled to occur in the NEOC area that are likely to affect rehabilitation. ACOL will continue to conduct exploration activities which will include seam continuity and splitting exploration in the Underground Mining Area. Exploration activities within the Underground Mining Area will provide baseline geological and coal quality data for modelling and planning purposes.

6.2.2 Decommissioning

a) Site Security

Site security measures will be implemented for the duration of the ACP and ACOL-operated RUM. These measures will be maintained during closure, decommissioning and demolition activities to prevent unauthorised access and to ensure public safety. Security measures include:

- fencing and signposting of the site;
- security patrols;
- all personnel, contractors and visitors will be required to undertake a relevant site induction and sign in and out of the site; and
- all visitors will be required to be accompanied by a site representative at all times.

Public and employee safety are fundamental considerations in the design and operation of the site and will be addressed through site procedures and work methods.

b) Infrastructure to be removed or demolished

All infrastructure will be removed from the site and the goaf gas drainage bores decommissioned and sealed in accordance with industry best practice and government guidelines, as required. Notwithstanding, prior to decommissioning, ACOL will investigate possible ongoing or future use of the installed infrastructure, such as continuing provision of gas for power generation or possible use of some sections of the pipeline network for property irrigation.

Decommissioning of the NEOC area (excluding the NEOC Void) has been completed. Upon cessation of underground mining activities, decommissioning of infrastructure with no ongoing beneficial use will commence.

c) Buildings, Structures and Fixed Plant to be Retained

Some infrastructure (e.g. site access roads, water storages) may be retained for alternate post-mining uses (where agreed in consultation with relevant authorities and local landholders).

Some access roads may be retained post-mining to enable access and for use in bushfire and other land management activities.

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d) Management of Carbonaceous / Contaminated Material

There are no currently defined areas of contaminated land within the ACP and ACOL-operated RUM boundaries.

Where there is the potential that contamination may have occurred as a result of site activities (e.g. refuelling areas, workshops, etc), investigations will be undertaken to determine the presence and extent of any contamination. Where identified, contaminated material will be bioremediated on site or disposed of off-site at an authorised waste facility.

If applicable, a suitably qualified contamination expert will be engaged to verify that any contamination has been adequately managed.

e) Hazardous Materials Management

ACOL endeavours to ensure active and efficient management of hazardous materials within its operations. ACOL has a current Dangerous Goods Register for all products stored and handled on the premises as required under the *Work Health and Safety Regulation 2011*. This register lists the Dangerous Goods stored and handled at the site (for Open Cut, CHPP and Underground operations), and ACOL has submitted a Dangerous Goods notification to Work Cover as required by the *Work Health and Safety Regulation 2011*.

Oils, fuels, greases and chemicals are labelled and stored in designated, impermeable bunded areas or approved storage facilities and are only used on a prescribed basis. Appropriate barriers are in place to eliminate the potential for soil contamination. Bunded fuel and oil storage areas are located near the NEOC Workshop, CHPP Store and the Underground Pit Top Workshop.

The storage and use of explosive materials on-site is no longer required since completion of Open Cut Mining. Should these be required in the future they will be addressed in consultation with the NSW Resources Regulator and DPE.

f) Underground Infrastructure

At completion of underground mining operations, all underground infrastructure (e.g. conveyors and dewatering systems) that are not retained will be removed for recycling or reuse.

6.2.3 Landform Establishment

The following sub-sections detail the key characteristics of landform establishment in accordance with the design of the Final Landform and Rehabilitation Plan (Section 5).

a) Water Management Infrastructure

Following cessation of mining operations, all Water Management Areas will be decommissioned. Current Water Management Areas include:

- water infrastructure (e.g. structures, clean water dams and dirty water dams);
- Bowmans Creek Diversion; and
- Bowmans Creek Riparian Zone.

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The decommissioning of water management infrastructure will be further refined during future mine closure planning and include:

- Drainage and desilting of structures.
- Reshaping, topsoiling and seeding of structures

b) Final Landform Construction: General Requirements

ACOL is committed to developing a stable landform that is capable of supporting self-sustaining ecosystems and land uses after the completion of mining operations. The final landscape will be returned to the same or higher land capability than prior to mining. Final landforms are to be consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post-mining landscape.

Construction works associated with Water Management Areas as described in Section 6.2.3e.

c) Final Landform Construction: Reject Emplacement Areas and Tailings Dams

The NEOC void has been designed to allow rejects and tailings emplacement, and efficient dewatering for maximum water recovery. Once capped and trimmed to a gently undulating landform the area will be revegetated with improved pastures. Water will drain from east to west and into the existing process water storage dam. The capping and remediation of the NEOC Void Tailing Emplacement Facility is not scheduled to occur until cessation of mining activities.

The emplacement of tailings in the NEOC Void (in addition to coarse rejects) would result in an approximate surface level of 78 m AHD for the rehabilitated landform of the NEOC void.

d) Final Landform Construction: Final Voids, Highwalls and Low Walls

The NEOC void would be substantially backfilled and no highwalls or low walls would remain post-mining, as shown on Plan 2.

e) Construction of Creek / River Diversion Works

The Bowmans Creek Diversion Rehabilitation Strategy (BCDRS) (ACOL, 2010) provides a consolidated account of the overall design and rehabilitation strategy for the Bowmans Creek Diversion. Progression of rehabilitation is ongoing and ahead of the schedule outlined in the BCDRS (ACOL, 2010). Phase 1 (Bank Stabilisation) is finalised with Phase 2 (Community Structure) in progress and Phase 3 (Species Diversity) commenced.

The diversion of Bowmans Creek, including the design of the bed control structures and the incorporation of aquatic habitat attributes will be undertaken using the rehabilitation guidelines set out in Rutherford *et al* (2000). Indicative design dimensions for such structures are:

- maximum gradient change per pool riffle sequence 0.3 m;
- riffles to have at least 1:20 gradients (which for a 0.3 m drop means a length of about 6 m). If longer riffle sequences are contemplated, resting pool sections would need to be incorporated into the riffle sequence;
- minimum pool lengths between main riffles to be about 25 m;
- stream beds will be of cobbles, gravel and sand to mimic the existing creek;

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- pool depths will be sufficient to prevent the growth of Cumbungi across the channel. The ACP pools will have relatively steep riparian edges to limit riparian emergent vegetation to those edges;
- pools will need to incorporate large woody debris to enhance fish habitat. The location and density of this material will mimic that of the existing creek; and
- the planting of riparian vegetation (especially River Oaks [*Casuarina Cunninghamiana*]) will be a high priority so that maximum shading can be achieved in the shortest time.

In accordance with DA 309-11-2001-i, ACOL installed stock proof fencing along both sides of the functioning diverted creek for its full length between the New England Highway and the Hunter River. Following closure, ACOL will install stock watering troughs at strategic locations on pasture areas adjacent to the creek where required.

6.2.4 Growth Medium Development

Once the final landform has been established, topsoil removed from the excavated areas will be immediately respread onto recontoured areas or stockpiled. Following the recontouring of overburden dumps, topsoil will be spread to a depth of approximately 100 millimetres (mm). The revegetation program will follow topsoiling and will include groundcover species to control initial soil erosion and native trees and shrubs. Revegetation methods will comprise:

- Deep ripping to remove any compacted surface layers.
- Topsoil spread evenly over the surface to a minimum depth of 300 mm.
- Seeding of pasture grasses, tree and shrub species.

Data derived from previous environmental assessments (HLA Envirosciences, 2001) demonstrates the suitability of the soils at the ACP in terms of suitability for use as top dressing and the required stripping depth.

Topsoil re-spreading operations will not be undertaken when the material is excessively wet or dry. Where required, soil ameliorant and fertiliser would be applied to improve the availability of nutrients. The appropriate application rates for soil ameliorants will be established through ongoing trials work of revegetation techniques and varying application rates.

6.2.5 Ecosystem and Land Use Establishment

The rehabilitation strategy includes establishment of final land uses of Agricultural – Grazing, Native Ecosystem, Biodiversity Conservation, Water Management Areas and Water Storage Areas. These final land uses may be established by the methods described below.

