



REHABILITATION MANAGEMENT PLAN

Version	Effective Date (Month/YYYY)	Revision Detail (Include the main areas reviewed, trigger / why the change)	Approved By (Name)	Author (Name/s)	Review Team (Name/s)
1	Aug 2022	Original Rehabilitation Management Plan	T. Cini	MCO, IEMA	MCO, IEMA

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SUMMARY TABLE

Name of mine		Moolarben Coal Complex	
Rehabilitation Management Plan commencement date		1 August 2022	
Rehabilitation Management Plan revision dates and version numbers		Version 9, August 2022	
Mining leases	Leaseholder	No.	Expiry
	Moolarben Coal Mines Pty Ltd, Sojitz Moolarben Resources Pty Ltd, Kores Australia Moolarben Coal Pty Ltd	1605	20 December 2028
		1606	20 December 2028
	Moolarben Coal Mines Pty Ltd	1628	24 February 2030
		1691	2 October 2034
	Moolarben Coal Mines Pty Ltd, Sojitz Moolarben Resources Pty Ltd, Kores Australia Moolarben Coal Pty Ltd	1715	31 August 2036
Date of Finalisation		1 August 2022	

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1.0 INTRODUCTION

1.1 HISTORY OF OPERATIONS

The Moolarben Coal Complex (MCC) an open cut and underground coal mining operation is located approximately 40 kilometres (km) north of Mudgee in the Western Coalfield of New South Wales (NSW) (**Figure 1**).

Moolarben Coal Operations Pty Ltd (MCO) is the operator of the Moolarben Coal Complex on behalf of the Moolarben Joint Venture (Moolarben Coal Mines Pty Ltd [MCM], Yancoal Moolarben Pty Ltd (YM) and a consortium of Korean power companies). MCO, MCM and YM are wholly owned subsidiaries of Yancoal Australia Limited (Yancoal).

The MCC comprises four approved open cut mining areas (OC1, OC2, OC3 and OC4), three approved underground mining areas (UG1, UG2 and UG4) and other mining related infrastructure (including coal processing and transport facilities). Current mining operations undertaken across the MCC have approval until 31 December 2038. Since the commencement of coal mining operations in 2010, mining activities have occurred within OC1, OC2, OC3, OC4, UG1, and UG4 (**Figure 2**).

Construction activities undertaken across the MCC to date include the progression of mining infrastructure for both open cut and underground operations. Mine infrastructure includes OC and UG administration buildings and maintenance workshops, the UG mine portal, Coal Handling and Preparation Plant (CHPP) and associated conveyors, railway loop and loading infrastructure, Run-of-Mine (ROM), water management and remote services infrastructure areas.

Mining operations are carried out 24 hours a day, 7 days a week. Significant surface disturbance activities undertaken across the MCC to date include:

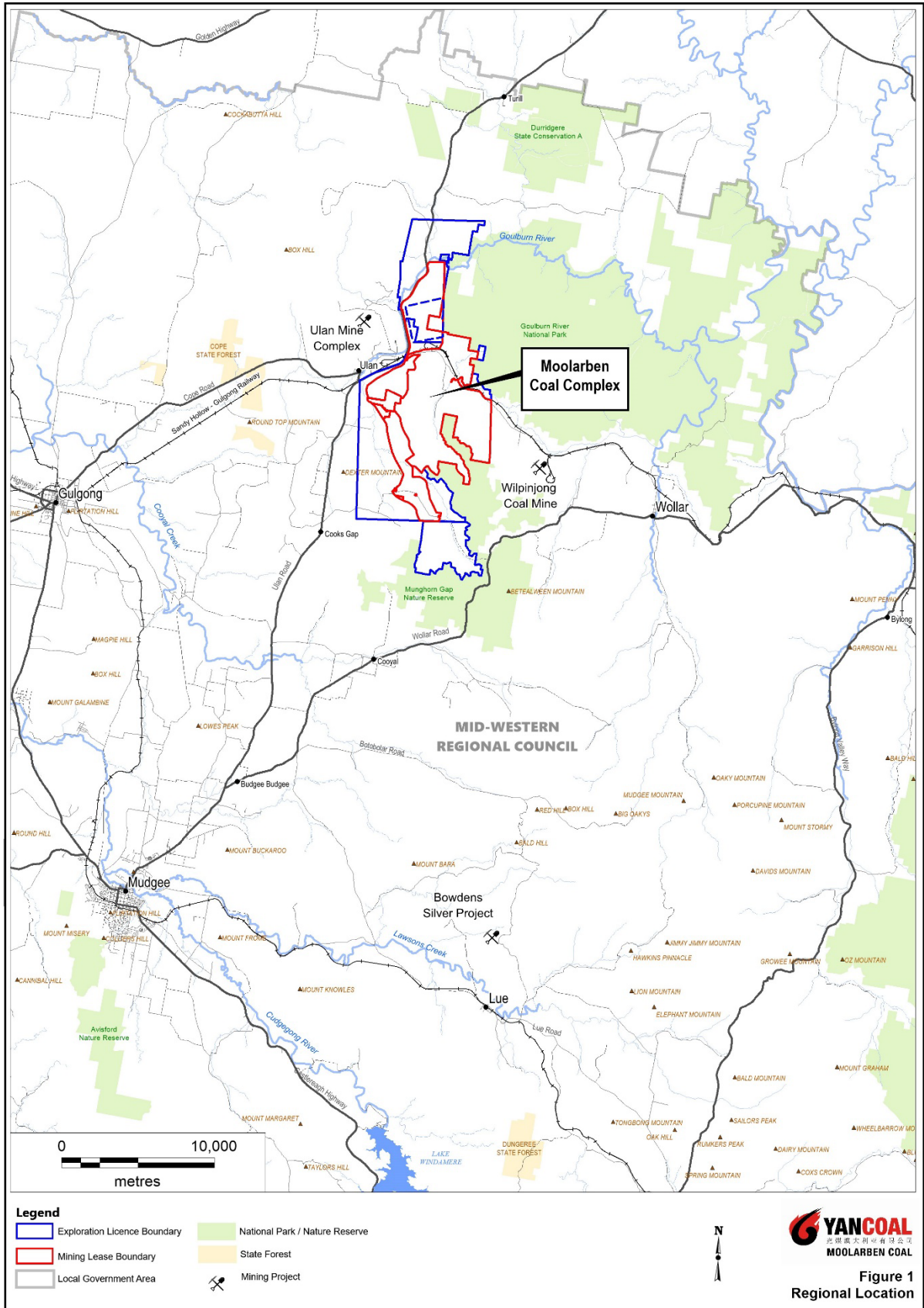
- Exploration activities,
- Topsoil Stripping,
- Overburden removal using excavator and truck fleets,
- Overburden removal using cast and dozer push,
- Coal extraction,
- Drilling and blasting select overburden and coal,
- Spoil emplacement,
- Bulk spoil reshaping and rehabilitation, and
- Construction and operation of water management work and other ancillary activities.

Longwall mining has been undertaken within UG1 and UG4 with UG2 longwall production planned in the future.

Rehabilitation has occurred in OC1, OC2, OC4, and progressive temporary rehabilitation of construction areas. Rehabilitation activities include landform establishment, growth medium development, ecosystem and landuse establishment and rehabilitation maintenance.

This RMP has been prepared in accordance with the *Form and Way Rehabilitation Management Plan for Large Mines* (Resources Regulator, 2021).

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1.1.1 Moolarben Coal Complex (Stage 1)

The Moolarben Coal Project Stage 1 was assessed in the *Moolarben Coal Project Environmental Assessment Report* (MCM, 2006) and was approved by the NSW Minister for Planning on 6 September 2007 (Project Approval [05_0117]).

Project Approval (05_0117) has been subject to fifteen modifications. The modifications were generally required to reconfigure the mine layout (e.g. extension to mining areas, relocation of coal handling infrastructure and water infrastructure) and were aimed to improve the efficiency and operation of the MCC and enable access to additional economically viable coal reserves.

Stage 1 of the MCC has commenced and at full development will comprise three open cut mines (OC1, OC2, and OC3), a longwall underground mine (UG4), and mining related infrastructure (including coal processing and transport facilities) (**Figure 2**).

1.1.2 Moolarben Coal Complex (Stage 2)

The Moolarben Coal Project Stage 2 was assessed in the *Moolarben Coal Project Stage 2 Environmental Assessment Report* (Wells Environmental Services and Coffey Natural Systems, 2009), and Preferred Project Report (MCM, 2012) which was exhibited from 31 January 2012 to 24 February 2012. The Moolarben Coal Project Stage 2 was approved by the Planning Assessment Commission (PAC) (as a delegate of the NSW Minister for Planning) on 30 January 2015 (Project Approval [08_0135]).

Project Approval (08_0135) has been subject to three modifications. Modifications were generally required to reconfigure the mine layout (e.g. extension to mining areas, haul roads and infrastructure) and were aimed to improve the efficiency and operation of the MCC and enable access to additional economically viable coal reserves.

Moolarben Coal Project Stage 2 commenced in 2015. At full development, there will be one open-cut (OC4), two longwall underground mines (UG1 and UG2) and mining related infrastructure.

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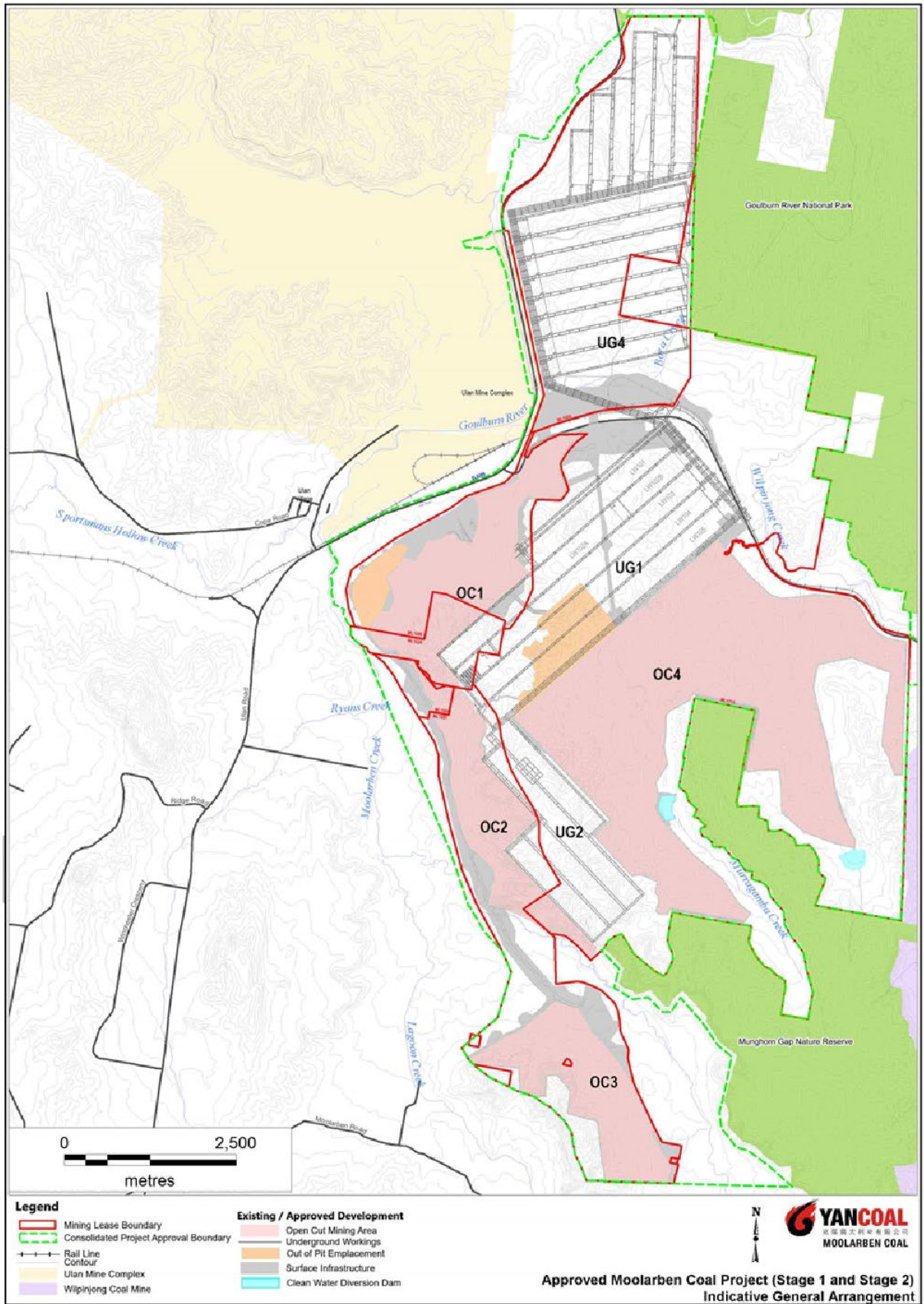


Figure 2 Indicative general layout

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1.2 CURRENT DEVELOPMENT CONSENTS, LEASES LICENCES

The date of grant and duration of the MCC approvals, leases and licences issued by government agencies relevant to the MLs are provided in Table 1.

Table 1 Key Approvals, Leases and Licences

Type	Approval	Number	Approval Authority	Date Granted	Expiry/ Renewal Date
Exploration Licences					
EL	Exploration Licence	6288	Minister for Mineral Resources	23/08/2004	23/08/2023
EL	Exploration Licence	7073	Minister for Mineral Resources	12/02/2008	12/02/2026
EL	Exploration Licence	7074	Minister for Mineral Resources	12/02/2008	12/02/2026
Mining Leases					
ML	Mining Lease	1605**	Minister for Mineral Resources	20/12/2007	20/12/2028
ML	Mining Lease	1606	Minister for Mineral Resources	20/12/2007	20/12/2028
ML	Mining Lease	1628	Minister for Mineral Resources	24/02/2009	24/02/2030
ML	Mining Lease	1691	Minister for Resources and Energy	3/10/2013	2/10/2034
ML	Mining Lease	1715	Minister for Resources and Energy	31/08/2015	31/08/2036
Project Approvals					
PA	Project Approval	05_0117 (as modified)	NSW Minister for Planning	6/09/2007	20/12/2038
PA	Project Approval	08_0135 (as modified)	PAC as a delegate of NSW Minister for Planning	30/01/2015	31/12/2038
EPBC	EPBC Act Approval	2007/3297	Commonwealth Department of the Environment and Water Resources	24/10/2007	31/12/2027
EPBC	EPBC Act Approval	2013/6926	Commonwealth Department of the Environment (DoE)	13/11/2014	31/12/2064
EPBC	EPBC Act Approval	2008/4444	DoE	18/05/2015	31/12/2065
EPBC	EPBC Act Approval	2017/7974	Department of the Environment and Energy (DoEE)	06/09/2019	31/12/2050
Licences					
LIC	Environment Protection Licence (EPL)	12932	NSW Environment Protection Authority (EPA)	November 2021	Until the licence is surrendered, suspended or revoked. The licence is subject to review every five years after the issue of the licence.

Notes:

** Including the carrying out of ancillary mining activities within AMA1015

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1.3 LAND OWNERSHIP AND LAND USES

The MCC is located approximately 40 km north of Mudgee in the Western Coalfield of NSW in the vicinity of Cook's Gap and Ulan settlements as shown in **Figure 1**.

The MCC MLs exist predominantly within freehold land owned by MCO. Some small parcels of Crown Land also occur in the MCC MLs as shown in **Figure 3**.

Land use in the vicinity of the MCC is characterised by a combination of coal mining operations, ridgeline country, woodlands, nature reserves, agricultural operations and the Cooks Gap locality (**Figure 4**). Several reserved areas are located in the vicinity, including the Goulbourn River National Park and Munghorn Gap Nature Reserve.

Appendix A provides details of the land tenure of the general area as well as land ownership, occupancy and leases.

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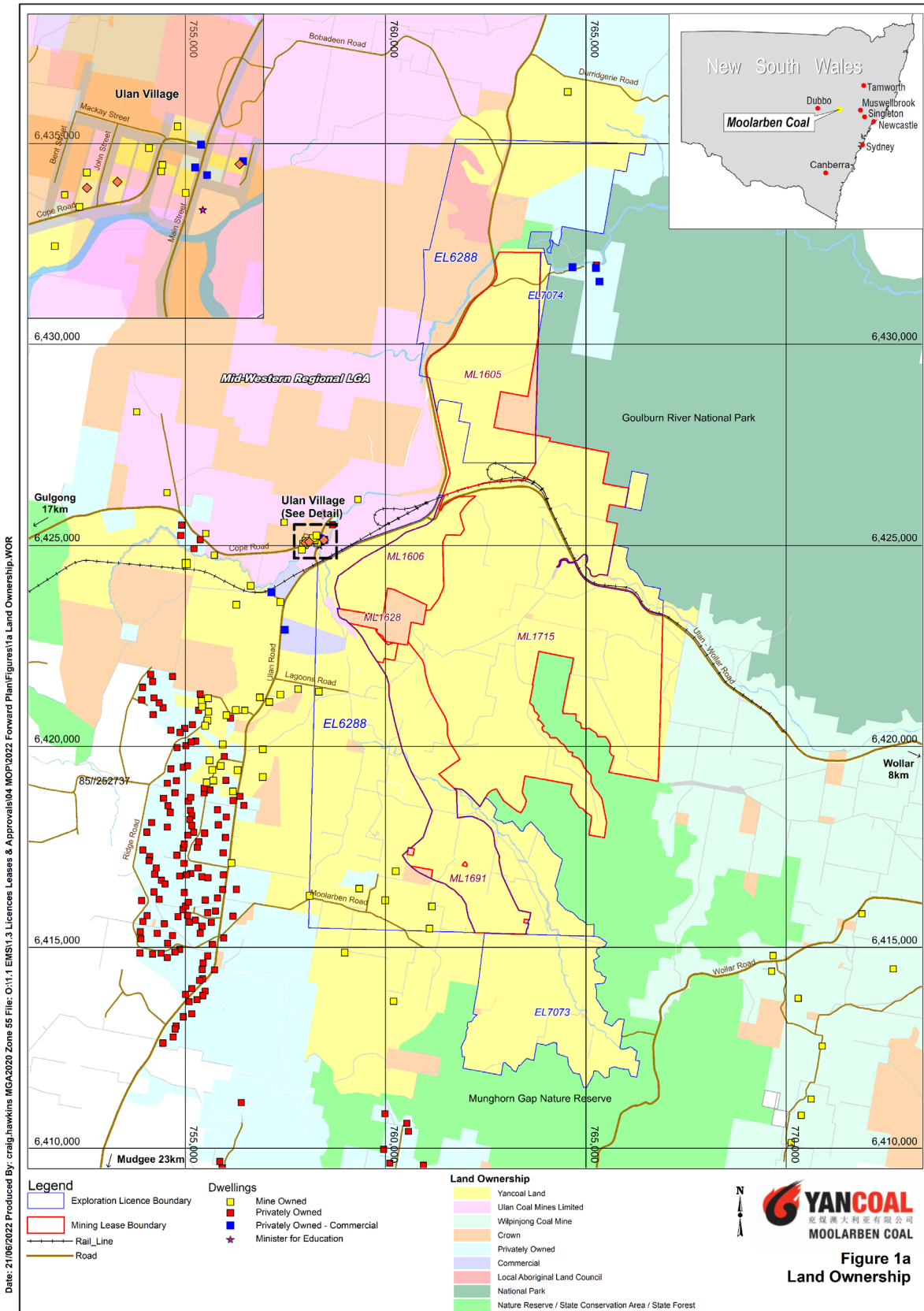


Figure 3 Land Ownership around the Moolarben Coal Complex (RMP Figure 1a)

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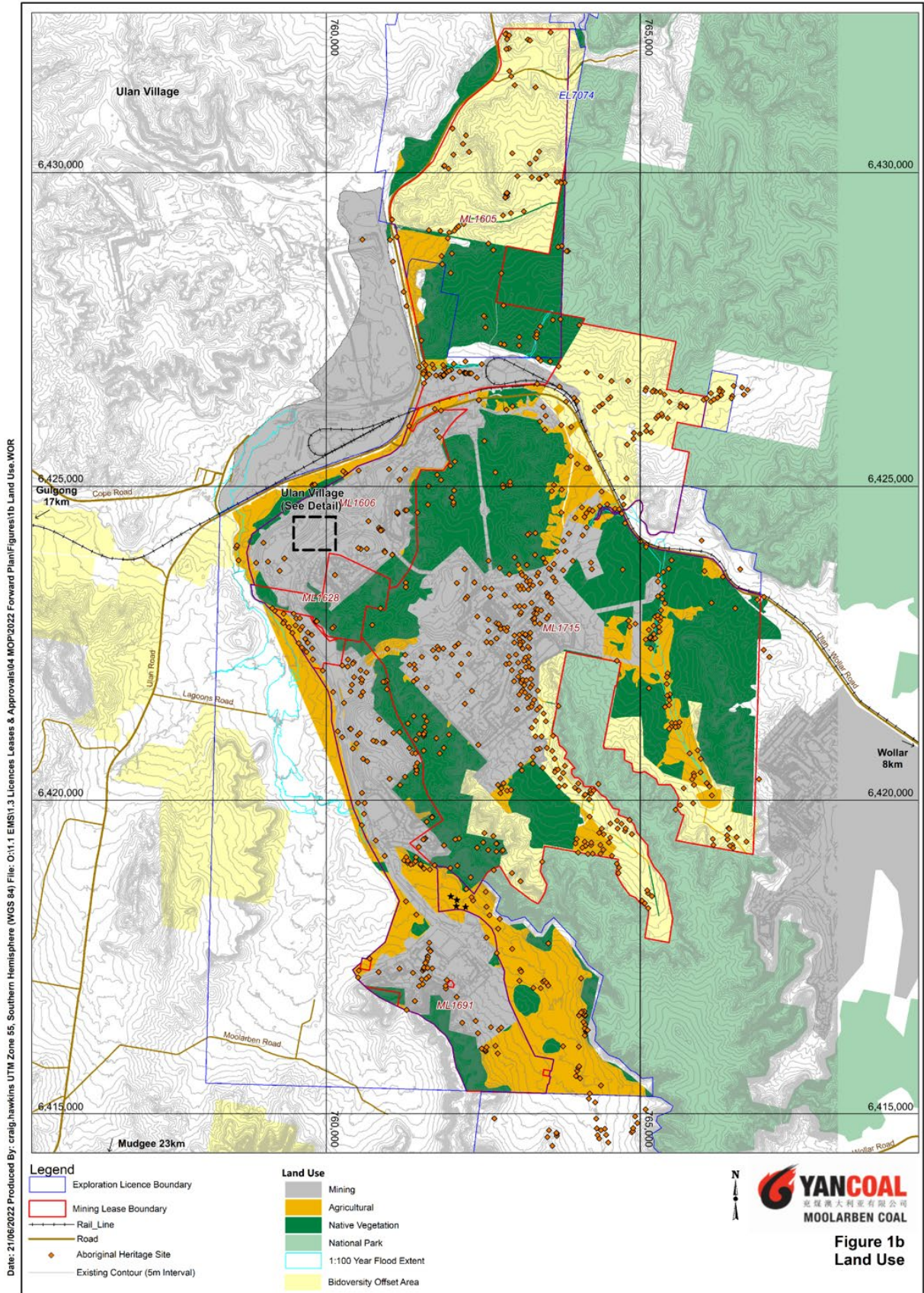


Figure 4: Land Use around the Moolarben Coal Complex (RMP Figure 1B)

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2.0 FINAL LAND USE

2.1 REGULATORY REQUIREMENTS FOR REHABILITATION

Several regulatory requirements relate to rehabilitation at the MCC. **Table 2**, through to

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Table 5, outline these requirements from development consents, mining leases, relevant legislation, and relevant policies.

2.1.1 Key Regulatory Guidelines

Key regulatory guidelines which have been considered during preparation of this RMP include (but are not limited to):

- Form and way: Rehabilitation Management Plan (large mines) (DPE-RR, 2021);
- Form and way: Rehabilitation objectives, rehabilitation completion criteria and final landform and rehabilitation plan for large mines (DPE-RR, 2021);
- Leading Practice Sustainable Development Program for the Mining Industry – Mine Rehabilitation (former Commonwealth Department of Industry, Tourism and Resources, 2016);
- Managing Urban Stormwater – Soils and Construction Volume 1 (Landcom, 2004);
- Managing Urban Stormwater – Soils and Construction Volume 2 (DECC, 2008);
- A Rehabilitation Manual for Australian Streams (Rutherford, 2000); and
- Mine Rehabilitation: a Handbook for the Coal Mining Industry (Hannan, 1995).

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Table 2: Project Approval 05_0117

NSW Project Approval Condition	Area	RMP Section
<p>Rehabilitation Offsets</p> <p>35B. Within 12 months of the commencement of activities under MOD 14, unless otherwise agreed by the Secretary, the proponent must, in consultation with BCD, the Department and DAWE and to the satisfaction of the Secretary, develop suitable rehabilitation performance and completion criteria for the vegetation communities to be established in the rehabilitated OC2 and/or OC3 landforms to generate the residual ecosystem and species credits for Koala listed in Table 12A.</p> <p>The performance and completion criteria must include consideration of the effect of climatic conditions, such as drought, the NSW Biodiversity Offsets Policy for Major Projects 2014 and the associated Fact sheet: Mine Site Rehabilitation (OEH, 2014).</p> <p>Notes:</p> <ul style="list-style-type: none"> The rehabilitation offset performance and completion criteria form a component of the Rehabilitation Management Plan required under condition 69 of this schedule. The indicative final rehabilitation areas are shown in Figure 8.2 of Appendix 8. 	<p>Rehabilitation Offsets in OC2 and/or OC3</p>	<p>4.0</p>

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NSW Project Approval Condition	Area	RMP Section
<p>35C. If at the end of 10 years after landform establishment in OC2 and/or OC3, unless otherwise agreed by the Secretary, the rehabilitation does not meet the performance and completion criteria in condition 35B to the satisfaction of the Secretary, the Proponent must retire the relevant number of residual credits listed in Table 12A under other mechanisms provided by the Biodiversity Offsets Scheme of the BC Act, to the satisfaction of the Secretary.</p> <p>Notes:</p> <ul style="list-style-type: none"> Landform establishment is a recognised stage of rehabilitation when the final land shape has been developed prior to growth medium development and ecosystem development. As landform establishment stage will progressively occur across the mine site, the performance criteria for new areas progressing into the landform establishment stage will need to be assessed by the Secretary on a regular basis, for example every 3 years, to determine whether the requirements of the condition are being met. In accordance with the NSW Biodiversity Offsets Policy for Major Projects, additional biodiversity credits can be generated for the ongoing management of the rehabilitation area to ensure its biodiversity values are continually improved. Any additional credits could be secured through a Biobanking Agreement and used to offset future developments. 	<p>Rehabilitation Offsets in OC2 and/or OC3</p>	<p>3.0</p>
<p>35D. Notwithstanding the requirements in conditions 35B and 35C, the Proponent may retire the residual credits listed in Table 12A earlier than the specified timeframe in condition 35C by other mechanisms under the BC Act in place of rehabilitation, to the satisfaction of the Secretary.</p>	<p>Rehabilitation Offsets in OC2 and/or OC3</p>	<p>3.0</p>

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<p>Rehabilitation Objectives</p> <p>65. The Proponent shall rehabilitate the site to the satisfaction of the Resource Regulator. This rehabilitation must be generally consistent with the proposed rehabilitation described in the EA (and depicted conceptually in the figure in Appendix 8), and comply with the objectives in Table 13.</p> <p>Table 13: Rehabilitation Objectives</p> <table border="1"> <thead> <tr> <th>Feature</th> <th>Objective</th> </tr> </thead> <tbody> <tr> <td>Mine site (as a whole)</td> <td> <ul style="list-style-type: none"> • Safe, stable and non-polluting; • Constructed landforms are to drain to the natural environment (excluding the final voids); • Final landforms are to be consistent with the surrounding topography of the area, taking into account relief patterns and principles; and • Minimise visual impact of final landforms as far as is reasonable and feasible. </td> </tr> <tr> <td>Final Voids</td> <td> <ul style="list-style-type: none"> • Minimise the size and depth of final voids so far as is reasonable and feasible, subject to meeting the objectives below; • Minimise the drainage catchment of the final void so far as is reasonable and feasible; • Negligible high wall instability risk; • The size and depth of the final voids must be designed having regard to their function as long-term groundwater sinks, to ensure that groundwater flows across the back-filled pit towards the final void; and • Minimise risk of flood interaction for all flood events up to and including the Probable Maximum Flood level. </td> </tr> <tr> <td>Water quality</td> <td> <ul style="list-style-type: none"> • Water retained on site is fit for the intended land use (s) for the post-mining domain(s). • The potential ecological, hydrological and geomorphic impacts from post-mining water discharges on receiving creeks are assessed and appropriate mitigation measures are effectively implemented as part of the closure plan. </td> </tr> <tr> <td>Surface Infrastructure</td> <td> <ul style="list-style-type: none"> • To be decommissioned and removed, unless the Executive Director, Mineral Resources agrees otherwise. </td> </tr> <tr> <td>Agricultural land</td> <td> <ul style="list-style-type: none"> • Establish agricultural land in areas indicated in the figure in Appendix 8 to a similar agricultural suitability to that existing prior to mining. </td> </tr> <tr> <td>Other land</td> <td> <ul style="list-style-type: none"> • Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: <ul style="list-style-type: none"> ○ native forests and woodland, including EECs; ○ habitat for threatened fauna species; and ○ wildlife corridors (as indicated in the figure in Appendix 8). </td> </tr> <tr> <td>Community</td> <td> <ul style="list-style-type: none"> • Ensure public safety; and • Minimise the adverse socio-economic effects associated with mine closure. </td> </tr> </tbody> </table>		Feature	Objective	Mine site (as a whole)	<ul style="list-style-type: none"> • Safe, stable and non-polluting; • Constructed landforms are to drain to the natural environment (excluding the final voids); • Final landforms are to be consistent with the surrounding topography of the area, taking into account relief patterns and principles; and • Minimise visual impact of final landforms as far as is reasonable and feasible. 	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NSW Project Approval Condition	Area	RMP Section
<p>Progressive Rehabilitation</p> <p>66. The Proponent shall rehabilitate the site progressively. That is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies shall be employed when areas prone to dust generation cannot yet be permanently rehabilitated.</p> <p>Note: It is accepted that some parts of the site that are progressively rehabilitated may be subject to further disturbance at some later stage of the project.</p>	Rehabilitation Areas	6.0
67. The Proponent shall progressively landscape the environmental bunds on site.	Environmental bunds on site	6.0
<p>Rehabilitation Management Plan</p> <p>68. The Proponent shall prepare and implement a Rehabilitation Management Plan for the project to the satisfaction of the Resource Regulator. This plan must:</p>	Rehabilitation Areas	This RMP
a) be prepared in consultation with the Department, DPIE Water, BCD, Council and the CCC;		
b) be submitted to the Resource Regulator for approval by 31 March 2015;		
c) be prepared in accordance with any relevant MEG guideline;		
c1) provide for the periodic review and updating of the rehabilitation plans and management strategies to ensure best practice landform design and establishment strategies are employed		
d) describe how the rehabilitation of the site would be integrated with the implementation the biodiversity offset strategies in Table 12 and Table 12A;		
e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);		
f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, and address all aspects of rehabilitation including mine closure, final landform, and final land use;		
g) include interim rehabilitation where necessary to minimise the area exposed for dust generation;		
h) include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and		
i) build to the maximum extent practicable on the other management plans required under this approval.		

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NSW Project Approval Condition	Area	RMP Section
<p>Appendix 3 – Statement of Commitments</p> <p>Rehabilitation</p> <ul style="list-style-type: none"> Soils will be stockpiled and used to rehabilitate areas not required for ongoing operations. 	Soil Stockpiles	6.0
<ul style="list-style-type: none"> MCO is committed to progressively rehabilitating mined areas as soon as practical following disturbance, in accordance with an approved Landscape Management Plan (or equivalent Rehabilitation Plan), including returning areas disturbed by mining to their pre-mining land use (unless otherwise agreed with relevant stakeholders). The plan will be updated, as required, to include the Open Cut 1 and Open Cut 2 extension areas. The plan will consider use of terrestrial riparian buffers. 	Rehabilitation Areas	6.0
<ul style="list-style-type: none"> The majority of the Open Cut 1 and Open Cut 2 extension areas will be rehabilitated for biodiversity outcomes. 	Open Cut 1 and Open Cut 2 extension areas	4.0
<p>Visual</p> <ul style="list-style-type: none"> Trees and shrubs will be planted to provide a visual screen: <ul style="list-style-type: none"> To the switch and bore pads located adjacent to Saddlers Creek Road, where required. Along the southern edge of Cope Road, where views of Open Cut 1 extension areas will be possible, subject to landowner consent. 	As described in the condition	6.0
<ul style="list-style-type: none"> The Landscape Management Plan (or equivalent) will be reviewed and updated to describe the measures that will be implemented to manage visual impacts associated with the Open Cut 1 and Open Cut 2 extension areas, such as: <ul style="list-style-type: none"> Vegetation screen planting, subject to land owner's consent, along the southern edge of Cope Road, in areas visually affected by direct views of the Open Cut 1 extension area. Investigating the feasibility of targeted vegetation screen planting for affected properties along Ridge Road (with direct views from the residence to both Open Cut 1 and Open Cut 2 extension areas), to mitigate the visual and lighting impacts of Open Cut 1 and Open Cut 2 extension areas, subject to landowner consent. Building-up out-of-pit embankments first so that continued operations are obscured by the embankment. Wherever possible out-of-pit emplacements around the perimeter will be established first, providing a visual screen while work is undertaken in the central part of the emplacement. Seeding and grassing embankment outer faces visually exposed to private residents as soon as practically possible to soften the view. Where possible, maintaining a strip of vegetation along the leading face of the ridgeline associated with the Open Cut 1 extension area to provide a visual screen to workings for as long as practical. Use of operational screening measures such as landform re-establishment sequencing and lighting management. 	Open Cut 1 and Open Cut 2 extension areas	6.0

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<ul style="list-style-type: none"> ○ <i>Progressive rehabilitation.</i> 		
<p>Biodiversity</p> <ul style="list-style-type: none"> • <i>Tree hollows and other habitat features will be salvaged for use as compensatory habitat, in rehabilitation areas.</i> • <i>The cleared area along the mining lease boundary will be rehabilitated and revegetated to enable cleared EEC to re-establish.</i> • <i>Disturbed areas not required for ongoing access and maintenance will be rehabilitated. Endemic species will be used to supplement natural vegetation regeneration, where required.</i> • <i>Progressive rehabilitation of disturbed areas and re-use of habitat features (e.g. hollow logs, rocks) in rehabilitation areas to minimise the habitat resource competition in adjoining conservation reserves.</i> 	<ul style="list-style-type: none"> Rehabilitation Areas As described in the condition Rehabilitation Areas Rehabilitation Areas 	6.0

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Table 3: Project Approval 08_0135

NSW Project Approval Condition		Area	RMP Section										
<p>REHABILITATION</p> <p>Rehabilitation Objectives</p> <p>53. The Proponent shall rehabilitate the site to the satisfaction of DRG. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EA (and depicted conceptually in the figures in Appendix 9), and comply with the objectives in Table 17.</p> <p>Table 17: Rehabilitation Objectives</p> <table border="1"> <thead> <tr> <th>Feature</th> <th>Objective</th> </tr> </thead> <tbody> <tr> <td rowspan="5">Mine site (as a whole)</td> <td> <ul style="list-style-type: none"> Safe, stable and non-polluting; Constructed landforms drain to the natural environment (excluding final voids); and Minimise visual impact of final landforms as far as is reasonable and feasible. </td> </tr> <tr> <td> <ul style="list-style-type: none"> Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems that is compatible with the conservation values of the adjacent Munghorn Gap Nature Reserve and Goulburn River National Park, that is comprised of: <ul style="list-style-type: none"> 1502 ha of open woodland including Grey Box – Narrow leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin; Scribbly Gum – Brown Bloodwood woodland of the southern Brigalow Belt South; Rough-barked Apple – Coast Banksia shrubby woodland on Warkworth Sands of the central Hunter Valley, Sydney Basin; and White Box Yellow Box Blakely’s Red Gum Woodland (EEC); </td> </tr> <tr> <td> <ul style="list-style-type: none"> aquatic habitat areas (within the diverted creek lines and retained water features); </td> </tr> <tr> <td> <ul style="list-style-type: none"> habitat for threatened fauna species; and </td> </tr> <tr> <td> <ul style="list-style-type: none"> wildlife corridors. </td> </tr> <tr> <td>Final Voids</td> <td> <ul style="list-style-type: none"> Minimise the size and depth of final voids so far as is reasonable and feasible, subject to meeting the objectives below: <ul style="list-style-type: none"> Minimise the drainage catchment of the final void so far as is reasonable and feasible; Negligible high wall instability risk; The size and depth of the final voids must be designed having regard to their function as long-term groundwater sinks, to ensure that groundwater flows across the back-filled pit towards the final void; and Minimise risk of flood interaction for all flood events up to and including the Probable Maximum Flood level. </td> </tr> </tbody> </table>		Feature	Objective	Mine site (as a whole)	<ul style="list-style-type: none"> Safe, stable and non-polluting; Constructed landforms drain to the natural environment (excluding final voids); and Minimise visual impact of final landforms as far as is reasonable and feasible. 	<ul style="list-style-type: none"> Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems that is compatible with the conservation values of the adjacent Munghorn Gap Nature Reserve and Goulburn River National Park, that is comprised of: <ul style="list-style-type: none"> 1502 ha of open woodland including Grey Box – Narrow leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin; Scribbly Gum – Brown Bloodwood woodland of the southern Brigalow Belt South; Rough-barked Apple – Coast Banksia shrubby woodland on Warkworth Sands of the central Hunter Valley, Sydney Basin; and White Box Yellow Box Blakely’s Red Gum Woodland (EEC); 	<ul style="list-style-type: none"> aquatic habitat areas (within the diverted creek lines and retained water features); 	<ul style="list-style-type: none"> habitat for threatened fauna species; and 	<ul style="list-style-type: none"> wildlife corridors. 	Final Voids	<ul style="list-style-type: none"> Minimise the size and depth of final voids so far as is reasonable and feasible, subject to meeting the objectives below: <ul style="list-style-type: none"> Minimise the drainage catchment of the final void so far as is reasonable and feasible; Negligible high wall instability risk; The size and depth of the final voids must be designed having regard to their function as long-term groundwater sinks, to ensure that groundwater flows across the back-filled pit towards the final void; and Minimise risk of flood interaction for all flood events up to and including the Probable Maximum Flood level. 	Rehabilitation Areas	4.0
Feature	Objective												
Mine site (as a whole)	<ul style="list-style-type: none"> Safe, stable and non-polluting; Constructed landforms drain to the natural environment (excluding final voids); and Minimise visual impact of final landforms as far as is reasonable and feasible. 												
	<ul style="list-style-type: none"> Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems that is compatible with the conservation values of the adjacent Munghorn Gap Nature Reserve and Goulburn River National Park, that is comprised of: <ul style="list-style-type: none"> 1502 ha of open woodland including Grey Box – Narrow leaved Ironbark shrubby woodland on hills of the Hunter Valley, North Coast and Sydney Basin; Scribbly Gum – Brown Bloodwood woodland of the southern Brigalow Belt South; Rough-barked Apple – Coast Banksia shrubby woodland on Warkworth Sands of the central Hunter Valley, Sydney Basin; and White Box Yellow Box Blakely’s Red Gum Woodland (EEC); 												
	<ul style="list-style-type: none"> aquatic habitat areas (within the diverted creek lines and retained water features); 												
	<ul style="list-style-type: none"> habitat for threatened fauna species; and 												
	<ul style="list-style-type: none"> wildlife corridors. 												
Final Voids	<ul style="list-style-type: none"> Minimise the size and depth of final voids so far as is reasonable and feasible, subject to meeting the objectives below: <ul style="list-style-type: none"> Minimise the drainage catchment of the final void so far as is reasonable and feasible; Negligible high wall instability risk; The size and depth of the final voids must be designed having regard to their function as long-term groundwater sinks, to ensure that groundwater flows across the back-filled pit towards the final void; and Minimise risk of flood interaction for all flood events up to and including the Probable Maximum Flood level. 												

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NSW Project Approval Condition		Area	RMP Section
<i>Table 17: Rehabilitation Objectives (continued)</i>			
Feature	Objective		
Water Quality	<ul style="list-style-type: none"> Water retained on site is fit for the intended land use (s) for the post-mining domain(s). The potential ecological, hydrological and geomorphic impacts from post-mining water discharges on receiving creeks are assessed and appropriate mitigation measures are effectively implemented as part of the closure plan. 		
Surface Infrastructure	<ul style="list-style-type: none"> To be decommissioned and removed, unless DRG agrees otherwise. 		
Degraded riparian areas along Wilpinjong Creek and along Murragamba and Eastern Creeks downstream of the mined areas to the boundary of the Wilpinjong mine	<ul style="list-style-type: none"> Restore channel stability; Restore riparian and aquatic ecosystem function; and Include compensatory aquatic habitat areas. 		4.0
Community	<ul style="list-style-type: none"> Ensure public safety; and Minimise the adverse socio-economic effects associated with mine closure. 		
Progressive Rehabilitation			
54. The Proponent shall rehabilitate the site progressively as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies shall be employed when areas prone to dust generation cannot yet be permanently rehabilitated. <i>Note: It is accepted that some parts of the site that are progressively rehabilitated may be subject to further disturbance at some later stage of the project.</i>		Rehabilitation Areas	6.0
Long Term Security of Rehabilitated Areas			
55. Prior to relinquishing the mining lease that covers the site, unless the Secretary agrees otherwise, the Proponent shall make suitable arrangements to protect the rehabilitation areas with conservation value in perpetuity, in consultation with OEH and to the satisfaction of the Secretary.		Stage 2 Rehabilitation Areas	4.1
Rehabilitation Management Plan			
56. The Proponent shall prepare and implement a Rehabilitation Management Plan for the project to the satisfaction of DRG. This plan must:		Rehabilitation Areas	This RMP
a) be prepared in consultation with the Department, DoI Water, OEH, Council and the CCC;			

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b) be submitted to and approved by DRG prior to the commencement of any development on site under this approval, unless the Secretary agrees otherwise;		
c) be prepared in accordance with any relevant DRG guideline;		
d) provide for periodic review and updating of the rehabilitation plans and management strategies to ensure best practice landform design and establishment strategies are employed		
e) describe how the rehabilitation of the site would be integrated with the implementation the biodiversity offset strategy;		
f) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);		
g) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, and address all aspects of rehabilitation including mine closure, final landform, and final land use;		
h) include interim rehabilitation where necessary to minimise the area exposed for dust generation;		
i) include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and		
j) build to the maximum extent practicable on the other management plans required under this approval.		
Appendix 3 – Statement of Commitments		
Rehabilitation		
36. MCM will rehabilitate the Stage 2 project area to restore forest and woodland across the valley landscape, including rehabilitating 631 ha of currently degraded secondary grasslands. Areas of derived native grassland, secondary grassland and exotic grassland will be rehabilitated to treed landscapes.	Stage 2 Rehabilitation Areas	4.0
37. MCM will implement best practice environmental management to progressively rehabilitate mined and degraded non-mined areas with a focus on the re-establishment of C/EEC Box Gum Woodland and threatened species habitat.	Stage 2 Rehabilitation Areas	4.0, 5.0 and 6.0
38. The gradients of final landform slopes will be generally designed to be no more than 10 to 14 degrees. However, where the out-of-pit (OOP) emplacement area is spatially constrained the final gradients of these slopes will be limited to a maximum of 20 degrees, provided it is agreed to by the relevant regulators.	Stage 2 Rehabilitation Areas	4.0, 5.0 and 6.0
Visual		
41. Rehabilitation will be carried out on disturbed areas as soon as practical after disturbance with emphasis on bunding and the OOP emplacement area.	Stage 2 Rehabilitation Areas	6.0

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Table 4: Commonwealth Approval EPBC 2007/3297

EPBC Requirements	Area	RMP Section
3. <i>In order to protect the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland listed ecological community, the person taking the action shall prepare and implement a detailed Rehabilitation and Offsets Management Plan for the project to the satisfaction of the Minister for the Environment and Water Resources. The proponent shall progressively rehabilitate the site to the satisfaction of Minister for the Environment and Water Resources and the NSW Department of Primary Industries, in general accordance with the proposed Rehabilitation and Offset Management Plan. The Rehabilitation and Offset Management Plan must include:</i>	Rehabilitation Areas	This RMP
<i>(a) the rehabilitation objectives for the site, vegetation offsets and landscaping;</i>		6.0
<i>(b) a description of the short, medium, and long term measures that would be implemented to:</i> <ul style="list-style-type: none"> • <i>rehabilitate the site;</i> • <i>implement the vegetation offsets; and</i> • <i>landscape the environmental bunds;</i> 		6.0 Biodiversity Offset Management Plan
<i>(c) performance and completion criteria for the rehabilitation of the site, implementation of the vegetation offsets, and landscaping of the environmental bunds;</i>		6.0
<i>(d) a detailed description of the measures that would be implemented over the next 3 years including the progressive rehabilitation of mining areas and progressive implementation of the vegetation offset areas referred to in Condition 2.</i>		4.0
<i>(e) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria (see (c) above);</i>		Forward Plan
<i>(f) a description of the potential risks to successful rehabilitation and/or revegetation, and a description of the contingency measures that would be implemented to mitigate these risks; and</i>		8.0
<i>(g) details of who would be responsible for monitoring, reviewing, and implementing the plan.</i>		3.0
		11.2

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Table 5: Mining Lease Conditions

ML	Condition	Condition Requirement	Area	RMP Section
ML 1605, ML 1606, ML 1628	Condition 7	<i>Disturbed land must be rehabilitated to a sustainable/agreed land use to the satisfaction of the Director-General.</i>	Rehabilitation Areas	This RMP
ML1691	Condition 7	<i>Any disturbance as a result of activities under this lease must be rehabilitated to the satisfaction of the Director-General.</i>	Rehabilitation Areas	This RMP
ML1715	Condition 2	<i>Any disturbance as a result of activities under this lease must be rehabilitated to the satisfaction of the Minister.</i>	Rehabilitation Areas	This RMP

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2.2 FINAL LAND USE OPTIONS ASSESSMENT

A conceptual final land use has been previously determined through existing project approval processes. See **Section 2.4.1** of this RMP for details on final land use domains. This section does not replace the outcomes of those processes.

2.3 FINAL LAND USE STATEMENT

The principal final land use vision at the MCC is to:

- Enhance biodiversity by providing a net increase in native vegetation and improving connectivity with adjacent woodland and forest communities at Munghorn Gap Nature Reserve and Goulburn River National Park; and
- Reinstate pre-mining land use on areas of OC3 by re-establishing agricultural land.

It is envisaged that the rehabilitated Murragamba and Eastern Creeks will be used for conservation, passive recreation and environmental education purposes. Some infrastructure may also be retained post-mining for future exploration/mining purposes or for passive recreation, educational and transport activities.

Final post mining land uses will be subject to consultation with relevant regulatory authorities and key stakeholders, including surrounding landholders.

The proposed final land use for the MCC can be seen in The Final Landform and Rehabilitation Plan (Plan 1 - Final Landform Features and Plan 2 Final Landform Contours).

A description of the post-mining land use goals relevant to biodiversity enhancement and agriculture are outlined in the following sections.

2.3.1 Biodiversity Enhancement

Regional biodiversity values will be enhanced by creating long-term north-south and east-west habitat corridors linking the Goulburn River National Park and Munghorn Gap Nature Reserve. Enhanced corridor linkages will be achieved through the rehabilitation of disturbed lands (including riparian areas) with native vegetation. This rehabilitation will develop habitats similar to the existing undisturbed environments.

Native vegetation rehabilitation areas will be a mosaic of Box Gum Shrubby Woodland, Sedimentary Ironbark Forest and Box Gum Grassy Woodland communities. Box Gum Woodland associations will be consistent with key species associated with the Box Gum Woodland Endangered Ecological Community. The type of woodland or forest community will ultimately be dependent on the post-mining landform slope and overburden material characteristics.

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Native vegetation will be established across the majority of OC1, OC2 and OC4 footprints and along the steeper areas of OC3 where the final landform approaches the ridge to the west. This will integrate with remnant stands of vegetation and enhance habitat connectivity.

2.3.2 Agriculture

MCO will re-establish lands suitable for agriculture on portions of the OC3 final landforms (**Figure 5: Final Landform Features (FLRP Plan 1)**). Agricultural rehabilitation areas will be predominantly rehabilitated with pasture species suitable for grazing.

2.3.3 Final Voids

One final void will remain in each of OC1, OC3 and OC4. A detailed description of final void design and management is provided in **Section 6.2.3.6**.

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2.4 FINAL LAND USE AND MINING DOMAINS

Consistent with contemporary rehabilitation regulatory requirements, MCO have developed final land use and mining domains for the MCC.

The NSW Resources Regulator has provided a list of Final Land Use and Mining domain names and codes that must be adhered to within this Rehabilitation Management Plan (RMP). **Table 6** details the specific domain titles and the relevant codes.