Pasture and Native Ecosystem Establishment

Trees or shrubs, which will be used in landscape plantings as a visual screen, will be species common to the areas of woodland that were removed from the north-eastern woodland. Species will include the Narrow-leaved Ironbark, Grey Gum and to a lesser extent the Forest Red Gum or Blakely's Red Gum. Shrub species used will include Western Boobialla, Acacia species native in the area and possibly the less common species such as Wilga.

The target vegetation communities are representative of the pre-mining vegetation communities or the surrounding vegetation communities.

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Ponds will be incorporated into creek diversion design to promote fish movement and provide aquatic fauna habitat. The placement of tall shrubs and trees near the aquatic habitats will be designed so as not to shade the aquatic habitat, therefore maintaining basking opportunities. Where the ponds are within pasture that is grazed, efforts will be made to restrict stock to defined access points to manage water quality. With the exception of designated watering areas stock will be excluded from at least 20 m from the high water mark, allowing vegetation to establish and provide foraging and refuge opportunities.

Foraging habitat and dispersal corridors will be maintained as open woodland with sparse/moderate groundcover interspersed with refuge habitat (i.e. rock piles and fallen timber). Where pasture becomes dense along the edges of the ponds or between clusters of ponds cattle may be temporarily introduced into the area to assist in maintaining a sparse ground cover as preferred by this species.

Bushfire Management

Bushfire management will continue through rehabilitation areas to support establishment of vegetation. Bushfire risk is managed through ameliorative actions as well as management safeguards. Ameliorative actions include:

- Ensuring mining activities with potential to cause ignition such as sparks from vehicles, metal grinding, welding are managed.
- Ensuring vegetation does not interfere with power lines.
- Creating firebreaks to ensure that bushfire does not spread from surrounding lands.

Management safeguards include:

- the provision of firefighting equipment;
- fire training for staff and on-site fire-fighting team;
- suppression of any bushfire outbreaks;
- set up appropriate communication strategies to ensure all employees, contractors and service providers are aware of fire emergency policies and procedures;
- communication and liaison processes with the Upper Hunter Rural Fire Service are in place in relation to preparation of Bushfire Management Procedures; and
- develop appropriate fire breaks and perimeter trails.

Suppression where practicable of all wildfires occurring in the conservation area as quickly as possible with the aim of keeping fires to a small area.

Bushfire management will be undertaken in accordance with the ACOL Bushfire Management Plan.

Weed Management

Weed management will be a key factor in determining the success of the project, particularly within the first 12 to 18 months of the Plant Establishment Period. Weed management has been implemented across the lifespan of the ACP and ACOL-operated RUM and is described in Section 6.2.1b.

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6.2.6 Ecosystem and Land Use Development

At the ecosystem and land use development phase, rehabilitation monitoring results would be used to confirm rehabilitation areas are on a trajectory towards a self-sustaining ecosystem and meeting the rehabilitation completion criteria. Monitoring results would also be used to determine the recommendations and requirements for maintenance and/or contingency measures (e.g. supplementary plantings, weed control and erosion repair) to improve rehabilitation performance. The rehabilitation monitoring program implemented is described in Section 8.

It is expected that at this phase, the need for maintenance/intervention would be no greater than that required for the surrounding lands whether it be for Agricultural – Grazing or Native Ecosystem areas.

Notwithstanding the above, potential rehabilitation maintenance requirements include (but are not necessarily limited to):

- Weed and feral animal control of rehabilitation.
- Erosion control works.
- Re-seeding/planting of rehabilitation areas that may have failed.
- Maintenance fertilising.
- Repair of fence lines, access tracks and other general related land management activities.

Habitat Connectivity

Long term post-mining land use objectives are to create a mosaic of agricultural land and wildlife habitat. This will be achieved by limiting stock access to riparian and revegetated habitats and by allowing the continued grazing of stock within some woodland units once they have been established. The retention of fencing will allow the rotation of grazing within woodland units allowing the regeneration process to be controlled in the long term and to aid in bushfire hazard reduction by grazing.

The open cut area will be a mixture of grazing land and trees in clumps incorporating several dams to capture water from the emplacement areas. Trees in clumps will be fenced to restrict cattle access until maturity. Subsided areas south of the highway will be predominantly improved pasture with isolated stands of trees, riparian vegetation along waterways and the VCA.

6.3 Rehabilitation of Areas Affected by Subsidence

All areas affected by subsidence are covered by an associated EPs. Where relevant, these EPs describe the proposed subsidence remediation processes that would be undertaken if required.

A summary of subsidence management and/or remediation measures are provided below, including an outline of the relevant EPs and the Subsidence Monitoring Program.

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Basic land management practices relating to subsidence include:

- open areas of pasture impacted by mining subsidence will be deep ripped to a depth of approximately 600 mm for the purposes of repairing surface cracking and/or compaction, where required. The ripping should be undertaken with a bulldozer (or other suitable equipment) and rip lines should closely follow the contour; and
- wooded areas impacted by mining subsidence will be deep ripped where access is possible, or excavated and compacted using smaller equipment and imported fill where required. Where possible, tree clearing will be minimised providing that effective and safe remediation can be undertaken. Where this is not possible trees will be felled prioritising smaller regrowth over larger trees. Where possible felled timber will be reused on site for habitat improvement or emission control.

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

Interim erosion control devices such as hay bales and geotextile barriers will be provided as necessary to divert surface runoff away from the remediated area until sufficient ground cover has been established. Nick points in grassland or woodland areas will be reshaped and remediated in a similar manner or may be managed by the use of coir log dams which may be installed at nick points to assist in slowing surface water flows allowing siltation upslope of the log.

Minor ephemeral drainage lines may develop nick points that will require reshaping to ensure velocities and scour characteristics are not altered. Once reshaped, any steepened areas that may remain unstable will be lined with loosely placed rock to dissipate runoff energy. While it is not expected to occur, surface cracking of rock exposures in drainage lines may be sealed by cement or chemical grout as appropriate.

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7. REHABILITATION QUALITY ASSURANCE PROCESS

A Rehabilitation Quality Assurance Process will be implemented at the ACP and ACOL-operated RUM which details the key actions and/or processes nominated for each rehabilitation phase to ensure that:

- Rehabilitation is implemented in accordance with the nominated methodologies and designs.
- Identified risks to rehabilitation are adequately addressed before proceeding to the next phase of rehabilitation.
- Rehabilitation is completed to the standard required to achieve the applicable completion criteria.

The Rehabilitation Quality Assurance Process will measure how the requirements of this RMP have been met and will document the rehabilitation evidence used for assessing against the ACP completion criteria (Section 4). The Rehabilitation Quality Assurance Process will be integrated into day to day operations at the ACP and ACOL-operated RUM and implemented throughout the life of the operation including into closure and until relinquishment has been achieved. The Rehabilitation Quality Assurance Process is outlined in **Table 11** below. Rehabilitation validation monitoring undertaken is described in Section 8.

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Table 11: Rehabilitation Quality Assurance Process

Rehabilitation Phase	Domain	Quality Assurance Actions and Processes	Responsibilities for Implementation	Method for Documenting and Recording Process
Decommissioning	All Mining Domains	<ul style="list-style-type: none"> Infrastructure Decommissioning Strategy. Contaminated land assessment. Hazardous material assessment. 	<p>Operations Manager.</p> <p>Suitably qualified/experienced person(s).</p>	<ul style="list-style-type: none"> Annual Rehabilitation Report and Forward Program. Annual Review. Inspections and documentation. Validation report.
	Domain 1 Infrastructure Area	<ul style="list-style-type: none"> Infrastructure Decommissioning Strategy. Inspections and demolition reports. 	<p>Operations Manager.</p> <p>Suitably qualified/experienced person(s).</p>	<ul style="list-style-type: none"> Demolition report. Inspections and documents.
	Domain 3 Water Management Area	<ul style="list-style-type: none"> BCDRS. Water quality monitoring. Hydraulic and hydrologic modelling. Retained water infrastructure assessed. 	<p>Environment and Community Superintendent.</p> <p>Suitably qualified/experienced person(s).</p>	<ul style="list-style-type: none"> Annual Rehabilitation Report and Forward Program. Annual Review. Consultation records. Modelling reports. Monitoring reports. Survey. Validation reports.
	Domain 4 Overburden Emplacement Area	<ul style="list-style-type: none"> Contaminated land assessment. Monitoring and assessment of final landform. 	<p>Mine Planning Superintendent.</p> <p>Suitable qualified/experienced person(s).</p>	<ul style="list-style-type: none"> Inspections and documentation. Monitoring reports.