Table 6: NSW Resource Regulator Domain Codes (2021)

FINAL LAND USE DOMAIN	CODE	MINING DOMAIN	CODE
Native Ecosystem	A	Infrastructure Area	1
Agricultural – Grazing	B	Tailings Storage Facility	2
Agricultural – Cropping	C	Water Management Area	3
Rehabilitation Biodiversity Offset Area	D	Overburden Emplacement Area	4
Industrial	E	Active Mining Area (Open cut void)	5
Water Management Areas	F	Underground Mining Area (SMP)	6
Water Storage (Excluding Final Void)	G	Beneficiation Facility	7
Heritage Area	H	Other	8
Infrastructure	I		
Final Void	J		

The domains highlighted grey in **Table 6** are not applicable to MCO but have been included in this table for context.

2.4.1 Final Land Use Domains

The RMP Form and Way Document outlines a series of fixed domains for mine sites. For MCC the site will be rehabilitated to a final land use of Domain A – Native Ecosystem, Domain B – Agriculture Grazing, and Domain D – Rehabilitation Biodiversity Offset Area. **Figure 5** shows the domains physical boundaries within MCO. **Table 7** describes the final land use domains within the MCC.

Table 7: Final Land Use Domains

Code	RMP Final Land Use Domain	MOP Final Land Use Domain Reference (Superseded included for context)	RMP Final Land Use Domain Description
A	Native Ecosystem	A - Rehabilitation Area – Woodland	Native vegetation consistent with Box Gum Shrubby Woodland associations previously cleared by development of the Moolarben Coal Complex, including stands of <i>Allocasuarina</i> within OC1. Box Gum Shrubby Woodland associations will be generally consistent with key species associated with the Box Gum Woodland Endangered Ecological Community.

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Code	RMP Final Land Use Domain	MOP Final Land Use Domain Reference (Superseded included for context)	RMP Final Land Use Domain Description
			Box Gum Shrubby Woodland rehabilitation areas will contribute to habitat linkages between Munghorn Gap Nature Reserve (MGNR) and Goulburn River National Park (GRNP).
		B - Rehabilitation Area – Forest	Native vegetation comparable to Sedimentary Ironbark Forest communities in adjacent undisturbed areas, including stands of <i>Allocasuarina</i> within OC1. Sedimentary Ironbark Forest rehabilitation areas will contribute to habitat linkages between Munghorn Gap Nature Reserve (MGNR) and Goulburn River National Park (GRNP).
		C - Rehabilitation Area – Grassland	Native vegetation comparable to Western Slopes Grassy Woodland communities in adjacent undisturbed areas. Box Gum Grassy Woodland rehabilitation areas will contribute to habitat linkages between MGNR and GRNP.
B	Agriculture - Grazing	D – Rehabilitation Area – Agricultural	Areas to be rehabilitated to achieve a minimum Land Capability Class VI that is capable of supporting sustainable grazing. Pasture areas will be vegetated with a mix of native and non-invasive perennial pasture species.
D	Rehabilitation Biodiversity Offset Area	B - Rehabilitation Area – Residual Ecosystem and Species Credits	Areas within OC2/OC3 only to be rehabilitated to establish vegetation communities. This will generate the residual Framework for Biodiversity Assessment (FBA) ecosystem credits for HU730 (Plant Community Type (PCT) 618) and HU910 (PCT1696) and species credits for the Koala ¹ .
F	Water Management Areas	E – Post Mining Water Management Areas	The final landform drainage includes rehabilitated diversions of Murragamba and Eastern Creeks that will integrate with the surrounding catchments and be comparable to selected creek analogue sites.
G	Water Storage (Excluding Final Void)	E – Post Mining Water Management Areas	Sediment dams/water storages identified for retention in the final landform landscape (to provide water resources for fauna habitat or for agricultural

¹ Residual credits may be retired by other mechanisms under the BC Act in place of rehabilitation.

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Code	RMP Final Land Use Domain	MOP Final Land Use Domain Reference (Superseded included for context)	RMP Final Land Use Domain Description
			purposes). Retained water storage systems will be de-silted and stabilised (if required).
I	Infrastructure	G - Retained Infrastructure (subject to agreement with relevant regulatory authorities)	Infrastructure identified to be retained (e.g. water supply and distribution structures and access tracks) for future management, exploration/mining purposes or for passive recreation, educational and transport purposes.
J	Final Void	F – Final Void	A final void in OC1, a final void in the southern extent of OC3, and a final void at the eastern extent of OC4. Final voids will be safe, stable, profiled for long-term stability and non-polluting. Final void batters will be rehabilitated with suitable vegetation.

2.4.2 Mining Domains

Mining domains are classified as a land management unit with a discrete operational function (e.g. overburden emplacement). These areas have similar geophysical characteristics that will require specific rehabilitation treatments to achieve the final land use(s). The mining domains for the MCC are defined below in **Table 8**.

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Table 8: Mining Domains

Code	RMP Mining Domain	MOP Mining Reference (Superseded included for context)	RMP Final Land Use Domain Description
1	Infrastructure Area	3 – Infrastructure Area	<p>Infrastructure areas including but not limited to:</p> <ul style="list-style-type: none"> • CHPP and related facilities • administration areas • fuel farms • stores • training building • service bays • bathhouses • haul truck tyre slab • hardstand/laydown • access road • haul road • pipelines • temporary MIA • explosives storage facilities • sewage treatment plant
3	Water Management Area	2 – Water Management Area	<p>Includes components of the network of dams that forms the MCO water management system in place to control the movement of water around the site. These include sedimentation, diversion, mine water and clean dams.</p>
4	Overburden Emplacement Area	5 – Overburden Emplacement	<p>Areas in which overburden and interburden is placed.</p> <p>Temporary overburden stockpiles will be strategically placed near other large disturbance areas, such as dams and infrastructure areas, to expedite backfilling and rehabilitation and minimise rehandling of overburden material.</p>
5	Active Mining Area (Open cut void)	1 – Final Void (this has been reclassified to cover areas of active mining).	<p>These are the current active mining areas.</p>

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Code	RMP Mining Domain	MOP Mining Reference (Superseded included for context)	RMP Final Land Use Domain Description
6	Underground Mining Area (SMP)	6 - Underground Mining Area (SMP)	Underground mining areas including UG1, UG2 and UG4.

3.0 REHABILITATION RISK ASSESSMENT

A Rehabilitation Risk Assessment was completed on 21 March 2022. Environmental risks and controls for current operational areas, rehabilitation areas and offset areas have been identified and assessed in accordance with MCO's risk management processes following the general principles outlined in *ISO 31000:2018 Risk Management Guidelines*. The risk management methodology encompassed the following key steps:

- Establish the context for the risk assessment process
- Identify risks and potential impact
- Analyse risks; and
- Evaluate risks to determine the necessary controls for mitigation.

The scope of the risk assessment was to identify, assess, and evaluate the risks that need to be addressed to achieve the following in relation to the mining lease—

- the rehabilitation objectives,
- the rehabilitation completion criteria for large mines,
- the final land use as spatially depicted in the final landform and rehabilitation plan, and
- identifies the measures that need to be implemented to eliminate, minimise or mitigate the risks.

A summary of the risks and controls identified in the RMP Rehabilitation Risk Assessment are outlined in **Table 9** below.

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Table 9: Key Risks to Rehabilitation

Risk	Proposed Risk Controls	RMP Section
Failure to identify or comply with legal and other obligations relating to rehabilitation.	<ol style="list-style-type: none"> 1. Compliance and obligations tracking system. 2. Independent Environmental Audits. 	2.1
LTA recovery of required rehab resources (eg. Habitat features, mulch, soil)	<ol style="list-style-type: none"> 1. Approved Vegetation clearance process and management plan. 2. Ground disturbance permit (internal process). 3. Known topsoil locations and habitat features. 	6.2
Less than adequate weed and pest management during all phases on mining and rehabilitation resulting in unperforming achievement of rehab objectives and completion criteria.	<ol style="list-style-type: none"> 1. Targeted management and control program implemented. 3. Restricted access in rehabilitated areas 4. Designated tracks throughout rehabilitated areas 5. Participate regional control programs in consultation with LLS. 	6.2
Adverse geochemical/chemical composition of materials such as overburden, interburden, processing wastes, subsoils and topsoils and imported cover materials which results in longterm rehabilitation and closure issues.	<ol style="list-style-type: none"> 1. Known soils and overburden from testing. 2. Use of ameliorants as required. 3. Water sampling of mine and sediment dams. 4. Additional testing as required. 5. Selective handling, burial and capping depth or stockpiling. 	6.2
Less than adequate management of spontaneous combustion in overburden areas results in longterm rehabilitation and closure issues.	<ol style="list-style-type: none"> 1. RMP documented process for dealing with potential Spon com - selective material handling and burial at depth. 3. Principal hazard Management Plan for spontaneous combustion - open cut. 4. TARP for spontaneous combustion. 	6.2
Less than adequate material resources (eg. Clays, rocks, soils) to construct a diversion.	<ol style="list-style-type: none"> 1. Detailed design and known quantities of material. 2. Material testing. 	6.2
Inconsistent landform design (e.g. macro and micro-relief) which results in rework of rehabilitation areas.	<ol style="list-style-type: none"> 1. QA/QC process (ITP) 2. Engage qualified contractors to undertake rehabilitation 3. Consultants for design and assessment of rehabilitation 4. RMP 5. LOM 6. Rehabilitation Monitoring 	6.2

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Risk	Proposed Risk Controls	RMP Section
Less than adequate location, size and treatment of final voids, highwalls and ramps.	<ol style="list-style-type: none"> 1. RMP 2. Approved final landform plan 	6.2
Inadequate topsoil quantity available to be salvaged during operations for later use in rehabilitation.	<ol style="list-style-type: none"> 1. Material balance 2. Approved management plan covering topsoil management. 3. Topsoil balance / inventory 4. LOM topsoil assessment 5. Ground disturbance protocols 	6.2
Less than adequate soil/materials characterisation undertaken during operations to inform rehabilitation.	<ol style="list-style-type: none"> 1. Previous soil assessments and material characterisation. 2. Soil surveys for new disturbance areas as required. 	6.2
Insufficient soil amelioration undertaken to achieve suitable growth media for planting/seeding.	<ol style="list-style-type: none"> 1. RMP 2. QA/QC process. 3. Known process and monitoring. 	6.2
Less than adequate use of mechanical treatments (e.g. deep ripping, harrowing) required to maximise water infiltration into the substrate and to provide for an adequate seed bed.	<ol style="list-style-type: none"> 1. RMP 2. QA/QC process (Rehab Preparations, Rehab Finishing). 3. Known process and monitoring. 	6.2
Long term rehabilitation is not tracking towards completion criteria.	<ol style="list-style-type: none"> 1. RMP 2. Use of rehabilitation monitoring and specialist consultants. 3. Rehabilitation maintenance. 4. LOM planning and budget process. 5. Completion criteria and indicators 6. Reporting in Annual Review. 	8.0
Rehabilitated OC2 and / or OC3 landforms not tracking towards completion criteria to enable generation of requirements ecosystem and species credits.	<ol style="list-style-type: none"> 1. Approved OC2/OC3 completion criteria and performance indicators 2. Use of specialist consultants in development of criteria 3. Rehabilitation monitoring 4. Rehabilitation ITP (internal process) 5. Adaptive management of planting process considering monitoring results including supplementary planting as required 	8.0
Less than adequate subsidence mitigation and remediation techniques implemented	<ol style="list-style-type: none"> 1. Subsidence monitoring in accordance with approved management plans 2. Contingency budgetary allocation for remedial works associated with subsidence (if required). 	6.3

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Risk	Proposed Risk Controls	RMP Section
	3. Subsidence predictions and impacts to rehabilitation areas considered by existing approval	
Widespread degradation/loss of rehabilitated vegetation from uncontrolled bush fire	<ol style="list-style-type: none"> 1. Bushfire management and response to follow MCO internal processes. 2. Assessment of areas following fires, with follow-up reseeded/replanting if determined appropriate. 3. Maintain suppliers of seed for key native species. 	6.2
Major storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitated area.	<ol style="list-style-type: none"> 1. Monitoring of rehabilitation 2. Consider relevant stabilisation and revegetation works (as required) 3. Maintain suppliers of seed for key native species. 	6.2
Severe and/or prolonged drought leading to failure of rehabilitation.	<ol style="list-style-type: none"> 1. Monitoring of rehabilitated areas during / following drought event and reseeded / replanting as necessary 2. Maintain suppliers of seed for key native species. 3. Consider irrigation of rehabilitation areas (as required). 	6.2
Insect attacks (e.g. locusts and beetles)	<ol style="list-style-type: none"> 1. Monitoring and reseeded/replanting as necessary. 2. Monitoring of rehabilitated areas as part of annual monitoring program 3. Maintain suppliers of seed for key native species. 	6.2
Frost leads to high mortality rates of rehabilitation areas	<ol style="list-style-type: none"> 1. Adaptive management of planting process considering climatic conditions including supplementary planting as required. 2. Consider delaying plantings during frost season (if relevant) 3. Maintain suppliers of seed for key native species. 	8.0
Overgrazing in rehabilitation areas (native species, pests and livestock).	<ol style="list-style-type: none"> 1. Access to rehabilitation areas currently restricted by fencing / operations 2. Monitoring and inspections of rehabilitated areas 3. Management of native grazing as required. 4. Use of grazing deterrents such as plant tubes to protect seedlings (as required). 	8.0
Damage from unauthorised entry into rehabilitation areas.	<ol style="list-style-type: none"> 1. Signage (and if relevant fencing) of rehabilitated areas with inspection program implemented. 2. Internal ground disturbance process and training 3. Designated tracks in rehabilitated areas 	6.2

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4.0 REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

4.1 REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

The overall rehabilitation objective for the MCC is to restore mine-disturbed land to a naturally vegetated state including biodiversity enhancement areas and areas suitable for grazing. In addition, MCO aims to improve existing degraded and cleared land within its ownership outside the mine disturbance footprint.

In accordance with Condition 55, Schedule 3 of Project Approval (08_0135), prior to relinquishing the mining leases associated with Stage 2 of the Moolarben Coal Complex (unless the Secretary of the DPE agrees otherwise), MCO will make suitable arrangements to protect the rehabilitation areas with conservation value in perpetuity. These arrangements will be made in consultation with the BCD and to the satisfaction of the Secretary of the DPIE.

The proposed rehabilitation objectives and completion criteria are outlined in **Table 10**.

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Table 10: Rehabilitation Objectives and Completion Criteria

Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
A – Native Ecosystem B – Agriculture Grazing D – Rehabilitation on Biodiversity Offset Area	All Mining domains	Final landform will be suitable for the intended land use and consistent with the surrounding landscape.	Landform compatibility.	Constructed landforms are assessed to be consistent with the surrounding topography.	As constructed final landform plan.
		Final landforms are safe, stable, non-polluting and drain to the local environment.	Slopes.	Landform regraded to a stable grade, with slopes generally 10° to 18° and no more than 20° without Resource Regulator (RR) consent.	As constructed final landform plan.
			Landform stability.	Reconstructed landforms are stable with no evidence of slumping.	As constructed final landform plan. Rehabilitation monitoring reports.
			Non-polluting landform.	Run-off EC is less than 1,200 micro Siemens per centimetre (µS/cm) after 5 to 7 years.	Water quality monitoring results.
			Free draining landform.	Landforms are free draining (excluding retained water storage dams and final voids).	As constructed final landform plan.
		Weeds and pests are controlled within rehabilitation areas.	Exotic species presence and cover	'High Threat Exotic' (HTE*) weed presence and cover is monitored regularly Priority and HTE weeds identified through monitoring have been controlled	Rehabilitation monitoring reports, site walk over assessment, records of weed control activities, Annual Rehabilitation Report.
			Vertebrate pest presence and impacts	Vertebrate pest species presence and impacts are recorded and controlled	Rehabilitation monitoring reports, site walk over assessment, records of pest control activities. Annual Rehabilitation Report
		The growth medium is suitable for the establishment and maintenance of the nominated Final Land Use	Soil quality	Developing soil profile shows no existing or developing characteristics that would limit the long-term maintenance of the nominated Final Land Use.	Expert report to be provided in relinquishment report.

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Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
Water Storage (Excluding Final Void)	Water Management Areas	Mine water dams and sediment dams are decontaminated prior to removal or re-use as clean water dams in the final landform.	Hazardous materials.	Accumulated sediments are removed from the dam floor of mine water and sediment dams and emplaced in the final void.	Rehabilitation completion Report, photo evidence.
			Mine water structures decommissioned.	All water management structures that are not required as part of the post-closure land use have been decommissioned (drained and decontaminated).	Rehabilitation completion Report, photo evidence.
		Clean water diversion structures are removed where no longer required.	Restore clean water flows.	Clean water diversion structures are removed where no longer required.	Rehabilitation completion Report.
A – Native Ecosystem B – Agriculture Grazing D – Rehabilitation on Biodiversity Offset Area	Infrastructure Areas	All surface infrastructure is decommissioned and removed (except where to be retained with approval of relevant regulatory authorities).	Demolition of infrastructure	All surface infrastructure has been demolished and removed from the site including buildings and fixed plant, conveyors, open drains, ROM and product stockpiles, bitumen car parks, and waste oil/lubricant storage areas, rail loader and rail loop, sewerage treatment plants.	Statement provided, Rehabilitation completion report, photo evidence.
				All demolition work has been carried out in accordance with AS2601-2001: <i>The Demolition of Structures</i> or its latest version.	Statement provided, Rehabilitation completion report, photo evidence.
				Internal haul roads, access tracks and hardstands have been removed when no longer required.	Statement provided, Rehabilitation completion report, photo evidence.
			Environmental bunds have been re-graded in accordance with final landform design.	Statement provided, As constructed final landform plan, Rehabilitation completion report, photo evidence.	
Disconnect Services.	All site services have been removed where not required (electricity, telecommunications etc.).	Statement provided, utility service disconnection record / notification.			
A – Native Ecosystem	Overburden Emplacement Area	Final landform will be suitable for the intended land use and consistent with the surrounding landscape (however some isolated faces	Landform compatibility.	In-pit overburden emplacements are back-filled to the disturbance line against adjacent ridge lines. Retained isolated faces constructed to the satisfaction of the RR.	As constructed final landform plan, Rehabilitation completion report, photo evidence.

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Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
B – Agriculture Grazing D – Rehabilitation on Biodiversity Offset Area		may be retained as agreed with RR to enable the final landform profile to comply with required gradients).			
		Final landforms are safe, stable, non-polluting- and drain to the local environment.	Reject emplacement	Rejects are capped with at least 5m of inert material.	Site records, Rehabilitation completion report.
			Stability.	Gullies and rills occurring in monitoring transects are assessed to be limited and stabilising.	Rehabilitation monitoring reports, Rehabilitation completion report.
			Erosion.	Active erosion (soil loss due to gullying and rilling) is assessed to be minimal.	Rehabilitation monitoring reports, Rehabilitation completion report.
Water Management Areas	Water Management Areas	Final landforms are safe, stable, non-polluting and drain to the local environment.	Final landform drainage design.	Final landform water management structures and storages have been designed and constructed in accordance with 'Blue Book' (i.e. Landcom [2004] <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> and DECC [2008] <i>Managing Urban Stormwater: Soils and Construction Volume 2</i>) requirements and the approved final landform drainage design.	Rehabilitation completion report, As constructed Final Landform Plan.
				Re-aligned sections of Murragamba and Eastern Creeks constructed in accordance with approved design.	Rehabilitation completion report, Creek diversion as-constructed plans.
				Drop structures, channel banks and drains are operating as designed.	Rehabilitation completion report.
				Final landform water management structures and storages are operating as designed.	Rehabilitation completion report.
			Landform stability.	Drainage structures are assessed to be stable with no significant gully heads, tunnel erosion or bank failure.	Rehabilitation completion report.
Water Storage (Excluding Final Void)	Water Management Areas	Water retained in surface water storages is fit for the intended land use (s) for the post-mining domain(s)	Water Chemistry	Water chemistry within surface storages do not negatively affect final land use objectives	Water quality monitoring.

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Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
Final Void	Active Mining Area	Final voids are safe, profiled for long-term stability and non-polluting.	Non-polluting landform.	No carbonaceous materials are exposed in the final void floor.	Rehabilitation completion report.
			Stability.	The final void highwalls and low walls are constructed in accordance with an approved Final Void Geotechnical Design.	Rehabilitation completion report, final void as-constructed plans.
				The final void highwalls and low walls have been assessed by a qualified geotechnical engineer to validate long-term stability.	Final void engineering report.
			Public safety.	Void perimeter bunding and safety fencing is constructed.	Rehabilitation completion report.
				Suitable signs, clearly stating the risk to public safety and prohibiting public access are erected at intervals along the entire length of the fence.	Rehabilitation completion report.
			Surface and Ground Water Management.	Clean water diversion structures are constructed in accordance with the approved final void design.	Rehabilitation completion report, final void as-constructed plans.
Size and depth of final voids is in accordance with the approved final void design.	Rehabilitation completion report, final void as-constructed plans.				
Other	Underground Mining Area	Final landforms are safe and stable.	Subsidence cracking	No subsidence surface cracks remaining that present a risk to the environment, safety and the final land use objectives.	Subsidence monitoring records.
A – Native Ecosystem	All Mining domains	Soil profile development is occurring	Soil development and function	The processes of soil formation and soil function are evident in the rehabilitated soil profile	This will be assessed through a one off examination of soil processes that may include an assessment of, for example, soil structure development, return of soil fauna, litter incorporation (nutrient cycling) or organic matter accumulation.
		Rehabilitation areas are resilient and self-sustaining	Resilience	Rehabilitation area at some point since seeding or final surface preparation has experienced a fire or declared drought or at least one year with annual rainfall in the	Rehabilitation monitoring reports, Rehabilitation completion report.

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Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
				first decile range and all other vegetation completion criteria have been met.	
		Weeds are controlled on MCO-owned lands	Exotic species presence and cover	Priority weeds are controlled and HTE cover is maintained at < 15%	Rehabilitation monitoring reports, site walk over assessment, records of weed control activities, Annual Rehabilitation Report.
		Rehabilitated areas provide habitat for Native fauna species	Presence of multiple fauna habitats	Multiple fauna habitats are available within all rehabilitation areas.	Rehabilitation monitoring reports, Rehabilitation completion report.
			Presence of multiple native fauna	Monitoring confirms multiple native fauna species are recorded utilising rehabilitation areas.	Rehabilitation monitoring reports, Rehabilitation completion report.
		Rehabilitation area floristics and structure is representative of, or trending towards Box Gum Shrubby Woodland communities, including stands of <i>Allocasuarina</i> spp. within OC1	Presence of Stands of <i>Allocasuarina</i> spp within Box Gum Shrubby Woodland rehabilitation areas on OC1	Stands ² of <i>Allocasuarina</i> spp have been maintained within Box Gum Shrubby Woodland rehabilitation areas on OC1.	Rehabilitation monitoring reports, site walk over assessment, records of planting and seeding, maintenance records, Annual Rehabilitation Report.
			Vegetation composition	Revegetation areas contain flora species assemblages characteristic of or trending towards that of Box Gum Shrubby Woodland communities ¹	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
			Vegetation Structure	Median foliage cover of the ecologically dominant layers (trees/shrubs/ground cover) and developing litter cover are within the 10th-90th percentile variation range of the Box Gum Shrubby Woodland Community Analogue sites	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.

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Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
			Regeneration	Rehabilitation monitoring verifies that second generation seedlings of species characteristic of Gum Shrubby Woodland Communities are present or likely to be, based on comparable older rehabilitation sites	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
		Rehabilitation area floristics and structure is representative of, or trending towards Secondary Ironbark Forest communities, including stands of <i>Allocasuarina</i> spp. within OC1	Presence of Stands of <i>Allocasuarina</i> spp within Secondary Ironbark Forest rehabilitation areas on OC1	Stands ² of <i>Allocasuarina</i> spp have been maintained within Secondary Ironbark Forest community rehabilitation areas on OC1.	Rehabilitation monitoring reports, site walk over assessment, records of planting and seeding, maintenance records, Annual Rehabilitation Report.
	Vegetation composition		Revegetation areas contain flora species assemblages characteristic of or trending towards that of Secondary Ironbark Forest communities ³	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.	
	Vegetation Structure		Median foliage cover of the ecologically dominant layers (trees/shrubs/ground cover) and developing litter cover are within the 10th-90th percentile variation range of the Secondary Ironbark Forest community Analogue sites	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.	
	Regeneration		Rehabilitation monitoring verifies that second generation seedlings of species characteristic of Secondary Ironbark Forest communities are present or likely to be, based on comparable older rehabilitation sites	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.	
		Rehabilitation area floristics and structure is representative of, or trending towards Box Gum Grassy Woodland communities	Vegetation composition	Revegetation areas contain flora species assemblages characteristic of or trending towards that of Box Gum Grassy Woodland communities ¹	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
	Vegetation Structure		Median foliage cover of the ecologically dominant layers (trees/shrubs/ground cover) and developing litter cover are within the 10th-90th percentile variation range of the Box Gum Grassy Woodland Community Analogue sites	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.	

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Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
			Regeneration	Rehabilitation monitoring verifies that second generation seedlings of species characteristic of Gum Grassy Woodland communities are present or likely to be, based on comparable older rehabilitation sites	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
D – Rehabilitation on Biodiversity Offset Area	All Mining domains	Establish vegetation communities in the rehabilitated OC2 and/or OC3 landforms to generate the residual ecosystem credits for HU730 618) and HU910 (PCT1696) and species credits for the Koala.	Species Composition	Native Plant Species Richness is ≥ 20.5 at year 10 post mining.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
			Species Composition for Koala Credits	$\geq 15\%$ of the total number of trees are the regionally relevant species** within koala FBA species credit areas	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
			Vegetation Structure	Native Over Storey Cover between 3.75 and 80% at year 10 post mining operations *	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
				Native Mid-Storey Cover between 1.25 and 40% at year 10 post mining operations.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
				Native Ground Cover, Grass between 3 and 100% at year 10 post mining operations.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
				Native Ground Cover, Shrubs between 0.5 and 20% at year 10 post mining operations.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
				Native Ground Cover, Other between 2 and 80% at year 10 post mining operations.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
Total Length Fallen Logs (m) is 1.25 at year 10 post mining operations.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.				

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Final Land use Domain	Mining Domain	Rehabilitation Objective	Performance Indicator	Proposed Completion Criteria	Validation Method
				Exotic Plant Cover is <45% at year 10 post mining operations.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
				Overall Site Value Score (OEH, 2015) (average of plots in vegetation zone) is ≥ 13.8 at 10 years post mining operations.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
B – Agriculture Grazing	All Mining domains	Return land disturbed by mining to pre-mining Rural Land Capability.	Rural Land Capability Class.	A suitably qualified professional has determined that the rehabilitated landforms have achieved Land Capability Class VI	Land Capability Assessment report
			Pasture composition	Average vegetation cover is dominated ⁵ by native and introduced grass, legume and herbage species recognised as pasture species or known to be palatable and to provide forage for livestock	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
			Productivity	Median standing herbage biomass is greater than the 10th percentile of the analogue pasture sites or exceeds the minimum herbage biomass required for sustainable grazing.	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.
		Agriculture Grazing land only requires the same level of maintenance as surrounding lands	Priority Weeds	Priority weeds are controlled, and median cover is within the 90th percentile of analogue sites	Rehabilitation monitoring reports, site walk over assessment, photo evidence, Annual Rehabilitation Report.

* HTEs as per the BAM 2020

1. A range of characteristic means that at least 25% of the species present in rehabilitated areas are recognised as being typical of the vegetation communities that match the Box Gum Shrubby Woodland Association (inclusive of any additional species listed in Table 16 of the RMP)
2. Patches of three or more individual stems
3. A range of characteristic means that at least 25% of the species present in rehabilitated areas are recognised as being typical of the vegetation communities that match the Sedimentary Ironbark Forest Association (inclusive of any additional species listed in Table 17 of the RMP)
4. A range of characteristic means that at least 25% of the species present in rehabilitated areas are recognised as being typical of the vegetation communities that match the Box Gum Grassy Woodland Association (inclusive of any additional species listed in Table 18 of the RMP)
5. At least 50% of the vegetative cover.

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4.2 REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA – STAKEHOLDER CONSULTATION

4.2.1 Consultation for Rehabilitation Objectives and Completion Criteria

MCO has conducted comprehensive consultation programs during the Moolarben Coal Project Stage 1 and Moolarben Coal Project Stage 2 approval processes under the NSW *Environmental Planning and Assessment Act, 1979*. These consultation programs included the rehabilitation strategy for the MCC.

As per Conditions 35B and 35C, Schedule 3 of the Stage 1 Project Approval 05_0117 (as modified) MCO is required to develop rehabilitation performance and completion criteria for vegetation communities to be established in the rehabilitated OC2 and/or OC3 landforms to generate the residual Framework for Biodiversity Assessment (FBA) ecosystem credits for HU730 (Plant Community Type (PCT) 618) and HU910 (PCT1696) and species credits for the Koala¹. These rehabilitation performance and completion criteria were approved by the DPE on 7 July 2020.

Development of the rehabilitation performance indicators and completion criteria will be an iterative process, whereby monitoring results will be used to refine the completion criteria in future revisions of the RMP.

A summary of the stakeholder engagement undertaken as part of the development MCO rehabilitation objectives and completion criteria is outlined in **Table 11**.

Table 11: Summary of stakeholder engagement undertaken for the development of rehabilitation objectives and rehabilitation completion criteria

Stakeholder	Consultation activities and form	Matters subject to consultation	Actions taken in response to stakeholder feedback
NSW Department of Planning and Environment (DPE)	Conditions 35B and 35C, Schedule 3 of the Stage 1 Project Approval 05_0117	Framework for Biodiversity Assessment (FBA) ecosystem credits for HU730 (Plant Community Type (PCT) 618) and HU910 (PCT1696) and species credits for the Koala ¹	Finalised completion criteria
NSW Department of Planning, Industry and Environment – Resources Regulator (RR)	Mining Operations Plan submission and approval	Objectives and completion criteria submitted for approval	Previously approved completion criteria
NSW Department of Planning, Industry and Environment – Biodiversity and	Conditions 35B and 35C, Schedule 3 of the Stage 1 Project Approval 05_0117	Framework for Biodiversity Assessment (FBA) ecosystem credits for HU730 (Plant	Finalised completion criteria

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Conservation Division (BCD)		Community Type (PCT) 618) and HU910 (PCT1696) and species credits for the Koala ¹	
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4.2.2 2022 Consultation

A copy of this RMP has been sent to relevant agencies and the CCC to meet the requirements of PA05_0117 Schedule 3 Condition 68 and PA08_0135 Schedule 3 Condition 56. The RMP has been designed to cover the Project Approval requirements as well as the layout required for the Resources Regulator Form and Way Document: Rehabilitation Management Plan.

Table 12: 2022 Summary Consultation

Agency/Stakeholder	Consultation Summary for 2022 RMP	MCO Comment
Community Consultative Committee	Copy of 2022 RMP has been provided for consultation.	To be updated if recommendations received.
NSW Department of Planning and Environment	Copy of 2022 RMP has been provided for consultation.	To be updated if recommendations received.
NSW Department of Planning and Environment – Water	Copy of 2022 RMP has been provided for consultation.	To be updated if recommendations received.
NSW Department of Planning and Environment – Biodiversity, Conservation and Science Directorate	Copy of 2022 RMP has been provided for consultation.	To be updated if recommendations received.
Mid-Western Regional Council	Copy of 2022 RMP has been provided for consultation.	To be updated if recommendations received.

4.2.3 Ongoing Consultation and Stakeholder Engagement

MCO will continue to improve the Rehabilitation Management Plan and Completion Criteria incorporating feedback from a range of stakeholders as part of the ongoing stakeholder engagement process in accordance with Condition 68, Schedule 3 of NSW Project Approval (05_0117). The RMP completion criteria in this document will remain ‘proposed’ until such a time that the Resources Regulator approves the completion criteria submitted as part of the Rehabilitation Outcomes Document (Division 3 Clause 12).

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5.0 FINAL LANDFORM AND REHABILITATION PLAN

The Final Landform and Rehabilitation Plans have been developed in line with relevant requirements and are presented as two sub plans in this document.

These sub plans area:

1. Plan 1: Final Landform Features (**Figure 5: Final Landform Features (FLRP Plan 1)**)
2. Plan 2: Final Landform Contours (**Figure 6: Final Landform Contours (FLRP Plan 2)**)

The following themes have been submitted the Mine Rehabilitation Portal as Shapefiles as per the *Form and Way: Rehabilitation objectives, rehabilitation completion criteria and final landform and rehabilitation plan for large mines* (NSW RR 2021).

- Final Land Use
- Final Landform Features
- Project Approval Boundary
- Final Landform Contours

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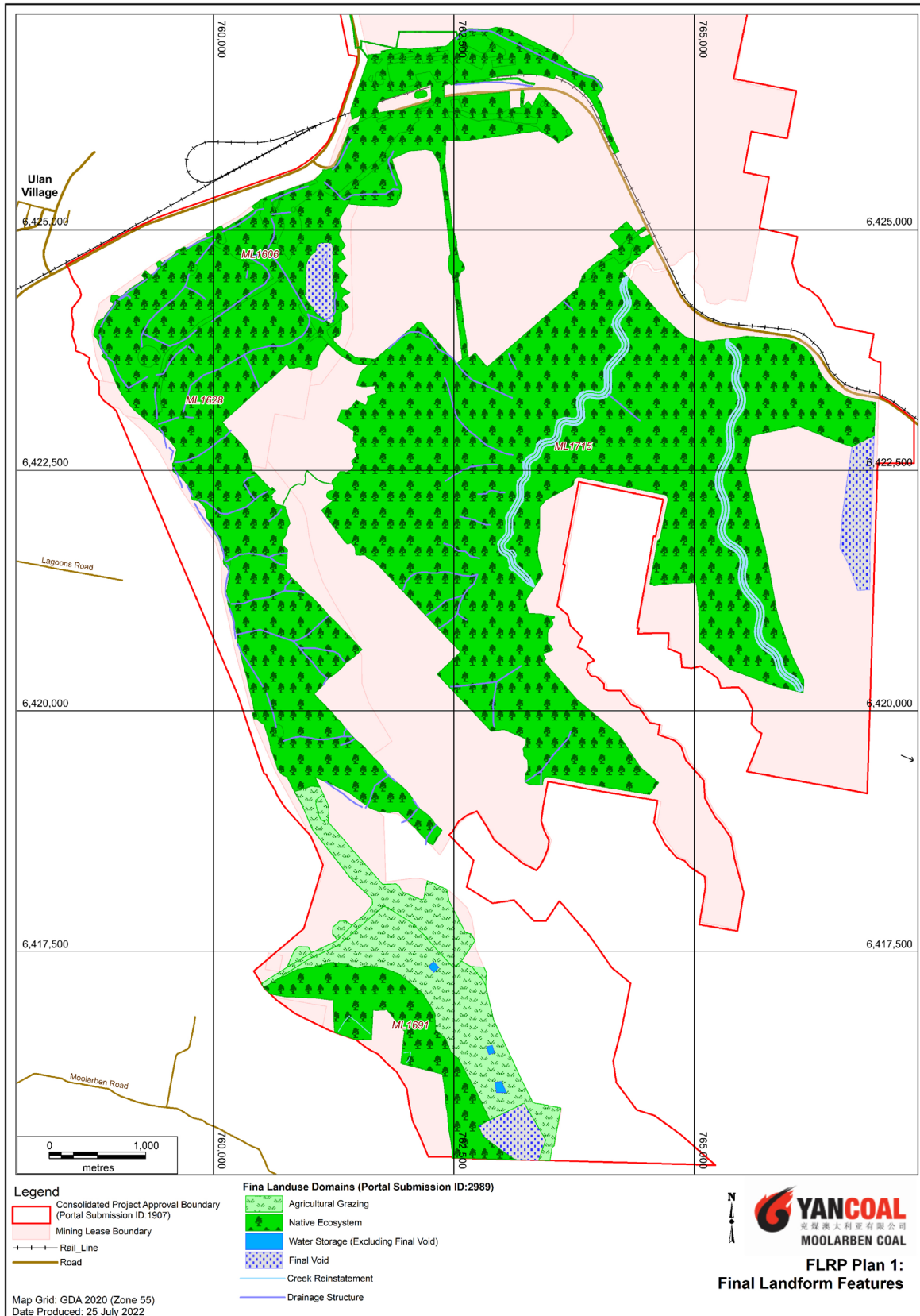


Figure 5: Final Landform Features (FLRP Plan 1)

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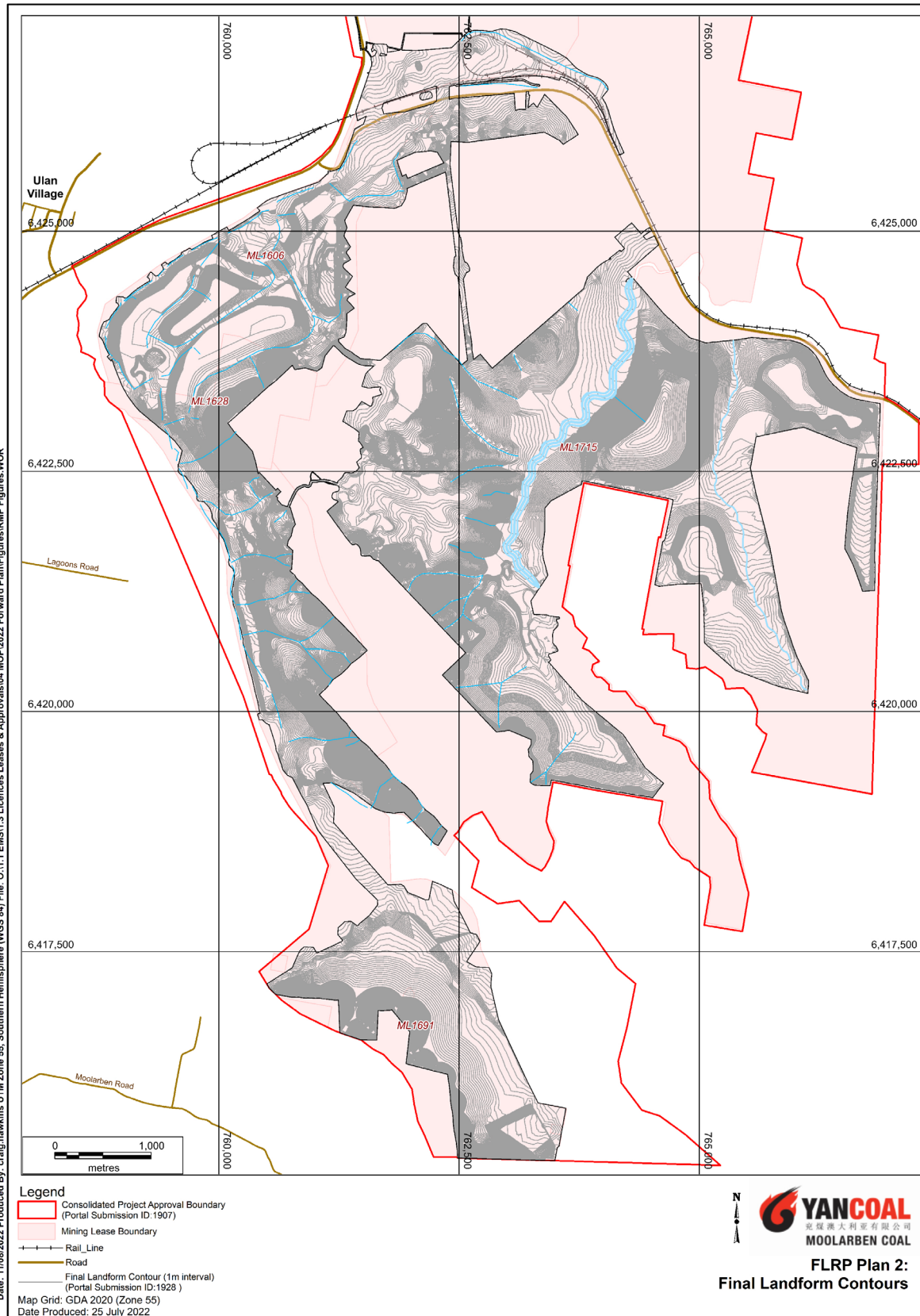


Figure 6: Final Landform Contours (FLRP Plan 2)

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6.0 REHABILITATION IMPLEMENTATION

6.1 LIFE OF MINE REHABILITATION SCHEDULE

The RMP Form and Way document outlines that this section should describe the rehabilitation schedule over the life of the mine, from the commencement of the rehabilitation management plan until lease relinquishment. The life of mine rehabilitation schedule must include a series of plans illustrating the proposed mine layout and sequence of progressive rehabilitation across the leasehold area at a minimum of five-yearly intervals until completion of mining and achievement of the final land use.

Detailed mine planning is completed annually and outlines proposed mining/disturbance and rehabilitation areas. Detailed figures will be prepared as part of the Annual Rehabilitation Report and Forward Program, with these outlining activities over the next three years. Beyond that, the site is working on detailed mine planning, but the information is considered conceptual and has not been included in this RMP.

6.2 PHASES OF REHABILITATION AND GENERAL METHODOLOGIES

The final land use objectives will be achieved through a series of conceptual stages of rehabilitation. Where available, definitions have been used from the RMP Form and Way document and are described below.

- Active – In the context of rehabilitation, land associated with mining domains is considered ‘active’ for the period following disturbance until the commencement of rehabilitation.
- Stage 1: Decommissioning – Removal of infrastructure associated with mining activities including preparation plants, hard stand areas, buildings, contaminated materials, 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 use(s) following lease relinquishment.
- Stage 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.
- Stage 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 support the desired vegetation community (including short-lived pioneer

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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.

- **Stage 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.
- **Stage 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.
- **Stage 6: Rehabilitation Competition** – 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.

6.2.1 Active Mining Phase

The RMP Form and Way document states in the context of rehabilitation, land associated with mining domains is considered ‘active’ for the period following disturbance until the commencement of rehabilitation. This sub section summarises the risks and opportunities for rehabilitation associated with the active mining phase across the mining domains. The sub sections have been prepared as per the RMP Form and Way document.

6.2.1.1 Soils and Material

Soil resources for rehabilitation have been identified and characterised for the *Moolarben Coal Project Stage 1 Environmental Assessment Report* (Wells Environmental Services, 2006), *Moolarben Coal Project Stage 1 Optimisation Modification Environmental Assessment* (EMM, 2013a) and *Moolarben Coal Project Stage 2 Environmental Assessment Report* (Wells Environmental Services and Coffey Natural Systems, 2009).

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Field and laboratory tests indicate that the soils are mainly acid in nature, have low organic matter content, are deficient in all major nutrients (such as phosphorus, sulphur and nitrogen) and are highly erodible. They are generally non-saline ($EC_{se} < 2$ dS/m) but may be prone to dryland salinity outbreak (there is some occurrence of saline discharge from soils within OC4).

The suitability of the soil types for rehabilitation, the chemical and physical characteristics for each soil type and proposed soil stripping depth is summarised in **Table 13**.

Table 13: Topsoil Suitability for Rehabilitation Purposes

Soil Type	Soil Horizon	Rehabilitation Suitability	Physical and Chemical Characteristics	Stripping Depth (cm) [#]
Yellow Solodic	A1	Suitable if ameliorated	Acid pH with severe dispersive qualities, excessive Mg levels (low Ca:Mg ratio), poor fertility, low Ca	30*
	A2	Suitable if ameliorated	Acid pH with severe dispersive qualities, excessive Mg levels (low Ca:Mg ratio), poor fertility, low Ca	
	B	Not suitable	Dispersive clay, excessive Mg and Na levels	
Yellow Podzolic	A1	Suitable if ameliorated	Acid pH with severe dispersive qualities, excessive Mg levels (low Ca:Mg ratio), poor fertility	30*
	A2	Suitable if ameliorated	Acid pH with severe dispersive qualities, excessive Mg levels (low Ca:Mg ratio), poor fertility	
	B	Not suitable	Dispersive clay	
Earthy Sands	A1	Suitable for blending only.	Acid pH, elevated Al levels, high sand content	100
	A2	Suitable for blending only	Acid pH, elevated Al levels, high sand content with moderate dispersive qualities	
	A3	Suitable for blending only	Acid pH, elevated Al levels, high sand content with severe dispersive qualities	
	B	Not suitable	Dispersive clay, high Na and Mg levels	
Red Podzolic	A1	Suitable if ameliorated	Acid pH with severe dispersive qualities, elevated Al levels, poor fertility	25*
	A2	Suitable if ameliorated and blended	Acid pH with severe dispersive qualities, excessive Mg levels (low Ca:Mg ratio), poor fertility, sand gravel content exceeds 60%	
	B	Not suitable	Dispersive clay, high Na and Mg levels.	
Red Earth	A1	Suitable for blending only	Acid pH, elevated Al levels, high sand gravel content	100
	A2	Suitable for blending only	Acid pH, elevated Al levels, high sand gravel content	
	B	Suitable for blending only	Acid pH, elevated Al levels, high sand gravel content	
Alluvial	A1	Suitable if blended and ameliorated	Acid pH with moderate dispersive qualities, elevated Mg levels, poor fertility	45
	A2	Suitable if blended and ameliorated	Acid pH with moderate dispersive qualities, excessive Mg levels (low Ca:Mg ratio), poor fertility, sand gravel content levels are high	
Euchrozem	A1-B	Highly suitable	Neutral to alkaline pH, low erosion hazard, moderate to high fertility, potentially elevated Mn at depth	100

Source: Wells Environmental Services and Coffey Natural Systems (2009).

Notes: * Stripping depth has incorporated the blending of the top 10 to 20 centimetres (cm) of the A2 horizon to increase topsoil volume. # Stripping depth may vary based on further site investigation.

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Soil Stripping

Soil resources are stripped at the relevant depth for the soil type (**Table 13**) based on soil mapping data and site verification. All suitable and available soil resources will be salvaged for re-use in rehabilitation. Soil and other organic matter will be removed from cleared areas and either directly respread on rehabilitation areas or stockpiled for future reuse.

Topsoils and subsoils will be stockpiled separately and will be managed to optimise the overall quality of growth media resources. Where practicable, cleared vegetation not retained for habitat augmentation on rehabilitation areas may be mulched on site and mixed into topsoil during the stripping process to provide a soil conditioner.

Soil Stockpile Management

MCO soil stockpile management strategies aim to preserve the soil resource and improve overall soil health. Management practices used to optimise the long-term viability of stockpiled soil resources include:

- Soil stockpiles are generally constructed to a maximum of height of 3m, with a rough friable surface to reduce erosion, increase infiltration, and minimise anaerobic conditions at the base of the stockpile.
- Long-term stockpiles are preferentially located outside of mine disturbance areas away from slopes and drainage lines.
- Soil stockpiles that are inactive for longer than 6 months seeded with native grass or non-invasive exotic pasture species to reduce erosion and maintain soil structure, organic content and microbial activity.
- Sodic soils may be ameliorated (as necessary) while stockpiled to minimise dispersion and loss of structure.
- Soil stockpiles are managed to minimise weed growth. Prior to re-spreading soils, stockpiles may be scalped to remove weeds and minimise the transfer of weed seeds into rehabilitation areas. Topsoil stockpiles are de-compacted prior to soil re-spreading by deep ripping.
- Application of appropriate (type and quantity) soil amendments and fertilisers (e.g., sodic and dispersive soils will be treated with gypsum or lime, as required, where they are to be used on exposed surface areas).

A summary of the soil resource management strategies implemented at the MCC is provided in **Table 14**.

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Table 14: Soil Resource Management Strategies

Soil Characterisation and Quantification	Soil Stripping and Handling	Soil Stockpile Management	During the Rehabilitation Program
<ul style="list-style-type: none"> Quantification of soil resources. Characterisation of the suitability of soil resources for rehabilitation works. Subsoil material that may potentially enhance the revegetation works would be investigated, with suitable materials to be stockpiled and used in the revegetation works. Formulation of stripping specifications including location of areas to be stripped, appropriate stripping depths and scheduling. 	<ul style="list-style-type: none"> Stockpile selectively stripped material. Stockpile soils in a manner that reduces the impact on the long-term viability of the soil resource. Soil stockpiles will be preferably located outside of proposed mining areas. Vehicular traffic will be kept to a minimum on the soils to be stripped. Stockpiles will be constructed with a "rough" surface condition to reduce erosion hazard, improve drainage and promote revegetation. Stockpiles will be generally no more than 3 m in height in order to minimise potential for anaerobic conditions. 	<ul style="list-style-type: none"> Implement measures to manage long-term viability of stockpiled soil resources (and manage soil salinity) as follows: <ul style="list-style-type: none"> Where necessary fertilise and seed stockpiles which will be inactive for longer than 6 months to maintain soil structure, organic matter and microbial activity. Where necessary, install silt fences around the downslope perimeter of stockpiles to control potential soil loss and downstream sedimentation. Where necessary, apply appropriate soil ameliorants (lime/ gypsum) to dispersive soil stockpiles. Implement appropriate weed control strategies particularly for any priority weeds. 	<ul style="list-style-type: none"> Deep rip stockpiles (inactive for longer than 6 months) to establish aerobic conditions prior to reapplication of stockpiled soil for rehabilitation. Topsoil conditioning involving the addition of lime, gypsum or fertiliser will be used where required. On completion of landform contouring, topsoiling and erosion and sediment control works, a vegetative cover will be applied as soon as practicable. Depending on the proposed post-mining land use, this will involve direct seeding of selected shrub, grass and tree species. Implement appropriate weed control strategies particularly for any priority weeds. Immediate revegetation will provide vegetative competition to assist with control of undesirable plant species.