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Table 11: Rehabilitation Quality Assurance Process (Continued)

Rehabilitation Phase	Domain	Quality Assurance Actions and Processes	Responsibilities for Implementation	Method for Documenting and Recording Process
Decommissioning (Continued)	Domain 6 Underground Mining Area (SMP)	<ul style="list-style-type: none"> Infrastructure Decommissioning Strategy. Inspection and demolition reports. Evidence of sign-off by Operations Manager (or delegate) that security measures are installed, and recommendations of risk assessment satisfied. 	Operations Manager. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> Inspections and documentation. Monitoring reports. Validation reports.
	Domain 8 Other (Coarse Reject and Tailings Emplacement)	<ul style="list-style-type: none"> Life of Mine Tailings Management Strategy. Contaminated land assessment. Monitoring and assessment of final landform. 	Mine Planning Superintendent. Suitable qualified/experienced person(s).	<ul style="list-style-type: none"> Inspections and documentation. Monitoring reports.
Landform Establishment	All Final Land Use Domains	<ul style="list-style-type: none"> Final landform topographic survey. Landform erosion modelling. Surface water quality monitoring. Groundwater quality monitoring. Erosion and sediment control monitoring. Geotechnical assessment of stability. Photographic monitoring of rehabilitation landforms. Visual monitoring. 	Mine Planning Superintendent. Surveyor. Suitably qualified persons.	<ul style="list-style-type: none"> Expert assessment reports. Inspections and documentation. Validation reports. Survey.
Growth Medium Development	All Final Land Use Domains	<ul style="list-style-type: none"> Supervision of topsoil spreading. Visual and photographic monitoring. Tracking and review of topsoil balance. Soil chemistry analysis. Erosion and sediment control monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> Annual Rehabilitation Report and Forward Program. Annual Review. Inspections and documentation. Monitoring reports.

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Table 11: Rehabilitation Quality Assurance Process (Continued)

Rehabilitation Phase	Domain	Quality Assurance Actions and Processes	Responsibilities for Implementation	Method for Documenting and Recording Process
Ecosystem and Land Use Establishment	Domain A Native Ecosystem	<ul style="list-style-type: none"> • Analysis of ecosystem function. • Landscape Function Analysis (LFA). • Surface water quality monitoring. • Groundwater quality monitoring. • Visual and photographic monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> • Annual Rehabilitation Report and Forward Program. • Annual Review. • Inspections and documentation. • Monitoring reports.
	Domain B Agricultural – Grazing	<ul style="list-style-type: none"> • LFA Assessment. • Surface water quality monitoring. • Groundwater quality monitoring. • Visual and photographic monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> • Annual Rehabilitation Report and Forward Program. • Annual Review. • Inspections and documentation. • Monitoring reports.
Ecosystem and Land Use Development	Domain A Native Ecosystem	<ul style="list-style-type: none"> • Analysis of ecosystem function. • LFA. • Water quality monitoring. • Visual and photographic monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> • Annual Rehabilitation Report and Forward Program. • Annual Review. • ESF2 or equivalent. • Inspections and documentation. • Monitoring reports. • Validation reports.

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Table 11: Rehabilitation Quality Assurance Process (Continued)

Rehabilitation Phase	Domain	Quality Assurance Actions and Processes	Responsibilities for Implementation	Method for Documenting and Recording Process
Ecosystem and Land Use Development (Continued)	Domain B Agricultural – Grazing	<ul style="list-style-type: none"> • Agronomic assessment of land capability and agricultural suitability classification. • LFA. • Water quality monitoring. • Visual and photographic monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> • Annual Rehabilitation Report and Forward Program. • Annual Review. • ESF2 or equivalent. • Inspections and documentation. • Monitoring reports. • Validation reports.
	Domain F Water Management Areas	<ul style="list-style-type: none"> • Water quality monitoring. • Visual and photographic monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> • Annual Rehabilitation Report and Forward Program. • Annual Review. • Monitoring reports. • Validation reports.
	Domain G Water Storage (Excluding Final Void)	<ul style="list-style-type: none"> • Water quality monitoring. • Visual and photographic monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> • Annual Rehabilitation Report and Forward Program. • Annual Review. • Monitoring reports. • Validation reports.
	Domain K Other (Southern Woodland Conservation Area)	<ul style="list-style-type: none"> • Analysis of ecosystem function. • LFA. • Water quality monitoring. • Visual and photographic monitoring. 	Environment and Community Superintendent. Suitably qualified/experienced person(s).	<ul style="list-style-type: none"> • Annual Rehabilitation Report and Forward Program. • Annual Review. • Monitoring reports. • Validation reports.

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8. REHABILITATION MONITORING PROGRAM

8.1 Analogue Site Baseline Monitoring

ACOL has established analogue sites and conducted baseline monitoring which has guided the development of rehabilitation completion criteria for approval by the Planning Secretary. Analogue monitoring continues to be undertaken with the LFA programs for the Native Ecosystem areas and Agricultural – Grazing areas (Section 8.2).

The ongoing annual rehabilitation monitoring program which commenced in 2008 will continue throughout the life of ACP and ACOL-operated RUM. The program will assess the recovery of rehabilitation areas across the site. The program will be based on the performance indicators outlined in Section 4 and will utilise methodologies that can provide quantitative data to assess changes occurring over time.

The program compares the progress of a number of rehabilitation sites, against a set of completion criteria obtained from measurement made in areas of remnant woodland and grassland communities in the local area. The monitoring program aims to be consistent with the conditions specified in the approval documents and relevant approved Management Plans.

8.2 Rehabilitation Establishment Monitoring

The monitoring methodology adopted is a standard and simple procedure that can be replicated over any vegetation community or rehabilitation area and allows results to compare similar communities. The monitoring methodologies utilise a combination of the following:

- LFA;
- Soil Analysis;
- Assessment of Ecosystem Characteristics;
- Pasture Productivity Assessment;
- Land Capability Assessment;
- Photographic monitoring; and
- Subsidence Monitoring.

8.2.1 Landscape Function Analysis

LFA is a methodology used to assess key indicators of ecosystem function including landscape organisation and soil surface condition as measure of how well the landscape retains and uses vital resources. The indicators used quantify the utilisation of the vital landscape resources of water, topsoil, organic matter and perennial vegetation in space and time.

LFA is undertaken within the NEOC rehabilitation monitoring program. LFA is used to assess attributes that relate to pasture productivity and soil nutrient status, in line with the existing and future site-wide Agricultural – Grazing area surveys.

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8.2.2 Soil Analysis

Soil samples are taken five yearly using standard soil sampling techniques (core sampler). Soil parameters assessed include pH, electrical conductivity, available calcium, magnesium, potassium, ammonia, sulphur, organic matter, exchangeable sodium, calcium, magnesium, hydrogen, aluminium, cation exchange capacity, available and extractable phosphorus, micronutrients (zinc, manganese, iron, copper, boron), total carbon and nitrogen.

8.2.3 Ecosystem Characteristics

An assessment of ecosystem characteristics will be conducted which provides quantitative data that measures changes in:

- floristic diversity including species area curves and growth forms;
- ground cover diversity and abundance;
- fire;
- vegetation structure and habitat characteristics (including ground cover, cryptogams, logs, rocks, litter, projected foliage cover at various height increments);
- understorey density and growth (including established shrubs, direct seeding and tubestock plantings and tree regeneration);
- overstorey characteristics including tree density, health and survival; and
- other habitat attributes such as the presence of hollows, mistletoe and the production of buds, flowers and fruit.