More information on soil assessments within the MCC can be found in the following documents: JAMMEL Environmental & Planning Services Pty Ltd (2006) and JAMMEL Environmental & Planning Services Pty Ltd (2008)

6.2.1.2 Flora

Threatened Flora

A number of studies have been conducted over the life of MCO (Moolarben Biota, 2006; Ecovision Consulting, 2008; EMM, 2013a and b). These studies have recorded five threatened flora species at the MCC, including:

- Diuris tricolor* (Pine Donkey Orchid) – vulnerable under the BC Act.
- Eucalyptus cannonii* (Capertee Stringybark) – vulnerable under the BC Act.

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- *Eucalyptus scoparia* (Wallangarra White Gum) – endangered under the BC Act and vulnerable under the EPBC Act.
- *Leucochrysum albicans var tricolor* (Hoary Sunray) – endangered under the EPBC Act.
- *Pomaderris queenslandica* (Scant Pomaderris) – endangered under the BC Act and vulnerable under the EPBC Act.

Targeted spring surveys were undertaken by EcoLogical Australia in September, October and November 2013 for the Pine Donkey Orchid (*Diuris tricolor*) in potential habitat areas within Open Cut 1 and Open Cut 2 extension areas in accordance with the Stage 1 Project Approval (05_0117).

Flowering of the species was confirmed (by inspecting known locations/occurrence) prior to undertaking the targeted searches in areas of suitable habitat (grassy areas within Dry Sclerophyll Forest often with Cypress Pine or Ironbark's with sandy soils, either on flats or small rises).

The Pine Donkey Orchid (*Diuris tricolor*) was not recorded during the targeted searches. It was concluded by EcoLogical Australia that the potential for further occurrence of the Pine Donkey Orchid (*Diuris tricolor*) at the MCC was low.

Seed Collection

Seed collection will be conducted in accordance with the requirements of the Florabank Guidelines (2000), with additional consideration of (*inter alia*):

- Progressive collection of native seed from similar landscapes to augment revegetation resources.
- Strategically timed and cost-effective seed collection.
- Collection of fruit directly from the plant into collection bags for transfer to drying rooms.
- Maintenance of a seed inventory which records the amount of seed collected, species type and treatment and propagation specifications.

Seed collection activities will be undertaken within relevant vegetation communities located within the MCC biodiversity offset areas, non-operational/undisturbed areas and other MCO owned land. Where practicable and available, seed will be collected from threatened flora species proposed to be cleared, as a part of the Vegetation Clearance Protocol (VCP).

To avoid the spread of weeds and exotic species, seed collection will only be carried out for native species. The seedbank will be supplemented by commercially available material from endemic native species.

Harvested seeds not used in direct sowing or production of tubestock will be stored for future use on rehabilitation and biodiversity offset areas. Storage and management of seed stocks will comply with Florabank Guidelines (2000) so as to maintain seed viability. This may include:

- Storage of seed in paper or calico bag.

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- Labelling of seed collection and storage bags with relevant details (e.g. species and collection and storage dates).
- Seed storage in low humidity and at a cool temperature.

Weed Management

Under the *Biosecurity Act 2015*, MCO has a general biosecurity duty to prevent, eliminate or minimise spread of priority weeds.

There are also a number of weed species (particularly introduced perennial grasses) which are a significant concern in regard to the long-term viability of the Box Gum Woodland EEC and have been listed as a Key Threatening Process (NSW Department of Environment, Climate Change and Water [DECCW], 2010).

Minimising the risk of weed infestation of rehabilitation areas requires a 'whole of operation' approach to weed management. The MCO weed control program consists of:

- Regular inspections of operational lands to identify areas requiring the implementation of weed management measures
- Consultation with relevant government stakeholders regarding regional weed management strategies
- Implementation of appropriate weed management measures which may include mechanical removal, application of approved herbicides and biological control
- Control of priority weeds, when identified on MCO owned land in accordance with the relevant Department of Primary Industries (DPI) control category and the relevant regional weed management plan
- Inspections and maintenance of topsoil stockpiles
- Identification of weed infestations adjacent to or within the proposed disturbance area during preclearance surveys
- Follow-up inspections to assess the effectiveness of the weed management measures implemented and the requirement for any additional management measures; and
- Restricting vehicles to existing access tracks only with signage denoting rehabilitation areas.

Introduced plants are of concern as they have the potential to out-compete native species, to alter habitat and affect land use (agricultural or recreational).

Weed control activities will focus on priority weeds under the *Biosecurity Act 2015*. Specific management controls implemented across the MCC consider the recommended controls for individual weed species as outlined within the DPI, NSW WeedWise database (<https://weeds.dpi.nsw.gov.au/>)

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and will be guided by the Central Tablelands Regional Strategic Weed Management Plan 2017-2022 (LLS 2017). All weed control works will be completed in accordance with the *Pesticides Act 1999*.

6.2.1.3 Fauna

Threatened Fauna

Across MCO and surrounds, a total of 32 threatened and/or migratory fauna species, consisting of seven mammal species (including six microbat species) and 25 bird species have been recorded by Moolarben Biota (2006), Ecovision (2008) and EMM (2013a and b). These threatened species are listed in **Table 15**.

Table 15: Threatened Fauna Species Recorded at the Moolarben Coal Complex

Common Name	Scientific Name	Conservation Status ¹	
		BC Status	EPBC Status
Square-tailed Kite	<i>Lophoictinia isura</i>	V	-
Glossy Black-Cockatoo	<i>Calyptorhynchus lathami</i>	V	-
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	V	-
Powerful Owl	<i>Ninox strenua</i>	V	-
White-throated Needletail	<i>Hirundapus caudacutus</i>	-	M
Rainbow Bee-eater	<i>Merops ornatus</i>	-	M
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus victoriae</i>	V	-
Speckled Warbler	<i>Chthonicola sagittata</i>	V	-
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis gularis</i>	V	-
Painted Honeyeater	<i>Grantiella picta</i>	V	-
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis temporalis</i>	V	-
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata cucullata</i>	V	-
Gilbert's Whistler	<i>Pachycephala inornata</i>	V	-
Rufous Fantail	<i>Rhipidura fuliginosa</i>	-	M
Satin Flycatcher	<i>Myiagra cyanoleuca</i>	-	M
Dusky Wood Swallow	<i>Artamus cyanopterus cyanopterus</i>	V	-
Diamond Firetail	<i>Stagonopleura guttata</i>	V	-
Little Eagle	<i>Hieraaetus morphnoides</i>	V	-
Varied Sittella	<i>Daphoenositta chrysoptera</i>	V	-
Little Lorikeet	<i>Glossopsitta pusilla</i>	V	-
White-fronted Chat	<i>Epthianura albifrons</i>	V	-
Scarlet Robin	<i>Petroica boodang</i>	V	-
Spotted Harrier	<i>Circus assimilis</i>	V	-
Masked Owl	<i>Tyto novaehollandiae</i>	V	-
Flame Robin	<i>Petroica phoenicea</i>	V	-
Squirrel Glider	<i>Petaurus norfolcensis</i>	V	-
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	V	-
Large-eared Pied Bat	<i>Chalinolobus dwyeri</i>	V	V
Little Pied Bat	<i>Chalinolobus picatus</i>	V	-
Large Bent-winged bat	<i>Miniopterus schreibersii oceanensis</i>	V	-
Greater Long-eared Bat	<i>Nyctophilus timoriensis</i>	V	V
Eastern Cave Bat	<i>Vespadelus troughtoni</i>	V	-

Source: Moolarben Biota (2006); Ecovision (2008), EMM(2013 and ELA (2020).V = vulnerable; M = migratory.

¹ Conservation status under the BC Act and the EPBC Act (current as at June 2020).The BioMP describes management strategies to minimise impacts of vegetation clearance on fauna habitat.

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Pest Fauna Species

Ecological assessments undertaken within the MCC have identified 13 pest species, including nine mammals and four birds as follows:

- Fox (*Vulpes vulpes*)
- Dog (*Canis familiaris*)
- Feral Cat (*Felis catus*)
- Rabbit (*Oryctolagus cuniculus*)
- Brown Hare (*Lepus capensis*)
- Pig (*Sus scrofa*)
- Goat (*Capra hircus*)
- Fallow Deer (*Dama dama*)
- House Mouse (*Mus musculus*)
- House Sparrow (*Passer domesticus*)
- Common Blackbird (*Turdus merula*)
- Common Starling (*Sturnus vulgaris*)
- Spotted Dove (*Streptopelia chinensis*)

Management of Pest Animals

Vertebrate pest species will be managed in consultation with the Local Land Services (LLS), and in accordance with the *Biosecurity Act 2015*, *Pesticides Act 1999* and the *Central Tablelands Regional Strategic Pest Animal Management Plan 2018-2023*.

Vertebrate pest control is undertaken as necessary and can include trapping, baiting and/or shooting. Fauna monitoring undertaken to date indicates there are no significant feral animal problems causing impacts to existing rehabilitation areas at MCO. Where monitoring identifies that pest animals present a risk to rehabilitation, vertebrate pest animal control will be undertaken in consultation with the LLS in accordance with the requirements of the *Biosecurity Act 2015*.

Pest animal control programs will consider:

- Using a range of appropriate pest control measures to minimise collateral damage to native animals is (e.g. the destruction of rabbit burrows, feral cat and goat trapping and baiting of foxes and wild dogs and wild pigs); and
- Follow-up inspections to assess the effectiveness of control measures implemented and the requirement for any additional control measures.

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Measures to control vertebrate pest species will be implemented by an appropriately qualified person. A summary of the pest animal management will be reported in the Annual Review.

Vegetation Clearance Protocol (VCP) and Habitat Augmentation

A VCP has been developed and implemented to minimise impacts on threatened fauna species during native vegetation clearing at the MCC. A detailed description of the VCP is provided in the Biodiversity Management Plan. Key components of the protocol include:

- delineation of areas to be cleared
- pre-clearing procedures
- fauna management measures; and
- vegetation clearance measures.

Pre-clearing procedures will involve a Ground Disturbance Permit (GDP) process and pre-clearance surveys. The GDP provides an internal check against all relevant approvals and management actions that may be required to be obtained and/or implemented prior to carrying out the clearing or ground disturbance activities.

In conjunction with the GDP process and prior to vegetation clearing, a pre-clearance survey will be conducted by an appropriately trained and suitably qualified person. The objective of the pre-clearance survey is to identify:

- potential habitat features located within proposed disturbance areas (such as hollow bearing trees) that may require special management during clearing
- habitat features that can be salvaged for reuse in rehabilitation areas or in adjoining non-disturbed native vegetation areas
- active nesting/roosting sites that may require active management prior to or during disturbance to minimise impacts on those fauna species
- weed infestations that may need treatment prior to or during disturbance; and
- pest species that may require control prior to disturbance.

6.2.1.4 Rock/Overburden Emplacement

Waste rock (including overburden and interburden) mined in OC1, OC2, OC3 and OC4 will continue to be placed in-pit behind active mining.

Temporary overburden stockpiles will be strategically placed near other large disturbance areas, such as dams and infrastructure areas, to expedite backfilling and rehabilitation and to limit rehandling of overburden material. Out-of-pit overburden emplacements (and associated environmental bunds) will

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be progressively constructed and rehabilitated, as soon as practicable following dumping to the final height, to mitigate visual, noise and air quality impacts.

Selected overburden materials (e.g., clay subsoils and large rocks) will be stockpiled for later use, or used directly, in the reconstruction of Murrumbidgee and Eastern Creeks.

6.2.1.5 Waste Management

Key waste streams (apart from waste rock) that may be generated by MCO operations comprise:

- Recyclable and non-recyclable general wastes
- Sewage and effluent; and
- Other wastes from mining and workshop activities (e.g., waste oils, scrap metal and used tyres).

General waste minimisation principles (i.e., reduce, re-use and recycling) will continue to be applied at the MCC to minimise the quantity of wastes that require off-site disposal as described in the MCO Waste Management Plan

All general domestic waste (e.g., general solid [putrescibles] and general solid [non-putrescible] waste as defined in *Waste Classification Guidelines Part 1: Classifying Waste* [EPA, 2014]) and general recyclable products will continue to be collected by an appropriately licensed contractor.

Discharges from all on-site sewage management systems are licensed by EPL 12932.

MCO will maintain a register of regulated waste collected by the licensed waste contractor for disposal.

6.2.1.6 Geology and Geochemistry

Description of Mine Geology

The MCC is located in the northern part of the Western Coalfield, on the northwest margin of the Sydney Basin (Wells Environmental Services and Coffey Natural Systems, 2009).

Coal occurs in mid to late Permian age (approximately 250 to 275 million years before present) sediments collectively known as the Illawarra Coal Measures (also referred to as Permian coal measures). The Ulan Seam is the main seam targeted at MCO.

Narrabeen Group sediments (sandstones and conglomerates) of Triassic age (approximately 200 to 250 million years before present) overlie the coal measures, which in turn overlie older basement rocks of sedimentary (Shoalhaven Group) and igneous origin. Small intrusive plugs and remnant Tertiary-age (approximately 5 to 65 million years before present) basalt flows also outcrop in the area. Unconsolidated and partially consolidated Tertiary-age palaeochannel and Quaternary-age (less than

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approximately 5 million years before present) sediments occur as valley fill and along dominant drainage lines (Wells Environmental Services and Coffey Natural Systems, 2009).

Environmental Geochemistry

An assessment of the geochemical characteristics of the waste rock material associated with the development of the MCC is provided in the Moolarben Coal Project Stage 1 Geochemical Assessment (Environmental Geochemistry International Pty Ltd, 2006) and the Moolarben Coal Project Stage 2 Geochemical Assessment (Environmental Geochemistry International Pty Ltd, 2008).

Results of geochemical testing suggest that the bulk of the Moolarben overburden and floor material is likely to be non-acid forming. Potentially acid forming (PAF) overburden materials were identified as being associated with the Moolarben Seam, and the roof and floor of the Ulan Seam.

6.2.1.7 Material Prone to Spontaneous Combustion

Spoils will be selectively handled and blended to avoid emplacement of PAF material in concentrated areas, and to manage the potential risk of spontaneous combustion. Other spontaneous combustion management measures include:

- Accumulations of coal, coarse rejects and other carbonaceous material, particularly if it is known to contain pyritic material, will be buried under a minimum of 5 m of inert overburden material.
- Should any outbreaks of spontaneous combustion occur during mining operations, the available details of the materials involved, location, date, time and climatic conditions will be recorded on surveyed plans. These areas will be monitored and assessed at closure to put in place appropriate mitigation measures to minimise the likelihood of spontaneous combustion occurring post mine closure. These areas will also be included as part of the ongoing inspection and monitoring that will be required following closure of the mine and before final lease relinquishment.

Spontaneous combustion has occurred in Open Cut emplacement areas within OC1 and OC2. MCO continue to manage spontaneous combustion within Open Cut emplacement areas in accordance with the Air Quality Management Plan. Operational actions to manage instances of spontaneous combustion included:

- Restricting access to identified areas
- Reviewing the risk to personnel, environment, community, and operations
- Watering to cool known heating
- Exposure, spreading, and excavation of the heating material
- Applying further water
- Cover with inert material, track roll and reshape; and
- Monitoring of area to identify any further areas of heating.

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6.2.1.8 Materials Prone to Acid Mine Drainage

PAF Management Procedures

Landform design and surface water management are designed to minimise the potential for reconstructed landforms to generate acid mine drainage (AMD). Management measures adopted by MCO to minimise the potential generation of AMD include:

- Blending overburden to avoid emplacement of low PAF capacity material in concentrated areas
- If required, treatment of dispersive materials (e.g. with lime) if exposed on dump surfaces or used in engineered structures to minimise the potential to expose acid generating substrate; and
- Treatment and isolation of PAF coal rejects to minimise infiltration and subsequent leachate.

6.2.1.9 Ore Beneficiation Waste Management (Reject and Tailings Disposal)

MCO will generate approximately 3 Mtpa of coarse rejects and tailings from the washing of coal at full capacity. Following initial out-of-pit emplacement of overburden, all other waste rock (i.e. overburden, coarse rejects and tailings) will be used to backfill the mine void.

The three options for disposal include:

- In Dump - disposal of rejects within active overburden dump, thereby dispersing the rejects
- Block Tipping – disposal of rejects in segregated bulk within overburden dumps; and
- Cell Dump – disposal of rejects in cells within overburden dumps.

Rejects will be covered with at least 5 m of inert material. All identified PAF will be blended to avoid emplacement in concentrated areas and will be emplaced in deeper areas of the pit.

Emplacement of dispersive materials and overburden materials hostile to tree root growth will also be avoided near the surface of the final landform to minimise erosion potential, land slumping and potential for revegetation failure. Where dispersive spoils are emplaced at or near the surface, the material may require amelioration (e.g., with lime or gypsum). Once the landform is re-shaped, the ameliorants may be applied (if necessary), and the area deep-ripped along the contour.

6.2.1.10 Erosion and Sediment Control

Erosion and sediment control measures will be implemented for the life of the operation to minimise the potential impact on the surrounding environment. Erosion and sediment control strategies at the MCC, are outlined in the approved Surface Water Management Plan (SWMP).

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Prior to site disturbance, a GDP needs to be authorised by the Environment and Community Manager (ECM) or delegate. This GDP needs to include the erosion and sediment controls that must be established prior to disturbance.

Erosion and sediment control measures and techniques will be designed and operated in accordance with the requirements of Landcom 'Managing Urban Stormwater: Soils and Construction including Volume 1 (2004), Volume 2A – Installation of Services (DECC, 2008), Volume 2C – Unsealed Roads' and 'Volume 2E Mine and quarries' (DECC, 2008). Where required the design and operation of erosion and sediment control strategies and techniques will be supplemented with the *International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control Document*.

Activities that have the potential to generate sediment at the MCC include:

- Vegetation clearing and topsoil stripping
- Construction and use of linear infrastructure
- Open cut mining operations
- Operation of the CHPP infrastructure
- Operation and construction of additional site infrastructure (including office and workshop areas)
- Construction of operational sediment control measures
- Construction of creek crossings
- Construction and operation of exploration sites
- Construction of overburden and emplacement areas and haul routes; and
- Earthworks associated with mine site rehabilitation.

Rehabilitation of the overburden emplacement areas and open cut pit will be conducted progressively over the life of the mine, forming an integral component of mining operations. Erosion and sediment controls to be implemented during the rehabilitation phase include:

- Progressive rehabilitation of disturbed land as soon as practicable
- Implementation of temporary or interim vegetation measures as required
- Construction of drainage controls to improve the stability of rehabilitated land
- Reshaping, topsoiling and vegetating former areas used for earthworks, roads and batters as soon as practical upon completion of works
- Application of gypsum, lime or other appropriate soil ameliorant at quantified rates to mitigate soil sodicity/dispersibility where exposed subsoils have been identified
- Control of weeds through selective herbicide application and the reseeded of areas that fail to establish

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- Construction and installation of erosion and sediment controls such as silt fences, catch drains, grass swales, buffer strips and sediment dams down slope of rehabilitation areas
- Regular inspections and maintenance of all erosion and sediment control works; and
- Restricting access to rehabilitated areas through fencing and/or signposting.

Specific erosion and sediment controls to be implemented at the MCC are as follows:

- Clean water diversion drains and banks;
- Silt fences (or equivalent control);
- Vegetated buffer strips; and
- Sediment dams/basins.

Other *Blue Book* (Landcom, 2004) or *International Erosion Control Association Guideline* (IECA, 2008) erosion and sediment control measures may be implemented at the MCC as required.

6.2.1.11 Ongoing Management of Biological Resources for Use in Rehabilitation

Topsoil Management

Topsoil management actions to manage biological resources for use in Rehabilitation in place at MCO are described in section 6.2.1.1.

Native Vegetation Seeding

Native vegetation seed will be sown simultaneously with non-persistent cover crop and native grass species, preferably in the warmer months between late September and March. Sowing will occur as soon as possible after seedbed preparation to optimise the conditions for germination prior to surface crust development.

Native vegetation restoration includes initial establishment of local pioneer species to condition the soil for successive plant regeneration. Direct seeding is typically a cost-effective means of re-introducing pioneer species including wattles and native grass species known to occupy disturbed environments throughout the local area.

Tubestock Planting

Native vegetation establishment in rehabilitation areas may be supplemented with tubestock, where required. In particular, tubestock planting of long-lived trees may be the most efficient to ensure adequate establishment of these keystone species and to control density of establishment (which can be difficult to achieve with direct seeding).

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Habitat Features

Prior to site disturbance, a Ground Disturbance Permit needs to be authorised by the ECM or delegate. In conjunction with the GDP process a pre-clearance survey will be conducted and will identify potential habitat features, nesting sites, hollows etc.

Trees containing features with the potential to provide significant nesting/roosting habitat resources (i.e. numerous hollows suitable for nesting/roosting) for birds, bats and/or arboreal mammals will be clearly marked as habitat trees and retained for reuse in the rehabilitation program.

Where practical and feasible, habitat features such as large hollows and rock identified during the pre-clearance surveys will be salvaged and stockpiled for reuse in rehabilitation areas or relocated to adjoining areas of remnant vegetation. Remaining tree limbs, stumps, shrubs and other woody vegetation may be mulched or used in whole (or in part) in rehabilitation areas.

When salvaged, habitat features will be reused in native vegetation rehabilitation areas as follows:

- Stag trees – hollow bearing timber for vertical placement within rehabilitation for avian species or arboreal mammals, and bark retained timber for arboreal microbats
- Coarse Woody Debris – horizontal placement of hollow logs or small piles of timber and rocks creating cavities for habitat by small ground dwelling mammals and reptiles placed for interconnectivity across rehabilitation areas
- Habitat trees and non-habitat trees used generally as coarse woody debris

6.2.1.12 Mine Subsidence

A detailed description of predicted subsidence impacts and proposed subsidence management, mitigation and monitoring is provided in the *Moolarben Coal Project Stage 2 Preferred Project Report Subsidence Impact Assessment* (Mine Subsidence Engineering Consultants [MSEC], 2011), the *Moolarben Coal Project Stage 1 Optimisation Modification Environmental Assessment* (EMM, 2013b), the *Moolarben Coal Complex UG1 Optimisation Modification Subsidence Assessment* (MSEC, 2015) and the *Moolarben Coal Complex UG1 Longwalls 101 to 105 Extraction Plan* (Longwalls 101-105 Extraction Plan) (MCO, 2020) and the *Moolarben Coal Complex UG4 Longwalls 401 to 408 Extraction Plan* (Longwalls 401-408 Extraction Plan) (MCO, 2022). In accordance with Condition 77, Schedule 3 of Project Approval (05_0117) and Condition 5, Schedule 4 of Project Approval (08_0135), additional Extraction Plans (including a subsidence monitoring program) will be developed for the MCC prior to secondary extraction in UG2.

Subsidence Management and Remediation

The overriding objective for subsidence management is to minimise the potential for, or extent of, the predicted subsidence impacts.

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Several potential management measures will be implemented to mitigate/remediate subsidence impacts on land resulting from underground mining operations. Minor cracks that develop are not expected to require remediation as geomorphologic process will result in natural filling of these cracks over time.

Remediation of typical surface cracks (generally in the order of 150 mm up to approximately 500 mm in areas of lower depth of cover) will be undertaken where practicable and accessible using conventional earthmoving equipment (e.g., a backhoe) and will include:

- infilling of surface cracks with soil or other suitable materials; or
- locally re-grading and re-compacting the surface.

Notwithstanding, remediation will be undertaken in the event a crack is identified to present a significant risk to safety of people or livestock and/or presents a long-term degradation or erosion risk.

Areas of surface cracking will be stabilised using erosion protection measures (e.g., vegetation seeding and planting and/or brush matting). Drainage works and rehabilitation of subsidence troughs (i.e., areas of induced ponding) will be conducted as necessary and may include stabilisation of banks subject to soil slumping.

If surface crack remediation works are required in remnant vegetation areas, compact mobile equipment will be used, where practicable, to minimise damage to surrounding vegetation. If the remediation work requires clearing of remnant vegetation to an extent that would exceed the benefit of the remediation, the requirement for remediation will be reviewed. Vegetation that requires clearance will be subject to the GDP and VCP (as per the approved Biodiversity Management Plan).

Further details of MCO's subsidence management strategies associated with underground operations are provided within the respective MCO Extraction Plans.

6.2.1.13 Management of Potential Cultural and Heritage Issues

Aboriginal heritage and historic heritage management strategies are outlined in the approved Heritage Management Plan (HMP) for MCO. The HMP includes protocols for the involvement of the Aboriginal community, procedures for heritage surveys, recording and salvaging and management strategies for identified heritage sites within the MCC. Known heritage sites are shown on **Figure 4**.

Key roles and responsibilities concerning heritage management are outlined in the approved HMP

6.2.1.14 Exploration Activities

Prior to any exploration activity commencing, a GDP must be completed. The GDP identifies environmental, heritage and relevant regulatory obligations and management measures to mitigate and minimise potential impacts.

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In addition, MCO considers the relevant requirements of ESG5: Assessment Requirement for Exploration Activities (DRE, 2015) during the preparation of a GDP for proposed exploration drilling activities. In conjunction with the GDP process, MCO minimise the impacts from exploration drilling activities using the following controls:

- Implement the requirements from the due diligence assessments, including heritage and ecology
- Minimise disturbance (i.e., use existing tracks) and if required, only slash and remove vegetation from access tracks and drill pad areas
- Appropriately sized machinery will be utilised during site establishment, decommissioning and rehabilitation activities (if required); and
- Decommissioning, removal of wastes, sealing of boreholes, and site rehabilitation will be consistent with the Exploration Codes of Practice: Rehabilitation and Exploration Code of Practice: Environmental Management (DRE, 2015).

Rehabilitation activities involve infilling sumps, site stabilisation, topsoil replacement, applications of ameliorants and appropriate seed mix to return to site former land use.

6.2.2 Decommissioning

A detailed Mine Closure Plan will be developed for the MCC prior to mine closure and will include a demolition and decommissioning strategy. The Mine Closure Plan will also include a land contamination assessment. Issues expected to be addressed by this assessment will include, but not be limited to, decontamination of areas such as those impacted by carbonaceous material (e.g., coal spillage, coal storage), hydrocarbon spillage (e.g., workshops, fuel storage areas) or by sedimentation (e.g., dams which have directly received pit water).

6.2.2.1 Site Security

To reduce the degree of disturbance to the rehabilitation areas, measures have been put in place to limit access to these areas to authorised personnel only. Measures include restricting vehicles to existing access tracks only and signage denoting rehabilitation area. The MCC boundary will continue to be appropriately secured to restrict access to the site and signage installed at intervals denoting authorised access only.

6.2.2.2 Infrastructure to be Removed or Demolished

A detailed Mine Closure Plan will include an assessment of all structures to be decommissioned and demolished. A demolition strategy will be prepared in accordance with Australian Standard AS2601-2001: The Demolition of Structures (or its latest version) to determine the appropriate demolition techniques, equipment required, and the optimal decommissioning sequencing.

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All fixed plant, built infrastructure, equipment and services will be progressively decommissioned when infrastructure items and plant become redundant. All mining related infrastructure will be removed at mine closure; however, some infrastructure may be retained to support future post-mining land uses.

Key decommissioning activities pertaining to onsite infrastructure include:

- Disconnection of all above ground and buried services and removal of associated infrastructure; and
- Removal of all built surface infrastructure, plant and equipment.

6.2.2.3 Buildings, Structures and Fixed Plant to be Retained

Infrastructure (e.g. dams, surface water drains and bunds, roads, and buildings) which are determined to be beneficial for future uses will be left in place, subject to approval by the Resources Regulator and any other relevant regulatory agency.

Water management structures may remain post closure. A Geotechnical Assessment will be carried out by a suitably qualified engineer to verify that the water infrastructure retained on site is long term stable.

6.2.2.4 Management of Carbonaceous/Contaminated Material

The Mine Closure Plan will include a land contamination assessment. Issues expected to be addressed by this assessment will include, but not be limited to, decontamination of areas such as those impacted by carbonaceous material (e.g. coal spillage, coal storage), hydrocarbon spillage (e.g. workshops, fuel storage areas) or by sedimentation (e.g. dams which have directly received pit water).

Management measures regarding PAF material and carbonaceous material prone to spontaneous combustion are detailed in **Section 6.2.1.7** and **6.2.1.8**.

During decommissioning all carbonaceous material will be removed from the footprint of the CHPP including ROM and product stockpile areas and emplaced in spoil.

6.2.2.5 Hazardous Materials Management

As stated in **Section 6.2.2.4** strategies for the identification and remediation of hazardous material will be identified in the Mine Closure Plan.

6.2.2.6 Underground Infrastructure

At the completion of underground mining operations all underground infrastructure (e.g., conveyors and dewatering systems) that can be recycled or reused will be removed.

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Portals will be sealed and access restricted in accordance with requirements of the *Mine Design Guideline [MDG] 6001 Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams* [NSW Department of Trade and Investment, Regional Infrastructure and Services [DTIRIS] Mine Safety Operations, 2012]).

Rehabilitation of land above the underground mines subject to subsidence will be undertaken as required during mine operations in accordance with the MCC's Extraction Plans required under Condition 77, Schedule 3 of Project Approval (05_0117) and Condition 5, Schedule 4 of Project Approval (08_0135). Subsidence management and rehabilitation measures are described in **Section 6.2.1.12**.

6.2.3 Landform Establishment

The final landforms for MCC will be designed and constructed generally in accordance with the approval requirements outlined in **Table 2** to **Table 5**. The final landforms are designed to be free draining, stable landforms that are visually consistent with the surrounding landscape with typical gradients of 10° to 18° (18% to 32%).

6.2.3.1 Landform evolution modelling

Landform design studies are used at the MCC to assess the risk of long-term stability and erosion in the final landforms and determine controls for addressing the identified risks

Landloch Pty Ltd (Landloch) performed a technical soils and erosion assessment for the landform design of OC2. WEPP runoff/erosion modelling was utilised to investigate a wide range of slope profiles and surface treatment/revegetation options.

As part of this assessment, SIBERIA landform evolution modelling has been used to:

- Inform stable long-term rehabilitation on the proposed landform; and
- identify areas of within the current landform that may require either modification or changes in management to assist in achieving stable rehabilitation outcomes.

6.2.3.2 Micro-Relief landforms design

The incorporation of Micro-Relief is expected to have long-term stability on the landform as they immediately re-establish steady-state or equilibrium landforms with the local environment. Final landforms within OC3 and OC4 will be progressively revised during the life of the mine to include Micro-Relief.

The key aspects of the design include:

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- natural looking landscape with ridges that transition from convex to concave slopes, small sub-watersheds containing water channels that merge into larger water channels that are designed with the required cross-sectional profile to handle variable flows
- Landforms appears as a natural landscape with minimal long-term maintenance
- landscape variability promotes biodiversity – as the landscape has varying aspects and slope; and
- Reduced erosion.

6.2.3.3 Water Management Infrastructure

A Water Management Plan (WAMP) has been developed for the MCC in accordance with the requirements of Project Approval (05_0117) and Project Approval (08_0135).

Surface water will be managed with the aim of minimising erosion, preventing off-site sediment release, preventing use of brine in rehabilitation areas and increasing water availability for uptake by vegetation in rehabilitated areas. Drainage of rehabilitation areas will be developed in accordance with best practice guidelines including *Landcom (2004) Managing Urban Stormwater: Soils and Construction Volume 1* and *DECC (2008) Managing Urban Stormwater: Soils and Construction Volume 2*.

Run-off from rehabilitation areas will be managed via the inclusion of drainage and diversion channels and sediment dams and retention basins. This will assist to control the velocity of surface drainage across rehabilitation areas and assist in minimising erosion. Some sediment dams/water storages and ponded areas will remain in the post-mining landform to provide water resources for fauna habitat or for agricultural purposes.

Drainage, diversion channels and swales will be installed to divert run-off and carry surface water away from erodible surfaces, particularly during construction and seed emergence stages of rehabilitation. Drainage channels will be designed and built to ensure they reduce flow velocity. This may include use of temporary check structures (such as hay bales), rock armouring or lining to prevent scouring. Ultimately, channels will be vegetated with stoloniferous grasses or other suitable ground cover for long-term protection.

Sediment dams and ponds will be designed and constructed to accommodate critical storm events. Sediment dams and ponds will generally be located downhill of disturbance and rehabilitation activities to provide control of sediment laden water and prevent off-site contamination and ponded water for irrigating rehabilitation areas. The inclusion of sediment dams and ponds into the final landform will increase potential water availability in the post-mining landscape. This will provide aquatic and water sensitive terrestrial habitat and water resources for agricultural purposes. Revegetation of permanent sediment dams and ponds will consider the use of rush and other aquatic species to provide bank stability and fauna habitat opportunities.

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Water management structures (including clean water diversion drains and sediment dams) not required for water management in the final landform will be progressively decommissioned when no longer required for operational water management.

Drainage from OC4 rehabilitation areas will be directed to the reconstructed and rehabilitated Murragamba and Eastern Creeks and away from the final void. However, during the creek construction and the subsequent rehabilitation and stabilisation period, flows from upslope areas will be collected in temporary dams upstream of the diversion, where a pipe system will extend from the dam, to downstream of the realigned creek section to release the environmental flows (**Section 6.2.3.7**).

6.2.3.4 Final Landform Construction: General Requirements

The backfilled open cut pits will generally form elevated landforms above the pre-mining land surface due to bulking and expansion of the excavated overburden. The final landform will be designed to comprise slopes with gradients generally 10 to 18 degrees (°). However, where spatial constraints do not allow for this design, the gradient of overburden emplacement slopes will be constructed to no more than 20° without approval of RR. Where steep slopes are constructed, suitable erosion control structures such as contour banks, drop structures and rock armouring may be used to provide long-term stability.

Reconstructed landform slopes will be shaped to have non-linear profiles and a high degree of surface roughness. In addition, graded banks and contour channels/benches may be used to break up long slopes, slow down and redirect run-off.

Other engineering controls such as sediment dams, spillways, drainage and diversion channels, rock armouring and drop structures will be incorporated into the final landforms (where necessary) to manage post-mining surface water flows. A detailed description of surface water management is provided in the MCC Water Management Plan.

6.2.3.5 Final Landform Construction: Reject Emplacement Areas and Tailings Dam

As stated in **Section 6.2.1.9** coal rejects will be co disposed with overburden in the backfill voids.

6.2.3.6 Final Landform Construction: Final Voids, Highwalls and Lowwalls

The conceptual final landform at the MCC will comprise one final void (three in total) within each of OC1, OC3, and OC4 at mine closure **Figure 5: Final Landform Features (FLRP Plan 1)**.

Final void size will be minimised as far as practicable, while allowing for the efficient mining of coal from within the approved mining area. It is anticipated that following open cut mining/mine closure, the final voids in OC1 and OC3 will be groundwater sinks and will gradually fill with groundwater and rainfall run-off.

Final voids will be designed by a suitably qualified Geotechnical Engineer and will be made safe, stable and non-polluting by:

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- battering back the low walls and high wall to minimise potential for failures and mass movement (see sections below)
- capping (or excavating) exposed coal seams with inert material to prevent ignition from spontaneous combustion, bushfires or human interference
- constructing a trench or safety berm, as well as a security fence along the entire length of the remaining highwall where accessible to vehicles
- erecting suitable signs, clearly stating the risk to public safety and prohibiting public access
- constructing clean water diversion structures around the voids and limiting the slopes and slope lengths conveying run-off generated on the low walls and high walls
- designing and constructing final voids (size and depth) to maintain the voids as groundwater sinks that intercept all groundwater flows through the backfilled pits; and
- locating final voids to minimise the risk of flood interaction for flood events up to and including the Probable Maximum Flood level.

Low Walls

The low wall is assumed to comprise of mixed, disturbed and fragmented material. Stability of the low wall will be achieved in the following manner:

- The low wall will be battered back from the angle of repose to maintain the long-term geotechnical stability of the face. Geotechnical stability will be determined by a qualified Geotechnical Engineer considering an assessment of the overburden material, the likely degree of settlement, and the degree of weathering expected in the long-term. However, it is expected that the low wall sides of the final void will be battered back to a maximum of 18° with a goal of 10° being optimal.
- Surface water drainage on and over the low wall will be minimised through the construction of drainage control structures aimed to divert as much of the catchment as possible away from the final void.
- Erosion of the low wall will be controlled by limiting the length of slope through contour and graded drains, minimising the slope, and by the establishment of suitable vegetation.
- Battering of the low wall against the bottom of the high wall, where possible, to enhance high wall stability. Benching of the spoil material may need to be considered in some areas to achieve geotechnical stability and minimise erosion.

High Walls

The high wall is assumed to comprise of undisturbed, solid material generally occurring above the economically lower-most limits of the mineable seam in the final void. Depending on the geology of the deposit, the high wall material may comprise a range of natural occurring soil or rock materials of varying strengths or states of weathering.

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To maintain the safety of the final void, the surrounding final slopes will be left in a condition where a suitably qualified Geotechnical Engineer assesses the risk of slope failure as minimal. The following will be considered when assessing the geotechnical stability of the high wall:

- long-term final void water levels
- height and inclination of slope and number and spacing of intermediate benches (as may be required to achieve the final slope)
- shear strength of the high wall soils and rocks
- density and orientation of fractures, faults, bedding planes, and any other discontinuities, and the strength along them; and
- the effects of the external factors, such as surface run-off.

Where possible, revegetation of the high wall may be undertaken using an appropriate grass and shrub/tree seed mix and applied using specialised techniques (e.g., aerial seeding or hydro seeding). The feasibility/practicality of this procedure will be confirmed prior to mine closure. The purpose of this procedure will be to establish a vegetation cover to provide some stability, and also mitigate visual impacts.

Public Safety

Consistent with the rehabilitation objectives, at mine closure, the final voids will be made safe in terms of access by humans, livestock and wildlife. A physical barrier will be constructed at a safe distance from the perimeter of the void to prevent human access. The highwall areas will be secured by the construction of a trench and a safety berm where practicable, as well as a security fence along the entire length of the remaining highwall. The trench and berm will be constructed in such a way to restrict vehicle access.

Signs will also be installed at intervals along the entire length of the fence, denoting the risk to public safety and prohibiting public access.

Final Void Monitoring

Monitoring of the final voids will be undertaken prior to and during the mine closure phase and will include monitoring the effectiveness of erosion and surface water control measures, surface water run-off volumes and geotechnical stability. The monitoring program will be undertaken until such time that the completion criteria for the final voids have been met.

6.2.3.7 Construction of Creek/River Diversion Works

The final landform design for the MCC includes realignment of an approximate 5 km section of Murragamba Creek and an approximate 5 km section of Eastern Creek (as shown in **Figure 5**).

Several baseline studies have been conducted to determine the pre-mining stream health quality and channel stability of the Goulburn River, Bora Creek, Moolarben Creek, Ryan's Creek, Murragamba

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Creek, Wilpinjong Creek and Eastern Creek. Details of the studies are found in the EA and the MCO Water Management Plan (WMP).

A detailed design for the realignment of the Murragamba has been developed by Alluvium Consulting and a concept design has been progressed for *Eastern Creek Reinstatement*.

The Eastern Creek and Murragamba Creek reinstatement designs are founded upon a backfilled corridor that is to be formed in accordance with a dumping strategy. The strategy minimises the potential for ongoing and differential settlement that may adversely affect diversion performance. The upper horizons in the backfilling corridor provide a low permeability layer to limit seepage to deep backfill and a shallow sandy aquifer immediately below the creek bed. This will convey baseflow in a manner consistent with the existing system. This shallow alluvial aquifer will be constructed with paleochannel sands that are prevalent in the mine footprint near the surface.

The hydrology for both creek catchments has been informed by learnings from previous studies on Murragamba Creek and in monitoring data on small creek systems with similar geomorphic and hydrologic characteristics in the region. The hydrology and the geomorphic configuration of the design (valley fill/chain of ponds configuration) has been tested against hydraulic criteria for constructed channels that is widely adopted in the Australian mining industry. The design is suitable for long term stability with recognition that chain of ponds are inherently low energy systems that do not maintain continuous active channels.

6.2.4 Growth Medium Development

Growth medium development includes activities to reinstate soils (including subsoil/regolith soils) with the physical, chemical and biological characteristics required for vegetation establishment and growth. Elements applicable for growth medium development are described through various sections in this document including the following:

- The soil types and their suitability for rehabilitation in **Section 6.2.1.1**.
- Soil management methodologies in **Section 6.2.1.1**.
- Weed Control activities implemented in **Section 6.2.1.2**.

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6.2.5 Ecosystem and Land Use Establishment

The final landform and final land use will dictate the composition and structure of species to be established for rehabilitation. Species selection for native revegetation areas have been designed to promote the development of forest and woodland communities with structured understorey, mid-storey and tree canopy coverage. Species of the target vegetation communities will be seeded and planted adjacent or close to similar vegetation communities (where possible) to enhance vegetation connectivity. The re-establishment of ecological function conducive to the development of Box Woodland Endangered Ecological Community (ECC) will also be a key feature of the rehabilitation program.

Species will be also chosen to improve faunal biodiversity and habitat with the inclusion of areas with feed trees for the Regent Honey Eater and Koala. Shrubs and patches of native grasslands will be used to improve habitat for declining woodland bird species (e.g., Hooded Robins and Grey Crowned Babblers) and to control dominance of competitive native and exotic species.

Threatened local flora (e.g., Capertree Stringybark, Hoary Sunray, Wallangarra White Gum and Scant Pomaderris) will also be targeted for planting in areas conducive to their establishment and survival in consideration of the location and surrounding habitat of the species prior to disturbance. If these species are present within proposed vegetation clearance areas, and if viable seed is available, seed will be collected from these species prior to disturbance.

The species identified in the *Moolarben Coal Project Stage 2 Ecological Impact Assessment* (Ecovision Consulting, 2008) are used to guide selection of appropriate native species for rehabilitation of disturbed areas.

Species selection will take into consideration climate (e.g., water availability and frosts), landform (e.g., slopes, floodplains and creeks), soil availability, type and fertility.

As described in **Section 2.4**, the native ecosystem final land use domain is proposed to include Box Gum Shrubby Woodland, Box Gum Grassy Woodland, Sedimentary Ironbark Forest, pasture areas and rehabilitated riparian areas. A summary of the typical species associated with these vegetation communities to be used in the rehabilitation program is provided in the subsections below.

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Box Gum Shrubby Woodland Revegetation Species

Generally, Box Gum Shrubby Woodland will be established on lower and mid slopes of OC1 and mid slopes of OC4. Box Gum Shrubby Woodland areas at OC1 will also include stands of *Allocasuarina* to reinstate those removed during disturbance for OC1. A list of typical species for Box Gum Shrubby Woodland rehabilitation areas is provided in **Table 16**.

Table 16: Typical Species used for Box Gum Shrubby Woodland Rehabilitation

Species	Common Name
Overstorey	
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Eucalyptus albens</i>	White Box
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
<i>Eucalyptus dawsonia</i>	Slatey Gum
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
<i>Eucalyptus melliodora</i>	Yellow Box
<i>Eucalyptus moluccana</i>	Grey Box
Understorey	
<i>Acacia lineiflora</i>	Narrow-leaved wattle
<i>Allocasuarina gymnanthera</i>	She-oak
<i>Dodonaea viscosa ssp cuneata</i>	Wedge-leaf Hop Bush
<i>Daviesia acicularis</i>	Spiny Bitter-pea
<i>Acacia decora</i>	Western Silver Wattle
<i>Allocasurina diminuta</i> ¹	She-oak
<i>Allocasurina verticillata</i> ¹	Drooping Sheoak
Ground cover	
<i>Dianella revolute</i>	Flax Lilly
<i>Aristida vagans</i>	Three-awned Speargrass
<i>Austrodanthonia racemosa</i>	Wallaby Grass
<i>Austrostipa scabra</i>	Rough Speargrass
<i>Dichelachne micrantha</i>	Short-hair Plume Grass
<i>Arundinella nepalensis</i>	Reed Grass

¹Species to be utilised to form stands of *Allocasurina* spp within the Box Gum Shrubby Woodland community within OC1.

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Sedimentary Ironbark Forest Revegetation Species

Sedimentary Ironbark Forest will generally be established on upper slopes and crests of the OC1, OC2, OC3 and OC4 overburden emplacements to blend with the adjacent undisturbed ridgelines. Sedimentary Ironbark Forest areas will also include stands of *Allocasuarina* within OC1. A list of typical species for Sedimentary Ironbark Forest rehabilitation areas is provided in **Table 17**.

Table 17: Typical Species Used for Sedimentary Ironbark Forest Rehabilitation

Species	Common Name
Overstorey	
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Eucalyptus agglomerate</i>	Blue-leaved Stringybark
<i>Eucalyptus crebra</i>	Narrow-leaved Ironbark
<i>Eucalyptus fibrosa</i>	Broad-leaved Ironbark
<i>Eucalyptus rossi</i>	Scribbly Gum
<i>Callitris endlicheri</i>	Black Cypress
<i>Eucalyptus dwyeri</i>	Dwyer's Red Gum
<i>Eucalyptus parramattensis</i>	Parramatta Red Gum
<i>Eucalyptus punctata</i>	Grey Gum
Understorey	
<i>Acacia leucolobia</i>	Box-leaved Wattle
<i>Acacia lineiflora</i>	Narrow-leaved wattle
<i>Leucopogon muticus</i>	Blunt Beard Heath
<i>Allocasuarina diminuta</i> ¹	She-oak
<i>Allocasuarina verticillata</i> ¹	Drooping She-oak
<i>Allocasuarina gymnanthera</i>	She-oak
Ground cover	
<i>Aristida vagans</i>	Three-awned Speargrass
<i>Austrostipa scabra</i>	Speargrass
<i>Dichelachne micrantha</i>	Short-haired Plumed Grass
<i>Microlaena stipoides</i>	Weeping Meadow Grass
<i>Hardenbergia violaceae</i>	Native Sarsparilla

¹Species to be utilised to form stands of *Allocasuarina* spp within the Sedimentary Ironbark Forest community within OC1.

In addition to the species listed in **Table 17**, species that provide Regent Honeyeater foraging resources will also be established in Sedimentary Ironbark Forest rehabilitation areas. These species would include *Eucalyptus sideroxylon* (Mugga Ironbark), *Eucalyptus punctata* (Grey Gum), *Eucalyptus polyanthemus* (Red Box), *Eucalyptus caleyi* (Caley's Ironbark) and *Eucalyptus moluccana* (Grey Box).

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Box Gum Grassy Woodland Revegetation Species

Generally, Box Gum Grassy Woodland will be established on flat alluvial areas surrounding the realigned Murrumbidgee and Eastern Creeks on OC4. A list of typical species for Box Gum Grassy Woodland rehabilitation areas is provided in **Table 18**.

Table 18: Typical Species Used for Box Gum Grassy Woodland Rehabilitation

Species	Common Name
Overstorey	
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Eucalyptus melliodora</i>	Yellow Box
<i>Eucalyptus moluccana</i>	Grey Box
Understorey	
N/A	
Ground cover	
<i>Bothriochloa macra</i>	Red Grass
<i>Arundinella nepalensis</i>	Reed Grass
<i>Cynodon dactylon</i>	Couch
<i>Aristida ramosa</i>	Purple Wiregrass
<i>Microlaena stipoides</i>	Weeping grass
<i>Sporobolus creber</i> or <i>S. elongatus</i>	Rat's Tail Grass
<i>Calotis cuneifolia</i> and/or <i>C. lappulaceae</i>	Burr Daisy

Pasture and Cover Crop Species

Following emplacement and amelioration of topsoils, non-invasive pasture species mixes that are appropriate for the growing season will be sown onto agricultural rehabilitation areas or areas requiring a fast-growing annual cover crop. The seed mix will include perennial species to provide permanent cover (including on drainage channels and steep slopes) and a granular fertilizer to stimulate growth. Cool and warm season pasture and cover crop seed mixes and sowing rates are listed in **Table 19**.

Table 19: Typical Species Used for Cover Crop and Pasture Establishment

Spring/Summer		Autumn/Winter	
Species	Rate (Kg/Ha)	Species	Rate (Kg/Ha)
Millet	5	Oats/Ryecorn	20
Ryecorn/Oats	5	Millet	5
Couch	5	Couch	10
Wimmera Ryegrass	8	Wimmera Ryegrass	5
Cereal Rye	10	Perennial Rye	5
White Clover	5	Subterranean Clover	8
Lucerne	5	Seradella	10
		Consol Lovegrass	1
		White Clover	5

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Riparian Revegetation Species

Planting of native perennial grasses and deep-rooted woodland species (such as Box and Redgum species) on upper and mid banks will be incorporated into the design for the Murragamba and Eastern Creek diversions to increase habitat and minimise erosion, sedimentation and instability. The use of non-persistent cover crop and native endemic riparian species will increase ground cover and provide cohesion of the banks.