8.2.4 Land Capability Assessment

The land capability system is applied to the survey area in accordance with the relevant land classification and/or land capability guidelines (e.g. called *Systems used to classify rural lands in New South Wales* [Cunningham *et al.* 1986], *Land and Soil Capability Assessment Scheme; Second Approximation* [OEH, 2012]).

Data will be collected on a range of factors and assessed to determine land capability based on guideline requirements. These factors may include climate, soils, geology, geomorphology, soil erosion, topography and the effects of past land-uses.

Pasture Productivity Assessment

In areas with a post-mining land use aligned to Agricultural – Grazing, soil testing or pasture assessments will be undertaken in accordance with accepted methods to guide the appropriate stocking rates for the post-mining land use. Based on these results and other further studies as required, sustainable carrying capacities will be determined for pastures at the ACP and ACOL-operated RUM.

8.2.5 Photographic Monitoring

Opportunistic and permanent photo-points or transects may be utilised to record changes in attributes over time. Generally the location and orientation of photo-points and transects will be recorded using Global Positioning System.

Photo transects may be established by laying a length of tape (e.g. 50 m) between two star pickets. A consistent ground to sky ratio should be maintained (e.g. 5:1) where possible. Once established, the transect will allow for the capture of three digital photographs at each star picket; taken in the direction of the transect line:

- to the left of the tape (with the tape just in the frame in the far right);
- with the tape (and star picket) in the centre of the frame; and
- to the right of the tape (with the tape just in the frame in the far left).
- Alternatively, a panoramic shot can be taken centred around the star picket.

8.2.6 Subsidence Monitoring

Surface Cracking and Ponding

Monitoring of surface cracking will be undertaken during and post-mining. Monitoring of surface cracking will be conducted in accordance with the Subsidence Effects Monitoring Program incorporated into the relevant EP.

Visual inspections of low lying areas and ponding will be undertaken as part of the Subsidence Effects Monitoring Program.

Remote Sensing

In accordance with the approved EP and Subsidence Effects Monitoring Program, remote sensing data will be utilised to provide for quantitative comparison of key land surface condition parameters. Light Detection and Ranging (LiDAR) data will be captured across the entire Underground Mining Area.

The baseline data and all subsequent LiDAR captures will be processed into a land surface digital elevation model (DEM). Each new dataset will be subtracted from those produced from earlier captures creating a series of DEM change images. These datasets will document any changes in creek slope, width and depth. The datasets will also assist in the monitoring of steep slopes.

The best results will be derived from repeat data capture and image to image comparison. These comparisons may provide accurate assessment of erosion and deposition. Each dataset produced will be used to create a map for visual interpretation and analysis and for communication of results.

8.2.7 Bowmans Creek Diversion Monitoring

Monitoring of the Bowmans Creek Diversion will extend to include the LFA methodology and the program of rehabilitation and farmland monitoring undertaken at sites that will provide reference sites for some aspects of the program for Bowmans Creek.

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In addition to the above, ACOL previously had in place four aquatic ecology monitoring sites that have been sampled bi-annually since autumn 2007. Following the construction of the Bowmans Creek Diversion, a new site layout for stream health monitoring on Bowmans Creek was adopted. This design has been in place since spring 2009 and includes 13 monitoring sites located on the Bowmans Creek, with four sites on the diversion channels.

8.3 Measuring Performance Against Rehabilitation Objectives and Rehabilitation Completion Criteria

The results of rehabilitation monitoring will be compared against the completion criteria described in Section 4. Details of rehabilitation monitoring will be provided in subsequent Annual Rehabilitation Reports and Forward Programs.

Summaries of the monitoring results and performance against rehabilitation objectives and completion criteria will be included in this section when the RMP is revised.

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9. REHABILITATION RESEARCH, MODELLING AND TRIALS

9.1 Current Rehabilitation Research, Modelling and Trials

ACOL has embarked on several experimental trials and are planning to undertake several long term rehabilitation and ecological studies within its operations.

The rehabilitation research and trials previously undertaken by ACOL are discussed below.

Soil Ameliorants

Two rehabilitation trials have been conducted at the ACP to date to identify potential soil treatments that improve rehabilitation outcomes for the conceptual final land use. These treatment trials include the use of:

- Organic Growth Medium (OGM) (i.e. a municipal solid waste); and
- biosolids.

The trial involved the application of OGM at varying rates (e.g. 0 t/ha, 60 t/ha and 100 t/ha) to topsoil or overburden and seeded with either improved pastures or native trees and shrubs. The results of the trial indicated that an application rate of 60 t/ha OGM directly to overburden significantly increased tree and shrub growth and density when compared with other application rates and/or topsoil used. Improved pasture groundcover and above ground herbage mass was significantly higher with an OGM application rate of 100 t/ha to topsoil when compared to other application rates to topsoil or overburden. These application rates also decreased the prevalence of weeds, specifically *Galinea pubescens*. These findings have been adopted in ACOL's rehabilitation procedure.

The biosolids trial compared the use of a stabilised biosolids product against OGM. The preliminary observations from this trial have indicated that there is no difference in plant growth between the two soil treatments.

Herbicide Trials

DRG (now the NSW Resources Regulator) in conjunction with ACOL conducted a *Galinea pubescens* treatment trial program. The trial was conducted in the ACP woodland rehabilitation areas. The trial aimed to identify alternative herbicides and spray rates for eradicating *Galenia pubescens* around native saplings. Grazon^(R), the chemical traditionally used to treat *Galenia pubescens* on mine site rehabilitation is highly aggressive against Eucalypt and Acacia saplings. The trial addressed the effects on both young saplings (< 18 months and < 1 m height) and adolescent saplings (three years old and 2 to 3 m height). The results of these trials, when aligned to the legislative requirements of herbicide usage, provide the opportunity for the use of a greater range of herbicides to use on Galenia in woodland areas.

Closure Criteria for River Diversions

ACOL participated an ACARP research project: *C25031 Closure Criteria for River Diversions: An Alternative to Reference Sites*. The broad aim of the research was to move from the use of reference sites in an environmental assessment to a more pragmatic and robust methodology through designing realistic closure criteria based around the use of microbial communities as indicators of environmental condition.

Fieldwork and sampling along the Bowmans Creek Diversion was undertaken by researchers during 2016 and was completed in 2018.

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9.2 Future Rehabilitation Research, Modelling and Trials

Rehabilitation of the NEOC overburden emplacement commenced in 2005, with rehabilitation being completed in 2012. The majority of the remaining disturbed areas are Infrastructure Areas and Water Management Areas. As the rehabilitation of these areas is well understood, there are currently no rehabilitation trials, research or modelling proposed before mine closure.

ACOL will continue to review the need to establish rehabilitation trials, research or modelling at the ACP and ACOL-operated RUM as part of the Annual Rehabilitation Reports and Forward Programs.

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10. INTERVENTION AND ADAPTIVE MANAGEMENT

The following Trigger Action Response Plan (TARP) identifies the proposed contingencies strategies in the event of negative variations or impacts to rehabilitation outcomes. **Table 12** outlines the key identified risks, their trigger and proposed mitigation measures to reduce the identified risks.