Table 20 lists a selection of species that are proposed for use in revegetating the reconstructed creeks. Where necessary, these will be supplemented with other ground cover (such as stoloniferous grasses) to ensure the creek beds are appropriately protected against erosion.

Table 20: Typical Species Used for Riparian Rehabilitation

Upper Banks	
Species	Common Name
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
<i>Eucalyptus melliodora</i>	Yellow Box
<i>Eucalyptus moluccan</i>	Grey Box
<i>Angophora floribunda</i>	Rough-barked Apple
<i>Acacia spectabilis</i>	Mudgee Wattle
<i>Daviesia genistifolia</i>	Broom Bitter Pea
<i>Themeda australis</i>	Kangaroo Grass
Middle Banks	
Species	Common Name
<i>Melaleuca thymifolia</i>	Thyme Honey Myrtle (clayey soils only)
<i>Leptospermum polygalifolium</i>	Tantoon (sandy soils only)
<i>Dichelachne micrantha</i>	Short-haired Plumed Grass
<i>Lomandra confertifolia</i>	Mat-rush
<i>Themeda australis</i>	Kangaroo Grass
<i>Eucalyptus blakelyi</i>	Blakely's Red Gum
<i>Angophora floribunda</i>	Rough-barked Apple
Lower Banks	
Species	Common Name
<i>Arundinella nepalensis</i>	Reed Grass
<i>Melaleuca thymifolia</i>	Thyme Honey Myrtle
<i>Lomandra confertifolia</i>	Mat-rush

Various techniques exist for seeding and planting of rehabilitation areas and have been investigated during the early years of rehabilitation at the MCC, with the best techniques being carried through for ongoing use. Consideration is given to site conditions, including soil type and condition, landform, time of year, climate, water availability and vegetation community establishment outcomes and also the best methods of rehabilitation application.

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Native Vegetation Seeding

Native vegetation seed will be sown simultaneously with non-persistent cover crop and native grass species, preferably in the warmer months between late September and March. Sowing will occur as soon as possible after seedbed preparation to optimise the conditions for germination prior to surface crust development.

Native vegetation restoration includes initial establishment of local pioneer species to condition the soil for successive plant regeneration. Direct seeding is typically a cost-effective means of re-introducing pioneer species including wattles and native grass species known to occupy disturbed environments throughout the local area.

Tubestock Planting

Native vegetation establishment in rehabilitation areas may be supplemented with tubestock, where required. In particular, tubestock planting of long-lived trees may be the most efficient to ensure adequate establishment of these keystone species and to control density of establishment (which can be difficult to achieve with direct seeding).

Revegetation of Degraded Land and Riparian Areas

Consistent with the rehabilitation objectives, MCO will remediate cleared and degraded areas on MCO-owned land outside the mine disturbance footprint. For these areas, natural regeneration of native species will be supported and will include implementing relevant land management measures to improve degraded and eroding areas for example. Measures may include:

- Fencing and exclusion of stock from larger vegetation remnants on its land leased to agricultural users (note in some cases stock may not be able to be excluded due to the need/use of vegetation patches as shade for stock, etc.)
- Revegetation or regeneration of areas not required for agricultural purposes
- Fencing and exclusion of stock along strategic and/or degraded sections of Moolarben Creek
- Riparian corridor enhancement along degraded areas of Moolarben Creek, Wilpinjong Creek and Murragamba and Eastern Creeks on MCO-owned land (measures may include restoring channel stability, planting riparian vegetation, placement of large woody debris, etc to improve the riparian and aquatic ecosystem function and provide compensatory aquatic habitat)
- Creation of new areas/patches of trees in consultation with leasees in areas that complement their agricultural enterprises (e.g. shade and shelter belts)
- Weed and pest control on vegetation remnants and revegetation areas; and
- Bushfire management measures.

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Riparian corridor enhancement² along selected degraded areas of Moolarben Creek, Wilpinjong Creek and Murrumbidgee and Eastern Creeks would be undertaken in consideration of the rehabilitation principles within the NOW's *Guideline for Riparian Corridors on Waterfront Land* and *Guideline for Vegetation Management Plans on Waterfront Land*.

Implementation of these measures would lead to improved connectivity between the Munghorn Gap Nature Reserve (MGNR) and surrounding biodiversity offset areas by improving or creating "stepping stones" and refuges for mobile fauna such as birds and mammals. Ecological connectivity is also important for enhancing the colonisation of native species, particularly fauna, into rehabilitation areas.

Weed Control activities implemented across the MCC are described in detail in **Section 6.2.1.2**.

6.2.6 Ecosystem Land Use Development

Weed Control

Weed Control activities implemented across the MCC are described in **Section 6.2.1.2**.

Vertebrate Pest Control

Management of pest animals across the MCC are described in **Section 6.2.1.3**.

Erosion and Sediment Control

Potential erosion and sedimentation will be monitored during post rehabilitation inspections. Erosion and sediment controls will be implemented on an as needed basis and will be generally aligned in accordance with the controls outlined in **Section 6.2.1.10**.

Ecosystem Development Monitoring

Ecosystem development monitoring will be conducted generally in accordance with the methodology outlined in **Section 8.0**.

Management and mitigation responses for rehabilitation areas across the MCC are described in **Section 10.0**.

6.3 REHABILITATION OF AREAS AFFECTED BY SUBSIDENCE

Rehabilitation of areas affected by subsidence is described in **Section 6.2.1.12**

² Note that a number of the above investigative actions (where considered practical and feasible to implement) would need to be undertaken in consultation with and the agreement of the lessee.

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7.0 REHABILITATION QUALITY ASSURANCE PROCESS

MCO has implemented a Quality Assurance / Quality Control (QA/QC) process across the site to improve the management of rehabilitation risks throughout the rehabilitation process. The QA/QC process helps ensure that key rehabilitation methodologies and controls have been implemented as planned and records are stored for verification purposes.

MCO's QA/QC process for rehabilitation follows a defined Inspection Test Plan (ITP) where each stage of the ITP has a defined process flow. The ITP is broken up into four (4) stages that are aligned with the phases of rehabilitation, with each stage having defined hold points that must be achieved prior to the next stage of the process beginning. The ITP stages are outlined in **Table 21**. The ITP is intended to be refined and improved over time to promote continuous improvement.

Table 21: Stages of the ITP Process

Phase	ITP Stage
Active mining	Planning considerations
Landform establishment	Bulk Landform Shaping
Growth medium development	Rehabilitation Preparations
Ecosystem and land use establishment	Rehab Finishing
Ecosystem and land use development	Rehabilitation Monitoring Program

7.1 ITP DOCUMENTATION

Each rehabilitation area is subject to the ITP process flow and signoff. Records are kept for the key components of the ITP process. The ITP process ensures key records are stored to verify that the activity has been completed.

7.2 ITP REVIEW

A review of the ITP process will be triggered under the following circumstances:

- Changes to rehabilitation methodologies
- New risks identified in the rehabilitation process requiring additional controls; or
- Revision/update of project approvals requiring alternative rehabilitation outcomes.

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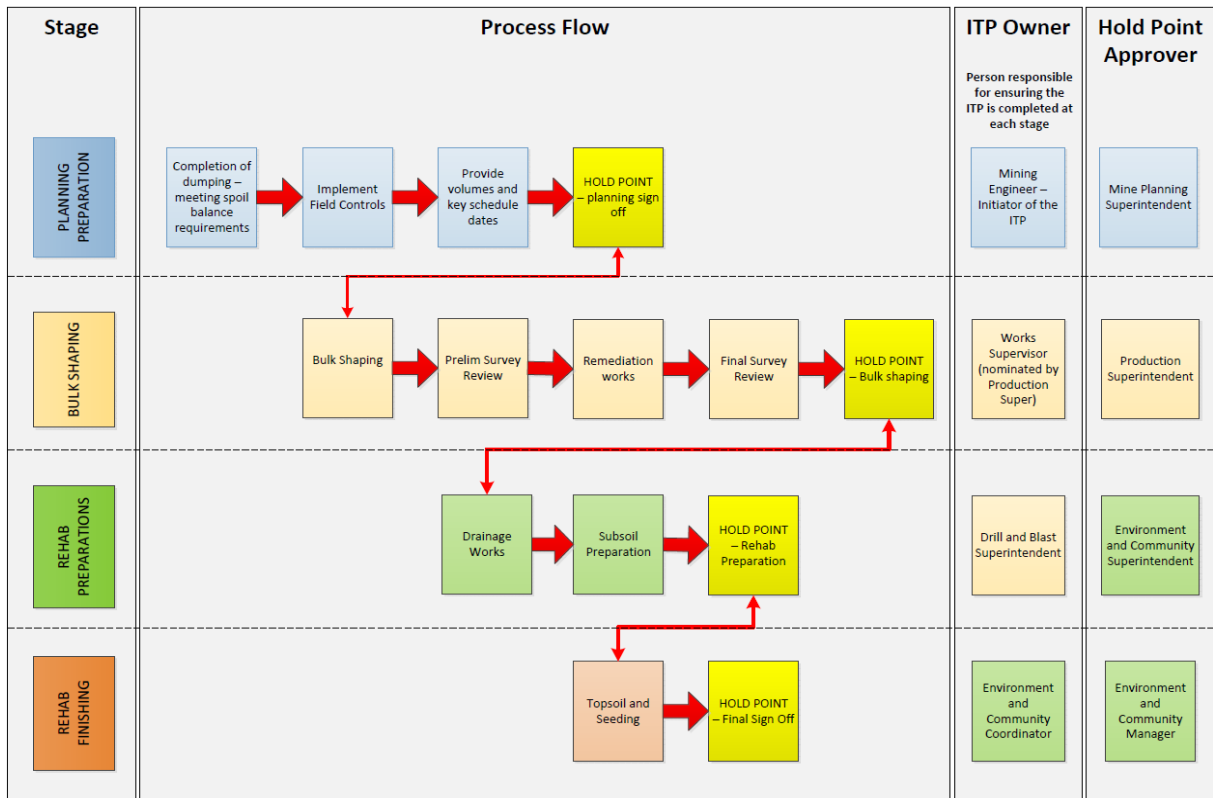


Figure 7: Workflow diagram for the MCO’s QA/QC process for rehabilitation

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8.0 REHABILITATION MONITORING PROGRAM

8.1 ANALOGUE SITE BASELINE MONITORING

Analogue sites representative of Box Gum Shrubby Woodland, and Sedimentary Ironbark Forest areas have been established in the Durridgere State Conservation Area and Goulburn River National Park at sites A1A and A1B, A5A and A5B and A2A and A2B, respectively (shown in **Figure 8**).

Analogue sites have also been established in woodland areas relevant to potential subsidence areas associated with UG4 (i.e. sites A6A and A6B).

Analogue sites representative of Box Gum Grassy Woodland and riparian rehabilitation areas will be established by MCO in consultation with a suitably qualified person.

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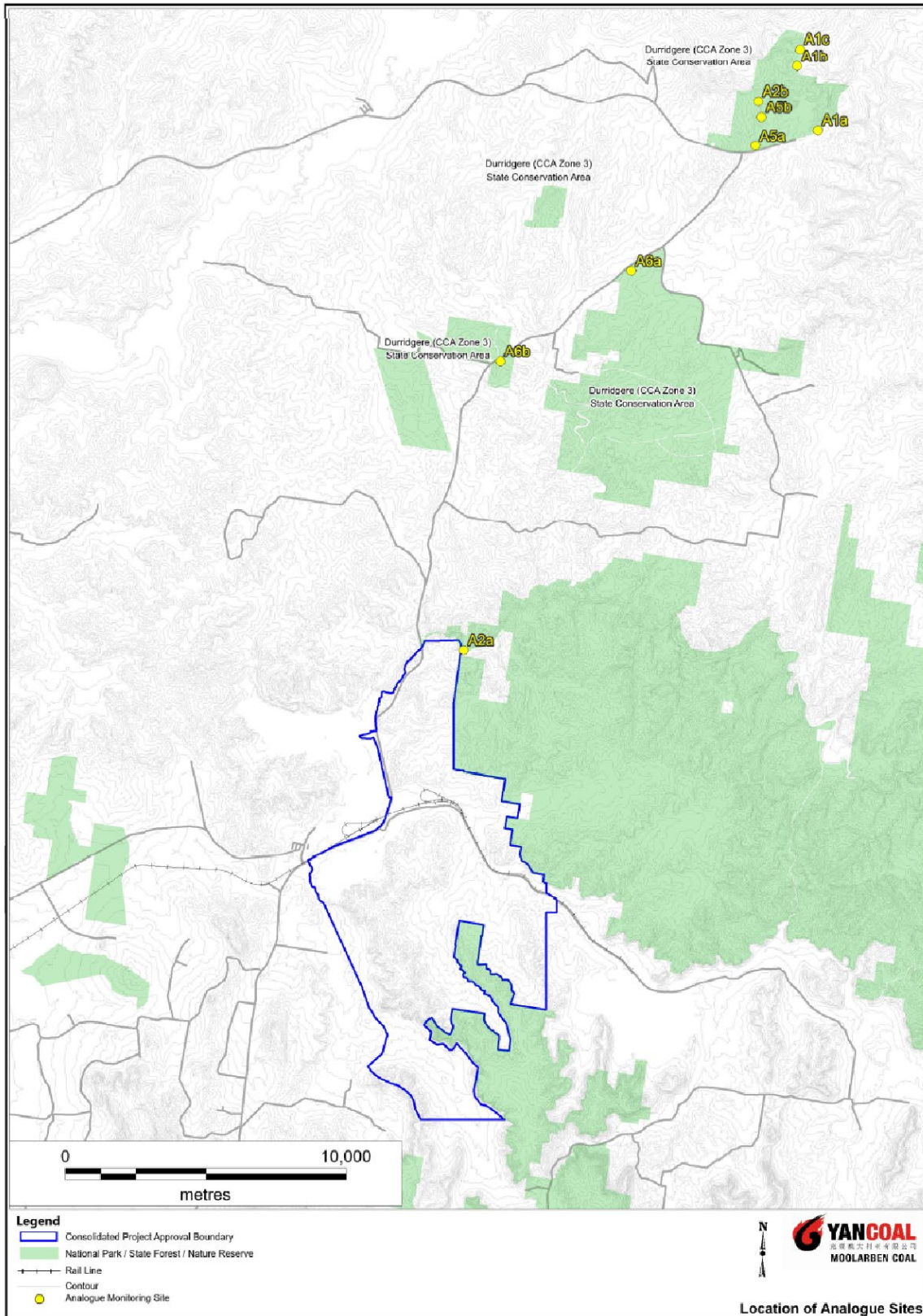


Figure 8 Location of Analogue Sites

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8.2 REHABILITATION ESTABLISHMENT MONITORING

Annual rehabilitation monitoring will be undertaken to:

- measure the progress and success of the rehabilitation program against performance indicators and completion criteria
- the continuous improvement process and refine rehabilitation methodologies and completion criteria; and
- identify when rehabilitation is not trending toward completion criteria in an appropriate timeframe, triggering adaptive management.

A description of the rehabilitation monitoring program methodologies is provided in the sections below. Rehabilitation monitoring program results will be reported and assessed within an annual rehabilitation monitoring report. A summary of the monitoring results, including any trend analysis and any proposed modifications to the monitoring program will be reported in the Annual Review.

8.2.1 Monitoring Site Selection

Permanent transects at a number of representative monitoring sites have been established in rehabilitation areas and corresponding analogue sites. To date, rehabilitation transects have been established across OC1, OC2 and OC4 rehabilitation areas (**Figure 9**). Rehabilitation transects will continue to be established on rehabilitation areas within 24 months of the rehabilitation areas being seeded. Each transect is established using the following technique:

- The site is randomly selected within the desired vegetation type.
- A 50 m transect is laid down-slope (according to the requirements of the Ecosystem Function Analysis methodology).
- A metal star picket is securely fixed at the start and finish of each transect.
- Each transect/star picket is numbered (with aluminium tag or plate).
- Each star picket is marked with a length of high visibility flagging tape (or similar) to maximise the visibility of the transect. The location of each end of the transect is recorded with GPS and photographed.

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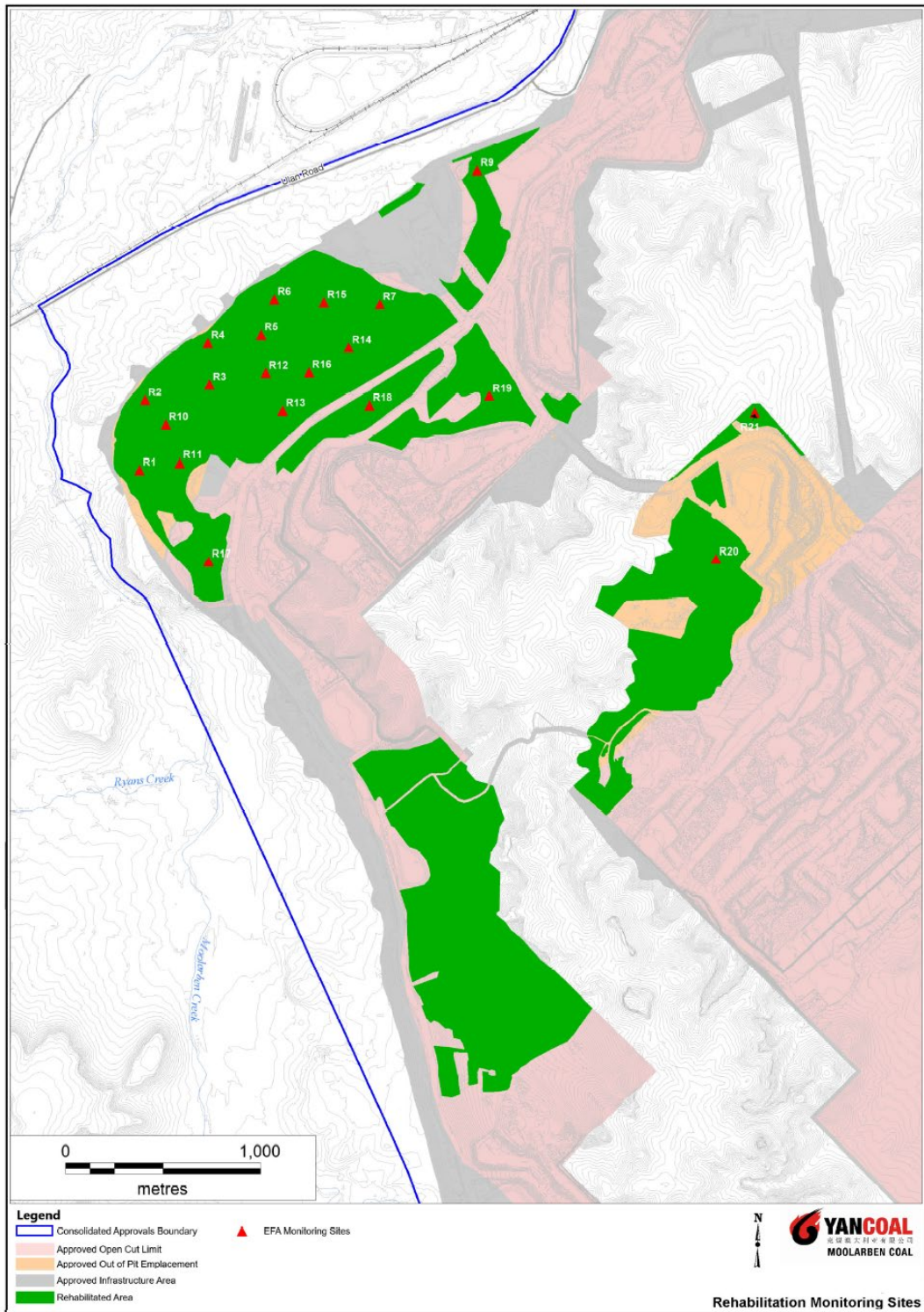


Figure 9 Rehabilitation Monitoring Sites

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8.2.2 Ecosystem Function Analysis (EFA)

The EFA methodology (Tongway and Ludwig, 2004; 2011) will be used to assess rehabilitation success and comprises the following components:

- Landscape Function Analysis (LFA)
- Landscape Organisation Index (LOI)
- Soil Surface Assessment (producing Stability, Infiltration and Nutrient Indices); and
- Vegetation Dynamics, including assessment of:
 - canopy cover for overstorey components
 - ground cover components (plant basal cover, bare ground and leaf litter)
 - woody species density
 - woody species richness
 - woody species function/health
 - habitat complexity; and
 - disturbance factors.

Ground flora monitoring will also be undertaken in permanent quadrats established along the EFA transects. At least three transects will be established in a rehabilitation area (where possible) to provide statistical rigour. All visible ground cover plants within the quadrat are recorded to determine the species abundance and diversity. Dominant species present are compared to those of analogue sites to determine if rehabilitation is progressing toward the targeted vegetation community.

Woody species density, richness and habitat complexity will be quantified using the plot-less technique described by Tongway and Ludwig (2011).

Landscape Function Analysis (LFA)

LFA is the primary component of the EFA monitoring methodology. It assesses ecosystem functionality at the soil landscape level in terms of the landscape's ability to retain water and nutrients within the system. In LFA, a soil landscape on the trajectory toward self-sustainability (in context of vegetation cover and soil stability) would have:

- A high LOI. That is, a low number of bare soil patches (interpatches) between obstruction components (patches) in the soil landscape, which would affect wind and water movement and the introduction and transportation of resources into and out of the system.

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- High Soil Surface Assessment indices, indicating that the site had favourable nutrient, infiltration, and stability characteristics.

Vegetation Dynamics

Vegetation dynamics assesses the functional role of vegetation in each stratum in the rehabilitation area. Measurements of plants on the EFA transects are used to calculate density of plants in each stratum and total canopy area. Measurements are used to derive the total canopy volume and wind amelioration index (i.e., the wind shielding capacity of the canopy).

Habitat Complexity

In addition to the vegetation dynamics parameters, presence of desirable habitat features including leaf litter, rocks and logs and water availability are measured to derive a habitat complexity index score. The habitat complexity index is a measure of the development of suitable habitat and resources for arboreal fauna.

Vegetation Monitoring

Vegetation monitoring is the other component of the EFA monitoring tool. An assessment of woody species density, species richness and canopy cover all contribute to the findings of the LFA in terms of available nutrients, soil stability and water infiltration. In vegetation dynamics, a landscape that is on a trajectory to self-sustainability in context of vegetative cover would have:

- high percentage ground cover vegetation and/or leaf litter components with a corresponding low percentage of bare soil areas
- high percentage canopy cover
- high density of woody species; and
- ideally high species richness (particularly pertinent to habitat complexity components).

This component is not undertaken in agricultural/pasture areas as woody vegetation is not represented in these areas.

Vegetation Monitoring Program Timing

The flora component of the monitoring program will be undertaken as follows:

- The LFA monitoring will be undertaken annually, generally in the lead up to spring (August – September) for areas of active regeneration.
- Given vegetation dynamics (i.e., densities, height and cover) is not expected to change drastically on an annual basis, particularly for woody strata, sampling will be undertaken every four years in areas of established vegetation (starting no sooner than Year 5 [2020]).

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- The LFA will be implemented reactively immediately after an event such as intense rainfall, frost or a bushfire, to sample any changes in landscape scores.
- The ground cover floristic quadrat monitoring will be undertaken annually, one year during spring and the next year during autumn. This will note seasonal species and growth rates and impacts from adverse weather conditions. Burrows (1999) noted in the south-west slopes that while most floristic diversity was accounted for in spring surveys, there were several species that were only recorded during autumn.

Furthermore, the DECCW guidelines for assessing Box Gum Woodlands recommends autumn survey, as one of the key criteria for assessing the presence of the community is the dominance of native perennials in the ground layer. These are most evident in autumn when they are not shrouded with annual exotics which predominantly grow in winter and spring.

Ephemeral Drainage Line Assessment and Monitoring

Prior to completion of construction of the realigned Murragamba and Eastern Creeks, MCO will develop, in consultation with suitable qualified specialists, a methodology for monitoring and assessment of the re-constructed creeks. An additional EFA tool for assessment of stability and function of ephemeral watercourses is described in Tongway and Ludwig (2011). MCO will consider use of this tool (and any other suitable methodologies) to assess performance of the realigned creeks.