Table 12: Trigger Action Response Plan

Risk	Trigger	Proposed Mitigation Measures
Surface subsidence is greater than that modelled.	Data obtained from the subsidence monitoring program indicates exceedance.	<p>Assess public safety and where applicable, implement safety measures in accordance with the Public Safety Subsidence Management Plan or as otherwise necessary to prevent injury or harm to any person.</p> <p>Assess impacts on known Aboriginal heritage sites and where appropriate implement measures in accordance with the HMP and relevant AHIP.</p> <p>Investigate, in consultation with affected stakeholders (where appropriate) to evaluate the contributing factors to the exceedance. The investigation may include (where applicable):</p> <ul style="list-style-type: none"> re-survey of the relevant subsidence monitoring lines; re-sampling or re-surveying of the applicable environmental monitoring locations (i.e. groundwater bores, surface water monitoring sites); review measured subsidence parameters against the observed impact, and latest subsidence predictions; and implement remedial action and/or adaptive management measures, dependent on the outcomes of the above investigation. Any such measures will be undertaken in consultation with the relevant stakeholder and/or to the satisfaction of the appropriate government agency and DPE.
Off-site release of contaminants from mined materials requiring long term management or treatment.	Data obtained from compliance monitoring program indicates exceedance.	<p>Ongoing monitoring of runoff and seepage waters during operations to validate predictions.</p> <p>Mitigation measures as proposed in the WMP.</p>
Inadequate or insufficient landform shaping to achieve a free draining surface.	Identification of ponding areas during daily inspections of surface positioning.	<p>Conduct works, in accordance with this RMP.</p> <p>Undertake earthworks to reshape the land, and/or provide a drainage path to the nearest watercourse where practical.</p>

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Table 12: Trigger Action Response Plan (Continued)

Risk	Trigger	Proposed Mitigation Measures
Inadequate or insufficient topsoil to create/enhance the desired ecological communities.	Monitoring and vegetation assessments highlight inadequate ground cover and or paucity in species diversity / distribution. Soil analysis indicates soil parameters are not compatible to post-mining vegetation community.	Manage topsoil, overburden and substrate management procedures and soil testing. Assess soil for weed contamination and treat affected soil. Apply ameliorants as appropriate.
Wind and water erosion.	Monitoring or vegetation assessments indicate poor vegetation cover or soil instability and potential for wind and water erosion.	Review adequacy of erosion and sedimentation controls which will be employed during rehabilitation activities, including rehabilitation of the creek diversion and the repair of subsidence areas, in accordance with the WMP. Annual monitoring detailed above will be designed to determine the type, source, degree, and location of potential erosion sites, source of sediment and potential methods of treatment.
Impact of weeds and/or vertebrate pest animal leading to widespread failure of revegetation ecosystems.	Monitoring and vegetation assessments identify increased weed competition or degradation by pest animal species.	Review and ensure topsoil management practices prevent the spread of weeds. Review management practices and ensure rapid establishment of ground cover. Review adequacy of weed control activities and ensure activities are undertaken in accordance with the requirements of the <i>Biosecurity Act 2015</i> . Review Weed Action Plan. Review and if necessary, increase control of pest animal species in accordance with industry guidelines.
Poor vegetation establishment success.	Monitoring data indicates noncompliance with performance criteria in terms of landscape function, biodiversity and pasture productivity.	The species mix used in enhancement/rehabilitation programs is reviewed to ensure these align to the floristic structure of the plant community of the site and the physical and chemical properties of the growing media. Physical and chemical properties of the growing media reviewed against completion criteria and appropriate treatment determined (e.g. soil ameliorants). Replanting activities to be scheduled and undertaken during favourable conditions with adequate follow up maintenance post planting.
Asset Protection Zone (APZ) is not maintained in context of bushfire risk.	Site assessment of APZ shows unacceptable fuel levels.	Control and maintain a suitable APZ surrounding rehabilitation areas by slashing and controlled grazing in accordance with ACOL's EMS.

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Table 12 Trigger Action Response Plan (Continued)

Risk	Trigger	Proposed Mitigation Measures
Major storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitated areas.	Weather warnings relate to severe storms and localised flooding. Monitoring program indicates lack of adequate ground cover.	Design final landforms, structures and revegetation to cope with major storm events. Implement maintenance program on sediment structures.
Severe and/or prolonged drought leading to widespread failure of revegetation.	Monitoring and vegetation assessments highlight inadequate ground cover and/or paucity in species diversity/distribution.	Selection of drought-tolerant species for revegetation. Selection of species aligned to desired vegetation community. Time plantings to take advantage of ideal weather conditions. Use of compost materials and mulched to increase organic carbon levels and improve soil structure with resultant increase in infiltration and water holding capacity irrigation.
Changing climate leading to failure of rehabilitation, failure of environmental management controls and/or inability to attain completion criteria.	Monitoring and vegetation assessments highlight inadequate ground cover and/or paucity in species diversity/distribution. Soil analysis indicates soil parameters are not compatible to post-mining vegetation community.	Assess climate change risks and implement appropriate measures where required. Irrigate rehabilitated areas in response to changed climate conditions.
New regulatory requirements or evolving community expectations leading to difficulties negotiating or attaining completion criteria.	Changes in relevant legislation.	Monitor trends and developments in legislation and changes to community expectations. Review completion criteria and consult with stakeholders to gain acceptance of completion criteria.

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11. REVIEW, REVISION AND IMPLEMENTATION

Review and Revision of this RMP

In accordance with clause 11, Schedule 8A of the *Mining Regulation 2016*, ACOL will amend this RMP in the following circumstances:

- to substitute the proposed version of the Rehabilitation Objectives and Rehabilitation Completion Criteria (Section 4) or Final Landform and Rehabilitation Plan (Section 5) with the version approved by the Secretary—within 30 days after the document is approved;
- as a consequence of an amendment made to the Rehabilitation Objectives and Rehabilitation Completion Criteria (Section 4) or Final Landform and Rehabilitation Plan (Section 5) – within 30 days after the amendment is made;
- to reflect any changes to the risk control measures in the RMP that are identified in a rehabilitation risk assessment – as soon as practicable after the rehabilitation risk assessment is conducted; and
- whenever directed in writing to do so by the Secretary – in accordance with the direction.

ACOL will ensure that the RMP remains current and relevant to ensure it defines the rehabilitation outcomes to be achieved in relation to the mining area and sets out the strategy to achieve those outcomes. This will be partly informed by ensuring that the effectiveness of the rehabilitation risk assessment and controls adopted in the life of mine progressive rehabilitation schedule and rehabilitation phases are routinely evaluated throughout the life cycle of the ACP and ACOL-operated RUM.

ACOL’s approach to managing the rehabilitation program in terms of subsidence and environmental impacts at the ACP and ACOL-operated RUM includes using past performance to guide and improve future monitoring and management actions. ACOL utilises monitoring records of environmental conditions and the subsequent response to monitoring to gain an improved understanding of the environmental and site-specific behaviour. Updated information is then incorporated into ACOL’s management plans through each phase of mine planning and reviewed when requested.

Whenever any foreseeable hazard is identified that presents a risk to achieving the Rehabilitation Objectives and Rehabilitation Completion Criteria, or the Final Landform and Rehabilitation Plan, ACOL will update the rehabilitation risk assessment and RMP.

The results of any environmental performance monitoring undertaken during the Forward Program term will also contribute to refining future RMPs.

Implementation of this RMP

Table 13 defines personnel who are responsible for the monitoring, review and implementation of this RMP.

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Table 13: Responsibilities for Implementation of the RMP

Title	Responsibility
Operations Manager	<ul style="list-style-type: none"> • Implement the procedures referenced in this RMP. • Undertake training in relevant Management Plans and procedures as required. • Provide resources required and support to implement these procedures. • Allow for forward planning to prepare rehabilitation areas.
Technical Services Manager	<ul style="list-style-type: none"> • Implement the procedures referenced in this RMP. • Undertake training in relevant Management Plans and procedures as required. • Provide resources required to implement these procedures. • Allow for forward planning to prepare rehabilitation areas. • Ensure mine planning is compliant with the requirements of the RMP. • Allow for forward planning to allow for any possible reviews of the RMP required by future mine planning. • Ensure all personnel undertaking works in relation to this RMP are trained and competent.
Environmental and Community Relations Superintendent	<ul style="list-style-type: none"> • Prepare the relevant Management Plans. • Implement, monitor and review the programmes and procedures linked to this RMP. • Consult with regulatory authorities as required. • Undertake monitoring as required. • Undertake maintenance as required. • Provide measures for continual improvement to this RMP and procedures. • Ensure all personnel undertaking works in relation to this RMP are trained and competent. • Report the progress of any rehabilitation and monitoring of biodiversity in the Annual Review.
Environment and Community Coordinator	<ul style="list-style-type: none"> • Provide support for the implementation of the Environmental and Community Relations Superintendent responsibilities.

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ATTACHMENT 1
ASHTON COAL REHABILITATION RISK ASSESSMENT

Risk Identification & Analysis					Unmitigated Risk				Risk Reduction Strategy		Residual Risk				
#	Rehabilitation Phase	Risk Source	Potential Impact/Consequence	Loss Type	Consequence	Likelihood	Existing Risk	Risk Level	Existing Control	Additional Control / Action	Consequence	Likelihood	Target Risk	Risk Level	Person Responsible
1	General	Insufficient resourcing: - skills and experience of rehabilitation personnel. - funding for or prioritisation of rehabilitation activities. - ongoing maintenance of rehabilitation requirements.	Rehabilitation signoff not given by Regulator	(O) Asset Damage and Other	3	C	13	(H)	Existing rehabilitation success. Experienced environmental team. Yancoal corporate oversight and experience. Existing Environmental Management Strategy and associated Plans. Rehabilitation Cost Estimate.		3	D	9	(M)	
				(R) Impact on Reputation	2	C	8	(M)	Existing rehabilitation success. Experienced environmental team. Yancoal corporate oversight and experience. Existing Environmental Management Strategy and associated Plans. Rehabilitation Cost Estimate.		2	D	5	(L)	
2	General	Lack of clearly defined responsibilities	Rehabilitation signoff not given by Regulator	(O) Asset Damage and Other	1	C	4	(L)	Technical Services Manager responsible for seeking approval for funding for closure, provision of resources for rehabilitation and managing rehabilitation activities. Environment and Community Superintendent responsible for design of technical closure plans. Yancoal Corporate Standard - Rehabilitation (Includes RACI matrix). Rehabilitation Management Plan and Forward Management Plan	1. Responsibilities to be defined in Section 7 of the Rehabilitation Management Plans.	1	D	2	(L)	Phillip Brown
3	Active Mining Phase of Rehabilitation	Adverse geochemical/chemical composition of materials such as overburden, interburden, processing wastes, subsoils and topsoils imported cover materials.	Poor quality rehabilitation outcomes. Poor quality run off from rehabilitated surfaces.	(E) Environmental Impact	3	C	13	(H)	Geochemistry assessment of rejects. Water sampling from the NEOC areas (saline and 9.1 pH) indicates water is saline. De-watering of the NEOC when used for the disposal and co-disposed material.	1. Complete material balance as part of mine closure planning 2. Obtain material to cover the identified areas.	2	D	5	(L)	

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Risk Identification & Analysis					Unmitigated Risk				Risk Reduction Strategy		Residual Risk				
#	Rehabilitation Phase	Risk Source	Potential Impact/Consequence	Loss Type	Consequence	Likelihood	Existing Risk	Risk Level	Existing Control	Additional Control / Action	Consequence	Likelihood	Target Risk	Risk Level	Person Responsible
4	Active Mining Phase of Rehabilitation	Lack of topsoil or poor topsoil management practices (e.g. topsoil and subsoil not separated, topsoil not stockpiled appropriately, etc.).	Insufficient/inadequate topsoil resources to rehabilitate requiring importation of additional resources.	(E) Environmental Impact	3	B	17	(H)	Existing stockpiles are placed on the NEOC and adjacent to Bowman's Creek; covered with revegetation [not sufficient volume]. Rehabilitation Monitoring includes soil monitoring. Closure criteria in place that require testing for suitable soil properties. Use of OGM and biosolids on NEOC as part of rehabilitation has been successful	1. Complete topsoil stockpile balance and budget for purchasing topsoil or alternate growth medium.	2	D	5	(L)	
5	Active Mining Phase of Rehabilitation	Limited pre-existing biological resources for salvage.	Insufficient/inadequate topsoil resources to rehabilitate requiring importation of additional resources.	(E) Environmental Impact	3	B	17	(H)	Use of topsoil substitutes in the rehabilitation (OGM). Purchase additional material or alternatives (Biosolids). Rehabilitation Monitoring which includes soil monitoring. Buy rock material in where required in rehabilitation.		2	D	5	(L)	
6	Active Mining Phase of Rehabilitation	Adverse surface and groundwater quality and quantity (underground and surface operations).	Contamination of waterways or land.	(E) Environmental Impact	3	D	9	(M)	Sediment dams and mine water management system. Review of groundwater modelling every 3 years. Groundwater monitoring (compliance and calibration of the model). Groundwater Monitoring is reviewed annually for trends. No licence discharge points onsite	1. Surface water assessment to be included as part of the final landform design [management of the water at closure].	3	D	9	(M)	
7	Decommissioning	Impacts on European heritage items	N/A - no European heritage items located within the Ashton Coal site.	(E) Environmental Impact	3	c	13	(H)	AHMP including pre-mining inspections. Ground disturbance permit sites are surveyed and recorded.		2	D	5	(L)	
8	Decommissioning	Impacts on Aboriginal heritage items as described in the Heritage Management Plan.	Inadvertent damage during rehabilitation activities. Prosecution.	(E) Environmental Impact	4	C	18	(H)	Survey of area completed previously. Heritage Management Plan. Ground Disturbance Permit. AHIPs across the site.	1. Survey of areas by local Aboriginal group. 2. Survey of areas by Archaeologist. 3. Obtain Section 90 Permit if required to relocate any found Aboriginal artefacts.	2	D	5	(L)	

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9	Decommissioning	Contamination resulting from storage and handling of hydrocarbons, resins, cement.	Contamination of waterways or land resulting in infringement notice.	(E) Environmental Impact	3	C	13	(H)	Storage and handling of hydrocarbons in accordance with Australian Standards and Industry best practice. Pollution Incident Response Management Plan. Ongoing surface water monitoring program. Monthly site inspections. Post wet weather inspections as per WMP.	1. Contamination Study of high-risk infrastructure and storage areas. 2. Consider disposal requirement costs as a result of the Contamination Study in budget for Mine Closure and Rehabilitation.	3	D	9	(M)	Environment & Community Superintendent
10	Decommissioning	Generation of waste products from demolition process.	Waste products not disposed of correctly (either at licensed disposal facility or in accordance with EPL and RMP) - infringement notice	(E) Environmental Impact	3	C	13	(H)	Reputable waste contract company engaged (licensed).	1. Determine disposal methods of waste products (either at licensed disposal facility or in accordance with EPL and Mine Closure MOP) and include in a Decommissioning Plan for Mine Closure.	2	D	5	(L)	
11	Decommissioning	Groundwater accumulation in underground workings.	Contamination of groundwater system with saline water.	(E) Environmental Impact	2	C	8	(M)	Review of Groundwater modelling every 3 years. Groundwater monitoring (compliance and calibration of model). Groundwater monitoring is reviewed annually for trends.		2	d	5	(L)	
12	Decommissioning	Adverse geotechnical and/or geochemical issues associated with process waste storage facilities (e.g. tailings, reject emplacements), overburden and waste rock dumps, etc.	Land contamination.	(E) Environmental Impact	2	C	8	(M)	Geochemistry assessment of the rejects (previous section 100 application/approval and current HRA process). Water sampling from the NEOC areas (saline and 9.1 pH) indicates water is saline.		2	D	5	(L)	
13	Decommissioning	Unauthorised access to underground workings.	Unauthorised access to underground by public following cessation of mining (no ventilation to underground workings).	(P) Harm to People	4	D	14	(H)	Site is currently manned 24/7.	1. Decommissioning Plan to include prevention of access to underground following cessation of mining (including sealing of portals). Current mining status until final sealing.	2	d	5	(L)	
14	Landform Establishment	Failure of borehole or gas well seals.	Resealing of boreholes or gas wells required. Oxygen ingress to underground workings. Impacts to rehabilitation equipment.	(P) Harm to People	2	D	5	(L)	GDP signoff process.	1. Reconciliation of all boreholes to determine rehabilitation status. 2. Rehabilitate boreholes.	1	d	2	(L)	

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15	Landform Establishment	Failure of mine seals.	Unauthorised access to underground by public following cessation of mining (no ventilation to underground workings).	(P) Harm to People	4	D	14	(H)		1. Sealing of portals and shafts in accordance with applicable guidelines. 2. High Risk Activity Notification for Final Sealing.	4	E	10	(M)	
			Integrity of seals compromised by rehabilitation blasting activities - authorised access underground.	(P) Harm to People	4	D	14	(H)		1. Decommissioning Plan to include prevention of access to underground following cessation of mining (including sealing of portals).	4	E	10	(M)	
16	Landform Establishment	Instability of highwalls and low walls.	Landform failure - public safety.	(P) Harm to People	4	D	14	(H)	Fencing and signage at property boundary. Bunding at top of highwalls. Design of rehabilitation blasting to minimise risk. Currently approved final slopes range from 10 degrees and 18 degrees.	1. Geotechnical/Final Landform Study to determine slope requirements to be long-term geotechnically stable. 2. If outcomes of Geotechnical/Final Landform Study determine different slope requirements, update relevant Management Plans and RMP.	2	C	8	(M)	1. T Sutherland 2. P. Brown
			Rehabilitation signoff not given by Regulator.	(R) Impact on Reputation	2	C	8	(M)	Fencing and signage at property boundary. Bunding at top of highwalls. Design of rehabilitation blasting to minimise risk. Currently approved final slopes range from 10 degrees and 18 degrees.	1. Geotechnical/Final Landform Study to determine slope requirements to be long-term geotechnically stable 2. If outcomes of Geotechnical/Final Landform Study determine different slope requirements, update relevant Management Plans and RMP.	2	D	5	(L)	1. T Sutherland 2. P. Brown

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17	Landform Establishment	Availability of suitable materials for capping of hazardous materials and impounded tailings/coarse reject materials.	Exposed hazardous material impact upon growth medium and ability to establish vegetative cover.	(E) Environmental Impact	3	B	17	(H)	Purchase of material to cover the NEOC and disturbance area. De watering of the NEOC when used for the disposal of co-disposed material. Buy rock material in where required by rehabilitation.	1. Complete material balance and budget for needing to purchase clean fill.	2	d	5	(L)	
			Rehabilitation signoff not given by Regulator.	(O) Asset Damage and Other	1	C	4	(L)	Technical Services Manager responsible for seeking approval for funding for closure, provision of resources for rehabilitation and managing rehabilitation activities. Environment and Community Superintendent responsible for design of technical closure plans. Yancoal Corporate Standard - Rehabilitation (Includes RACI matrix). Rehabilitation Management Plan and Forward Management Plan.	1. Responsibilities to be defined in Section 7 of the Rehabilitation Management Plans.	1	d	2	(L)	P Brown
18	Landform Establishment	Availability of suitable materials for capping of carbonaceous material and other unsuitable materials on final landform batters.	Exposed carbonaceous or other unsuitable material impact upon growth medium and ability to establish vegetative cover.	(E) Environmental Impact	4	C	18	(H)		1. A Rehabilitation Materials Balance Report to be prepared prior to commencement of final landform shaping.	2	d	10	(L)	P Brown
			Rehabilitation signoff not given by Regulator.	(O) Asset Damage and Other	2	C	8	(M)			2	E	3	(L)	
19	Landform Establishment	Final landform instability (e.g. Steep slopes, erosion, etc.) affecting final land use capability.	Water quality impacts. Impact on ability to establish vegetative cover.	(E) Environmental Impact	3	C	13	(H)	Existing erosion and sediment control structures on completed rehabilitation areas. Existing completed rehabilitation	1. Conduct Final Landform Study to determine appropriate slope and water/erosion control design and structures for areas yet to be rehabilitated.	2	D	5	(L)	T Sutherland

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20	Landform Establishment	Final landform unsuitable for existing land use (e.g. Large rocks present affecting cultivation, settlement and surface subsidence leading to extended ponding etc.).	Subsidence impacts prevent or reduce existing land uses.	(E) Environmental Impact	2	C	8	(M)	Rehabilitation Management Plan. Subsidence Management Plan. Rehabilitation Monitoring.	1. Continued implementation of existing subsidence rehabilitation procedures. 2. Undertake review of final landform with a view to modify free draining requirements.	1	C	4	(L)	1. T Sutherland 2. P Brown
			Rehabilitation signoff not given by Regulator.	(R) Impact on Reputation	2	C	8	(M)			1	C	4	(L)	
21	Landform Establishment	Diversion of surface water runoff away from catchment areas.	Reduced flow in downstream creeks.	(E) Environmental Impact	3	C	13	(H)	Sediment dams and mine water management system. Underground mine design is offset from the creek. Monthly inspections of rock lined drains. LiDar surveys of the existing landforms to check changes.	1. Final Landform Design to include water management requirements (e.g. diversions, etc.) considering potential impacts on water flow downstream.	3	D	9	(M)	T Sutherland
22	Landform Establishment	Watercourse diversion instability affecting riparian health.	Rehabilitation fails to be established, resulting in sign off not being achieved.	(E) Environmental Impact	1	C	4	(L)	Diversion built to engineered design. Maco invertebrate and flora monitoring. Stability monitoring in the alignment of the creek diversion. Underground mine design is offset from the creek.		1	C	4	(L)	
23	Landform Establishment	Water availability for dust suppression.	Inadequate water supply resulting in excess dust generation or requirement to stand down rehabilitation equipment.	(E) Environmental Impact	2	E	3	(L)			2	E	3	(L)	

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24	Growth Medium Development	Adoption of inappropriate or inadequate rehabilitation techniques, including equipment fleet.	Impacts of establishing vegetation due to soil compaction.	(E) Environmental Impact	2	C	8	(M)	Current high standard of Rehabilitation on site (past experience of managing similar areas) - accepted as industry best practice. Site Environmental Team experienced in rehabilitation. Use of experienced rehabilitation contractors (external) - previously conducted rehabilitation on site. Use of experienced rehabilitation consultants (external) - industry recognised content/technical experts. Yancoal Corporate environmental team provide expertise. Yancoal Corporate Standards - Rehabilitation (in progress). Existing Environmental Management Strategy and associated Plans (available on Internet/Intelex). Fit for Purpose Equipment used for rehabilitation activities (consideration of weight, compaction, etc.).	1. Preparation of Rehabilitation Management Plan. 2. Review equipment prior to and at commencement of rehabilitation works to ensure fit for purpose.	2	D	5	(L)	T Sutherland
25	Growth Medium Development	Subsoil and topsoil deficit for rehabilitation activities.	Suitable subsoil and topsoil material volume unavailable on site leading to inadequate depth of growth material.	(E) Environmental Impact	3	C	13	(H)		1. A Rehabilitation Materials Balance Report to be prepared prior to commencement of final landform shaping. 2. Source and budget any topsoil materials required.	2	D	5	(L)	
26	Growth Medium Development	Chemical properties of growth medium inadequate to support revegetation (e.g. Lack of organic matter, nutrient deficiency, lack of soil biota, adverse soil chemical properties).	Impacts of establishing vegetation due to soil chemical properties.	(E) Environmental Impact	2	C	8	(M)	Use of topsoil substitutes in the rehabilitation (OGM). Purchase additional material or alternatives (Biosolids). Rehabilitation Monitoring which includes soil monitoring. Buy rock material in where required in rehabilitation.	1. Undertake testing of growth medium to ensure suitable chemical properties / to calculate required rate of ameliorants (gypsum, fertiliser etc).	2	D	5	(L)	

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27	Ecosystem Establishment	Lack of availability and quality of seed resources, including genetic integrity.	Inability to establish preferred species.	(E) Environmental Impact	2	D	5	(L)		1. Source seed resources sufficiently in advance of rehabilitation works to ensure supply.	2	E	3	(L)	P Brown
28	Ecosystem Establishment	Weed and pest control: - Weed introduction and control (or lack thereof). - Damage from fauna (e.g. kangaroos, feral goats, etc.). - Insects and plant disease.	Impacts on vegetation (establishing and ongoing) - completion criteria not met.	(E) Environmental Impact	3	C	13	(H)	Biodiversity Management Plan includes weed and feral animal management. Environmental Inspections. Rehabilitation Monitoring. Current high standard of Rehabilitation on site.		2	D	5	(L)	
29	Ecosystem Establishment	Lack of structural integrity of buildings and infrastructure to be retained in final land use.	Retained infrastructure not suitable for final land use.	(P) Harm to People	2	C	8	(M)	Ongoing use and maintenance of infrastructure.	1. Decommissioning Plan to include engineering assessment for infrastructure to be retained. 2. Based on results of engineering assessment, undertake any recommended repairs or revise retention options.	1	C	4	(L)	
			Rehabilitation signoff not given by Regulator.	(R) Impact on Reputation	2	C	8	(M)			1	C	4	(L)	

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30	Ecosystem Establishment	Adoption of inappropriate or inadequate revegetation techniques.	Application of inappropriate species mix for respective domain area. Unnecessary compaction of growth medium. Inability to establish adequate vegetative cover.	(E) Environmental Impact	2	C	8	(M)	Current high standard of Rehabilitation on site (past experience of managing similar). Site Environmental Team (experience in rehabilitation). Use of experienced rehabilitation contractors (external) - previously conducted rehabilitation on site. Use of experienced rehabilitation consultants (external) - industry recognised content/technical experts. Yancoal Corporate environmental team provide expertise. Yancoal Corporate Standards - Rehabilitation (in progress). Existing Environmental Management Strategy and associated Plans (available on Internet/Intelex). Fit for Purpose Equipment used for rehabilitation activities (consideration of weight, compaction, etc.). Direct seeding.		2	D	5	(L)	
31	Ecosystem Establishment	Weather and climatic influences (e.g. Drought; intense rainfall events; bushfire; etc.).	Damage to vegetation due to fire, flood or drought.	(E) Environmental Impact	2	C	8	(M)	Bushfire Management Plan. Water Management Plan. Rehabilitation Management Plan. Local Rural Fire Service (established relationship with local RFS).		2	C	8	(M)	
32	Ecosystem Establishment	Insufficient establishment of vegetative cover/projected foliage cover.	Impacts on vegetation (establishing and ongoing) - completion criteria not met. Inappropriate levels of erosion / soil loss.	(E) Environmental Impact	3	C	13	(H)	Biodiversity Management Plan includes weed management. Environmental Inspections. Rehabilitation Monitoring. Current high standard of Rehabilitation on site.		2	D	5	(L)	

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33	Ecosystem Establishment	Erosion and failure of drainage and water management/storage structures.	Impacts on water quality and potential discharge.	(E) Environmental Impact	4	C	18	(H)	Final Landform Design to include water management requirements (e.g. diversions, etc.). Rehabilitation Management Plan - includes erosion and sediment control. Environmental Inspections. Rehabilitation Monitoring. Water Management Plan.	1. Ongoing inspection and maintenance of any Water Management structures required as part of final landform design.	2	d	5	(L)	
34	Ecosystem Establishment	Overgrazing of pasture rehabilitation areas.	Pasture cover establishment delayed.	(R) Impact on Reputation	1	C	4	(L)	Rehabilitation Management Plan. Subsidence Management Plan. Rehabilitation Monitoring.		1	C	4	(L)	
35	Ecosystem and Land Use Development	Weather and climatic influences (e.g. Drought; intense rainfall events; bushfire; etc.).	Damage to vegetation due to fire, flood or drought.	(E) Environmental Impact	2	C	8	(M)	Bushfire Management Plan. Water Management Plan. Rehabilitation Management Plan. Local Rural Fire Service (established relationship with local RFS).		2	C	8	(M)	
36	Ecosystem and Land Use Development	Vandalism to revegetation areas.	Damage to vegetation due to vandalism.	(E) Environmental Impact	2	C	8	(M)	Fencing and signage at property boundary. Environmental Inspections. Rehabilitation Monitoring.		2	C	8	(M)	
37	Ecosystem and Land Use Development	Inadvertent or unauthorised access.	Damage to vegetation due to inappropriate access.	(E) Environmental Impact	2	C	8	(M)	Fencing and signage at property boundary. Definition of retained access tracks.		2	D	5	(L)	
38	Ecosystem and Land Use Development	Insects and plant disease.	Refer to #28 Weed & Pest Control												
39	Ecosystem and Land Use Development	Overgrazing of pasture rehabilitation areas.	Pasture cover establishment delayed.	(R) Impact on Reputation	1	C	4	(L)	Rehabilitation Management Plan. Subsidence Management Plan. Rehabilitation Monitoring.		1	C	4	(L)	
40	Ecosystem and Land Use Development	Lack of resources for rehabilitation maintenance.	Refer to #1 General (Resourcing)												
41	Ecosystem and Land Use Development	Inadvertent or unauthorised access.	Refer to #37 Inadvertent or unauthorised access.												

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42	Ecosystem and Land Use Development	Insufficient establishment of vegetative cover / projected foliage cover.	Completion criteria not met. Inappropriate levels of erosion / soil loss.	(E) Environmental Impact	3	C	13	(H)	Biodiversity Management Plan includes weed management. Environmental Inspections. Rehabilitation Monitoring. Current high standard of Rehabilitation on site.	1. If required, seek assessment and review by rehabilitation expert / ecologist and implement recommendations.	2	D	5	(L)	
			Rehabilitation signoff not given by Regulator.	(R) Impact on Reputation	2	C	8	(M)			2	D	5	(L)	
43	Ecosystem and Land Use Development	Ecosystem established is not self-sustaining / contains inappropriate species.	Completion criteria not met.	(E) Environmental Impact	3	C	13	(H)	Biodiversity Management Plan includes weed management. Environmental Inspections. Rehabilitation Monitoring. Current high standard of Rehabilitation on site.	1. If required, seek assessment and review by rehabilitation expert / ecologist and implement recommendations.	2	D	5	(L)	
			Rehabilitation signoff not given by Regulator.	(R) Impact on Reputation	2	C	8	(M)			2	D	5	(L)	
44	Mine Subsidence Affected Areas	Extended water ponding.	Rehabilitation or existing vegetation are impacted by ponding.	(E) Environmental Impact	3	B	17	(H)		1. Conduct macroinvertebrate and WQ monitoring of chainage ponds. 2. Investigate modification of DA to remove the requirement for 'free draining landscape'.	3	d	9	(M)	
45	Mine Subsidence Affected Areas	Redirection of creek flows inconsistent with predicted impacts.	Effects vegetation along previous alignment. Changes to sediment load.	(E) Environmental Impact	3	D	9	(M)	Water Management Plan. Stream health monitoring. Biodiversity Management Plan.		2	d	5	(L)	
46	Mine Subsidence Affected Areas	Subsidence cracking and sink holes.	Cracking presents a risk to safety.	(P) Harm to People	2	C	8	(M)	Extraction Management Plans. Requirement to repair subsidence cracking. Subsidence monitoring programs.		2	d	5	(L)	
47	Mine Subsidence Affected Areas	Inter-connective cracking with underground workings.	Loss of surface flows to underground workings.	(E) Environmental Impact	3	D	9	(M)	Extraction Management Plan Review of Water Model and Annual Water Take. Subsidence Management Plan Stream health monitoring programs. Diversion rehabilitation monitoring programs.		2	d	5	(L)	

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48	Mine Subsidence Affected Areas	Impacts to aquifers and groundwater loss of water to water users including the environment.	Reduction of water availability in groundwater table.	(E) Environmental Impact	3	D	9	(M)	Review of Groundwater modelling every 3 years. Groundwater monitoring (compliance and calibration of model). Groundwater monitoring is reviewed annually for trends. No known groundwater users in the area.		2	d	5	(L)	
49	Mine Subsidence Affected Areas	Interference with tree roots.	Rehabilitation or existing vegetation are impacted by cracking.	(E) Environmental Impact	2	C	8	(M)	Rehabilitation monitoring program over subsidence areas.		2	c	8	(M)	

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