8.2.3 Visual Monitoring and Photopoints

Visual Monitoring

Visual monitoring will include a field based rapid assessment to visually assess and rate landscape contributors to rehabilitation. Components assessed include:

- vegetation components (overstorey, understorey and groundcover)
- surface stability and erosion issues
- habitat complexity; and
- disturbance factors.

Each of these subcomponents is scored to generate an overall score for each site. This allows comparison between different sites and over time. It also allows the identification of areas requiring remediation as indicated by low scores.

Photo points

Photographic records of rehabilitation transects will be undertaken in addition to EFA to visually assess rehabilitation progress.

A permanent photo point will be established at each star picket that designates the start of each EFA transect. The photo will be taken at the star picket, facing down the transect. An additional photo of

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the transect number tag/plate will be taken just prior to taking the transect photo to assist with documentation of each image with the relevant transect.

The photos will be reviewed to assist with documenting rehabilitation progress, including (but not limited to):

- surface stability and erosion issues
- presence of weed species
- vegetation function/health (e.g. die-back or flowering); and
- evidence of pest animal presence/disturbance.

OC2 / OC3 Rehabilitation Monitoring (Ecosystem and Species Credits)

For the rehabilitated areas in the OC2 and / or OC3 landforms which will generate specific residual ecosystem and species credits, monitoring sites will be selected using the same methodology as that outlined in **Section 8.2.1**. MCO will track performance every three years' post landform establishment by conducting the following monitoring:

Years 1 to 10	LFA and drone/aerial surveillance for any material areas of vegetation establishment failure.
Years 3 to 5	Single FBA plot* in each PCT (randomly selected).
Years 6 to 9	FBA plots required in accordance with the vegetation zone size (i.e. 4 plots in PCT 618 and 5 plots in PCT1696).

* Refer to Section 5.3.2 of the FBA (OEH, 2014).

This approach will provide for the early detection of any material areas of rehabilitation failure, track progress against the performance and completion criteria and allow for the implementation of corrective measures where this may be required.

In addition to the above, the following sampling method will be used to identify *highly suitable koala habitat* as per the *Koala Habitat Protection Guideline: Implementation the State Environmental Planning Policy (Koala Habitat Protection) 2019* (DPIE, 2020):

Quadrats can be selected within each PCT either randomly or along a selected transect. Quadrats need to be of sufficient size to enable a minimum of at least 20 trees to be counted (at least 20 x 20 metres) and of sufficient number to allow a robust statistical determination of the percentage of tree species present in the lower, mid and upper stratum. The number and size of quadrats chosen will depend on the size of the site and the vegetation present

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Results of the sampling within each PCT must be shown separately and not summed for the overall site.

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Notes about the vegetation survey:

- A “tree” is taken to be a plant with a diameter at breast height over bark (DBHOB) of 10 cm or greater.
- Appendix A of this Guideline provides a list of the tree species as per Schedule 2 of the SEPP.
- Only the trees listed for the relevant region must be surveyed for.
- The calculation of the percentage of tree species must be completed within each vegetation community present on the site area and not averaged or totalled across the site. A result of 15% or greater in any individual vegetation community meets the definition of highly suitable koala habitat.

It is anticipated that the performance and completion criteria for the generation of credits would be subject to change over the life of the operation based on increased knowledge and feedback from monitoring.

Fauna Monitoring

As rehabilitated areas develop habitat complexity, fauna monitoring will be expanded in rehabilitation areas to include hair funnels, camera trapping, nest box inspections and night time spotlighting.

Fauna monitoring techniques will be:

- consistent with industry standards
- scientifically robust (methodology will be repeatable)
- compliant with legislation regarding animal ethics and welfare
- safe for operators and site staff; and
- cost effective for collecting data appropriate for monitoring needs.

Fauna monitoring techniques are summarised in **Table 22**. The exact number and location of data collection points (e.g., trap sites) are subject to modification based on site constraints and suitability as appropriate.

Table 22: Fauna Monitoring Techniques

Method	Details	Effort
Camera traps	Each camera left <i>in-situ</i> for a minimum of 10 days with a bait chamber positioned between 1 to 3 m from the camera.	At each site: <ul style="list-style-type: none"> • Each camera left <i>in-situ</i> for a minimum of 10 days.
Spotlighting	Pedestrian and vehicle-based spotlight survey, two to three nights at each site. Targets nocturnal mammals, birds, reptiles and amphibians.	At each site: <ul style="list-style-type: none"> • 1 hour spotlighting per night.

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Hair funnels	At each site for 4 nights and possibly set in habitat trees if present. These target small and medium sized mammals.	At each site: <ul style="list-style-type: none"> • 10 hair funnels. • 4 nights.
Nest Box inspections	A series of nest boxes are to be installed across the Moolarben Coal Complex area. These will each require a one-off inspection to check for use and if possible identify what species are using them.	Inspect nest box established in rehabilitation areas.
Bat detection	Anabat recordings to identify microbats.	Two at each site over two nights.
Bird survey	Timed, fixed area surveys for diurnal birds, observing and listening (consistent with Birdlife Australia standard survey methodology).	20 minute observation at each site.
Call playback	Nocturnal broadcasting of calls, two to three nights at each site. Targets nocturnal birds.	0.5 hours of broadcasting at each site.
Herpetological searches	Direct searches for reptiles, scanning surfaces, rolling logs and rocks and raking leaf litter.	0.5 hours searching at each site.
Dam Inspection – permanent water storage features	Dams and waterways will be inspected for frogs, once by day and once by night.	Effort will be dependent on the extent of the habitat.
Collection of scats	Collect scats and send to laboratory for analysis of predator and prey species.	Effort will be dependent on the frequency of scats encountered.
Habitat assessment	Assessment of fauna habitat values and signs (scats, scratches, diggings, etc.) at each site using standardised pro-forma.	One survey will be completed at each site based on the methodology as described in other sections of this RMP.
Impact/damage caused by feral animals	GIS data and photos of scratchings, location of scats, warrens, browsing damage to seedlings etc.	To be undertaken concurrently with other components of the field work.
Opportunistic observations	All opportunistic observations of fauna will be recorded.	To be undertaken concurrently with other components of the field work.

The timings for fauna component of the monitoring program are outlined in

Table 23.

Table 23: Fauna Monitoring Program Timing

Fauna	Monitoring Program Timing
Diurnal birds	Spring (October/November)
Nocturnal birds	Spring (October/November)
Mammals	Spring (October/November)
Bats	Spring (October/November)
Reptiles	Spring to Summer (November to March)
Amphibians	Late Spring (November)

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8.2.4 Rehabilitation Monitoring Records

Active Mining Records

MCO will maintain active records related to processes that may impact upon rehabilitation of the site. These will provide the basis for interpretation of later rehabilitation monitoring outcomes.

Records to be maintained include the following:

- detailed rehabilitation procedures
- register of contaminated sites
- records of production wastes and other waste streams and where they are located on site
- environmental monitoring records, including surface and groundwater quality
- a topsoil and/or soil substitute stockpile register which includes the date stockpiles were formed, maintenance works undertaken (e.g., weed control, planting with native legumes to maintain microbes etc.), and amelioration prior to re-use; and
- environmental incident records.

Rehabilitation Methodology Records

MCO will also record the details of each rehabilitation campaign (including mapping) to provide context for rehabilitation monitoring results and assist the continuous improvement process. The key monitoring parameters to be included in the program are:

- landform design details
- drainage design details
- substrate geology (i.e., geology of overburden directly below topsoil)
- site preparation techniques (e.g., topsoil and source, time of sowing, soil ameliorants used)
- revegetation methodologies (e.g., rate and type of fertiliser, cover crop species, seeding rates, native seed viability, native seed sources/location, seedling sources, revegetation contractors)
- weather conditions
- photographic records; and
- initial follow-up care and maintenance works and any ongoing maintenance works required.

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8.3 MEASURING PERFORMANCE AGAINST REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

The combination of monitoring methodologies described in **Section 8.2** allows the site to be assessed over time to:

- measure the progress and success of the rehabilitation program against performance indicators and completion criteria
- inform the continuous improvement process and refine rehabilitation methodologies and completion criteria; and
- identify when rehabilitation is not trending toward completion criteria in an appropriate timeframe, triggering adaptive management.

The results of monitoring campaigns will be submitted as part of annual rehabilitation reporting requirements.

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9.0 REHABILITATION RESEARCH, MODELLING AND TRIALS

9.1 CURRENT REHABILITATION RESEARCH, MODELLING AND TRIALS

Investigations into the suitability/effectiveness of using tuffaceous claystone material (contained in the coal seam profile) to assist with the re-establishment of Box Gum Woodland communities at the MCC have been undertaken. The investigation found the material in its present form, is considered to not be comparable to 'topsoil materials' at MCO. Potentially the fine textured materials could be converted into a primary growth media by further addition of organic matter and fertiliser (Landloch 2019).

9.2 FUTURE REHABILITATION RESEARCH, MODELLING AND TRIALS

Rehabilitation trials and studies will be undertaken to refine the rehabilitation methodologies and validate rehabilitation performance indicators and completion criteria as required.

The outcomes of any future rehabilitation trials will be reported in the MCC Annual Reviews.

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10.0 INTERVENTION AND ADAPTIVE MANAGEMENT PLAN

Rehabilitation monitoring results will be assessed annually to identify if rehabilitation is trending towards the completion criteria. In the event that rehabilitation monitoring results indicate a significant risk of rehabilitation failure, MCO will respond with a series of actions to investigate the cause(s) for the unsatisfactory rehabilitation performance and take any corrective steps necessary. Monitoring results will be used to refine rehabilitation completion criteria (if appropriate) in the continual improvement process.

Where rehabilitation monitoring results indicate the potential for rehabilitation failure, MCO will undertake a preliminary review of all site monitoring data to determine the extent and causes of the unsatisfactory performance. MCO will review the rehabilitation monitoring results, active mining records (including weather records) and rehabilitation methodology records to identify possible relationships between rehabilitation monitoring results, site conditions and rehabilitation practices.

Site Investigations

Additional site investigations may be required if the contributing factors, and extent of rehabilitation failure are not clearly understood using the annual rehabilitation monitoring results. The scope of any additional site investigations will be adequate to:

- define the areas where rehabilitation results are not satisfactory
- identify specific site characteristics (such as topsoil and subsoil geochemical properties) that may be contributing to rehabilitation underperformance; and
- develop recommendations for site-specific management and mitigation actions or more broad amendments to rehabilitation methodologies.

Management and Mitigation Responses

Following site investigations, MCO will undertake appropriate management actions to mitigate the identified contributing factors. Mitigation measures may include:

- weed or feral animal control works to improve juvenile vegetation survival
- additional soil amelioration to improve seed germination rates; and
- implementing additional erosion and sediment controls to minimise erosion.

Following implementation of mitigation measures, MCO may undertake remedial works (such as remedial earthworks to regrade rills and gullies) or repeat rehabilitation works such as re-seeding/re-planting areas.

MCO has developed Trigger Action Response Plans (TARPs) based on potential risks to rehabilitation. Rehabilitation TARPs are outlined in **Table 24**.

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Table 24: Trigger Action Response Plans at MCO

Aspect/ Category	Item	Element	Trigger	Action/Response
Landform Stability	1	Water Management Structures	Water management structures (sediment dams, channels, contour banks) erosion &/or scouring	<ol style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as amelioration, revegetation or alternative scour protection as required. 3. For significant failures or repeat minor failures conduct review of design criteria and construction standards.
	2	Micro-Relief Landform Slope Gradient	Active rill/gully erosion	<ol style="list-style-type: none"> 1. Undertake a review of the landform design, including survey if required. 2. Undertake re-grading, surface treatment and revegetation of the area, if required. 3. For widespread erosion activity review methods for erosion risk assessment and control measures.
	3	Micro-Relief Landform Drainage Lines	Drainage line erosion &/or scouring	<ol style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as amelioration, revegetation or alternative scour protection as required. 3. For significant failures or repeat minor failures conduct review of design criteria and construction standards.
Spontaneous Combustion	4	Carbonaceous Material on Surface of Rehabilitation	Active spontaneous combustion within rehabilitation areas.	<ol style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Details of the materials involved, location, date, time and climatic conditions will be recorded on surveyed plans 3. Undertake remedial actions such as applying water, capping with inert material or excavation and removal as required. 4. For widespread spontaneous combustion activity review management measures for carbonaceous material.
Growth Medium Suitability	5	Chemical and Nutritional Properties	Soil properties atypical for the surrounding landscape &/or outside desirable ranges provided by the agricultural industry:	<ol style="list-style-type: none"> 1. Engage a consultant to recommend appropriate soil/spoil amelioration. 2. Undertake amelioration and revegetation in accordance with the consultant recommendations as required.

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Aspect/ Category	Item	Element	Trigger	Action/Response
	6	Growth Medium Depth	Soil depth (topsoil and ameliorates) is less than adequate in areas in the Growth Medium Development phase.	<ol style="list-style-type: none"> 1. Top dress with additional suitable topsoil resource and /or ameliorants if required. 2. For repeat topsoil thickness issues conduct review of topsoil placement procedures and operational practices.
Vegetation Establishment	7	Weed Levels	>15% HTE cover Ecosystem Establishment phase.	<ol style="list-style-type: none"> 1. Engage land management contractor to control HTE's using methods such as removal, biological control, herbicide application and/or slashing. 2. Treatment of infestations as appropriate to the species. 3. Conduct follow-up inspections to assess the effectiveness of weed management measures.
	8	Bushfire Resilience	Rehabilitation areas not able to recover in a reasonable time from effects of bushfire.	<ol style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as re-seeding affected area as required. 3. Review bushfire management plan.
	9	Uncontrolled Entry of Livestock or Vehicles	Damage to vegetation caused by uncontrolled access by livestock or vehicles.	<ol style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as fence installation or repairs, maintaining access tracks and sign posting.
	10	Understorey Species Diversity	Understorey species diversity not trending towards completion criteria.	<ol style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as soil amelioration, reseeding and fertilising as required. 3. For widespread low understorey diversity: <ol style="list-style-type: none"> a. Review seed mix understorey species composition and seeding rates. b. Review monitoring results to determine rates of successful establishment for various understorey species in seed mixes.
	11	Tree and Shrub Species Diversity	Tree and shrub species diversity not trending towards completion criteria.	<ol style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as reseeding and fertilising as required. 3. For widespread low tree and shrub diversity: <ol style="list-style-type: none"> a. Review seed mix tree/shrub species composition and seeding rates.

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Aspect/ Category	Item	Element	Trigger	Action/Response
				<ul style="list-style-type: none"> b. Review monitoring results to determine rates of successful establishment for various tree/shrub species in seed mixes.
	12	Tree Density	Tree density is not trending towards completion criteria.	<ul style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as reseeded (for low density) and thinning (for high density) as required. 3. For widespread tree density outside analogue site ranges: <ul style="list-style-type: none"> a. Review seed mix tree species composition and seeding rates. b. Review monitoring results to determine rates of successful establishment for various tree species in seed mixes. c. Review seed bed preparation, weed/grass control and sowing procedures.
	13	Vertebrate Pest Levels	Vertebrate pest species is causing significant damage to rehabilitation.	<ul style="list-style-type: none"> 1. Consult with relevant stakeholders to develop and implement appropriate vertebrate pest control programme.
Fauna Recolonisation	14	Habitat for Native fauna species	No habitat present for native fauna species	<ul style="list-style-type: none"> 1. An inspection of the site will be undertaken by a suitably trained person. 2. Undertake remedial actions such as introducing additional fallen timber (consider pruning or thinning standing trees) or rock as required.

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Continual Improvement

MCO adopts a continuous improvement feedback process to ensure that MCO maintains industry best practice rehabilitation and land management practices to achieve the post-mining land use objectives.

Where site investigations (or the periodic review protocol) conclude that current rehabilitation methodologies are contributing to unsatisfactory rehabilitation results, MCO will revise methodologies appropriately. Periodically, MCO may engage suitably qualified professionals to review rehabilitation and land management practices to recommend opportunities to modify methodologies.

Where rehabilitation failure is the result of unpredictable or isolated events (e.g., pest attacks or extended droughts), MCO may review risks to rehabilitation (**Section 3.0**) and rehabilitation planning to determine if risks to rehabilitation are adequately considered.

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11.0 REVIEW, REVISION, AND IMPLEMENTATION

11.1 REVIEW

In accordance with Clause 11 of Schedule 8A to the Mining Regulation 2016, Moolarben Coal Operations will amend this RMP in the following circumstances:

- an amendment has been made to the rehabilitation objectives, rehabilitation completion criteria or final landform and rehabilitation plan
- changes to the risk control measures in the Rehabilitation Management Plan that are identified in a rehabilitation risk assessment; and
- whenever directed in writing to do so by the Secretary.

The lease holder must ensure that the Rehabilitation Management Plan 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.

Whenever any foreseeable hazard is identified that presents a risk to achieving the rehabilitation objectives, the rehabilitation completion criteria, the final landform and/or the rehabilitation plan, the lease holder is required to update the rehabilitation risk assessment and the Rehabilitation Management Plan.

11.2 ROLES AND RESPONSIBILITIES

MCO personnel responsible for the monitoring, review and implementation of this RMP are listed in **Table 25**.

Table 25: Rehabilitation Implementation Responsibilities

Role	Responsibilities
General Manager	Take overall leadership and responsibility for compliance with all environmental approvals.
	Provide adequate resourcing (personnel and financial) to enable full implementation of the RMP.
	Approve subsequent revisions of the RMP.
Environmental and Community Manager	Report any land related incidents in accordance with legal requirements.
	Identify rehabilitation risks and budget for sufficient resources to effectively manage those risks.
	Effectively implement the GDP and VCP procedures.
	Provide training to all employees and contractors in environmental awareness, legal responsibilities and MCO's rehabilitation requirements.
	Restrict access to rehabilitation areas.
	Oversee communication of conditions of approval to relevant site personnel and contractors.
	Oversee implementation of the RMP.
	Oversee all regulatory reporting in relation to the RMP.

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Role	Responsibilities
	Oversee relevant reviews of the RMP.
Environment and Community Superintendent	Oversee all monitoring in relation to the RMP.
	Evaluate results of monitoring programs and longer trends and where appropriate, advise the Environmental and Community Manager of changes to management measures and controls
	Approve GDPs.
	Coordinate progressive site rehabilitation as final landforms become available.
	Coordinate topsoil management strategies.
	Coordinate all regulatory reporting in relation to the RMP.
	Coordinate relevant reviews of the RMP.
Environmental and Community Advisor(s)	Coordinate implementation of the RMP.
	Coordinate regulatory reporting and monitoring reporting in relation to the RMP.
	Check GDPs are effectively completed by relevant site personnel or contractors and approved by the Environmental and Community Manager or delegate prior to surface disturbance.
	Coordinate internal reporting on the performance of rehabilitation.
	Coordinate pre-clearance surveys.
	Coordinate implementation of fauna impact mitigation actions.
	Coordinate native seed collection and planting.
	Coordinate monitoring of rehabilitation and regeneration areas.
	Coordinate weed and pest control for rehabilitation areas (where required).
Open Cut Technical Services Manager	Oversee planning and scheduling of clearing, topsoil stripping, and topsoil stockpiling
	Develop dumping strategies to allow for progressive rehabilitation of mined land.
	Implement the procedures reference in the RMP
OC Mine Manger	Implement the procedures reference in the RMP
	Provide resources required and support to implement these procedures
	Oversee overburden placement and reshaping design.
	Oversee clearing, topsoil stripping, and topsoil stockpiling and habitat/resource salvage
	Oversee implementation of landform shaping and establishment
	Oversee topsoil placement
Project Manager	Delineate areas to be cleared/disturbed.
	Initiate GDP approval process.
	Implement VCP procedure.
	Implement fauna habitat salvage strategies.
	Implement topsoil management strategies.

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11.3 INCIDENT AND COMPLAINT REPORTING

In accordance with Condition 3, Schedule 5 and Condition 3, Schedule 6 of Project Approvals (05_0117 and 08_0135, respectively), MCO has developed protocols for managing and reporting the following:

- incidents
- complaints
- non-compliances with statutory requirements; and
- exceedances of Project Approval criteria.

These protocols are described in detail in the **MCC Environmental Management Strategy (EMS)**. A summary of incident and non-compliance reporting procedures is provided below.

Incidents

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment and/or breaches or exceeds the limits or performance measures/criteria in the NSW Project Approvals.

In the event that an incident associated with the MCC occurs, which causes or threatens to cause material harm to the environment, the incident will be managed in accordance with relevant regulatory approvals and statutory obligations.

The reporting of incidents will be conducted in accordance with Condition 7, Schedule 5 and Condition 7, Schedule 6 of the NSW Project Approvals (05_0117 and 08_0135, respectively). MCO will notify the Secretary of the DPE, and any other relevant agencies immediately after MCO becomes aware of the incident which causes or threatens to cause material environmental harm to the environment. For any other incident associated with the project, MCO will notify the Secretary and any other relevant agencies as soon as practicable after becoming aware of the incident.

In the event of a pollution incident, notification will also be conducted as per the processes outlined in the Pollution Incident Response Management Plan (prepared as part of MCO's holding EPL 12932), in accordance with the protocol for industry notification of pollution incidents under Part 5.7 of the POEO Act.

Within seven days of the date of the incident, MCO will provide the Secretary of the DPE and any relevant agencies with a detailed report on the incident. The report will:

- describe the date, time and nature of the exceedance/incident
- identify the cause (or likely cause) of the exceedance/incident
- describe what action has been taken to date; and
- describe the proposed measures to address the exceedance/incident.

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Compliance

A protocol for the managing and reporting of non-compliances with statutory requirements has been developed as a component of the EMS and is described below.

MCO will notify the Secretary of the DPE, and any other relevant agencies of any non-compliance associated with the MCC immediately after MCO becomes aware of the incident. Within seven days of the date of the incident, MCO will provide the Secretary of the DPE and any relevant agencies with a detailed report on the incident.

12.0 MINE CLOSURE PLANNING

Mine closure planning at the MCC will be undertaken in consideration of the following key industry best practice guidelines:

- The Strategic Framework for Mine Closure (Australian and New Zealand Minerals and Energy Council [ANZMEC] and the Minerals Council of Australia [MCA], 2000)
- Leading Practice Sustainable Development Program for the Mining Industry - Mine Closure and Completion (DITR, 2016b)
- Guideline: Achieving rehabilitation completion (sign-off) (Resource Regulator 2021); and
- Guidelines for Mine Closure and Lease Relinquishment (DMR, 2007).

The MCC's mine closure planning objectives (**Section 12.1**), the rehabilitation planning concepts and the approach to mine closure described in this section have been developed in consideration of The Strategic Framework for Mine Closure (ANZMEC and MCA, 2000) objectives and principles.

12.1 MINE CLOSURE PLANNING OBJECTIVES

The principal objectives of mine closure planning for the MCC include:

- Providing an overall framework for mine closure including rehabilitation and decommissioning strategies.
- Maintaining adequate financial provision to cover the cost of decommissioning, final rehabilitation and any other post closure costs related to the closure of the MCO site.
- Establishing clear and agreed criteria with all relevant stakeholders, which can be used to provide the standard to which the final mine rehabilitation and post-mining land use can be assessed against.
- Reducing or eliminating adverse environmental effects once the mine ceases operation.
- Completing closure in accordance with industry best practice as well as meeting the MCO's statutory requirements.
- The closed mine not posing an unacceptable risk to public health and safety.

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A detailed Mine Closure Plan will be developed for the MCC at least 5 years prior to mine closure and will include a demolition and decommissioning strategy prepared in accordance with Australian Standard AS2601-2001: The Demolition of Structures (or its latest version). The strategy will include details of proposed demolition techniques, equipment required, and optimal decommissioning sequencing. The Mine Closure Plan will also include a detailed description of the final landform rehabilitation concepts and measures, including any final works required for the rehabilitation and stabilisation of the realigned sections of the Murrumbidgee and Eastern Creeks.

The Mine Closure Plan will be developed in consultation with the Resources Regulator and other relevant regulatory agencies.

12.2 STAKEHOLDER ENGAGEMENT

MCO recognises the value of identifying and engaging key stakeholders during the mine closure planning process. Engaging relevant stakeholders is seen as one of the fundamental principles for effective mine closure, as the closure of the MCC will likely result in substantial changes to the community in which MCO operates.

Condition 65, Schedule 3 and Condition 53, Schedule 3 of Project Approvals (05_0117 and 08_0135, respectively) require MCO to minimise the adverse socio-economic effects associated with mine closure. Accordingly, MCO will undertake a Social Impact Assessment (SIA) as part of the mine closure process. The SIA will be prepared 5 years prior to closure (mining operations at the MCC are currently approved until 31 December 2038). The SIA will consider the following key issues related to closure:

- the demands and contributions of the MCC on local services to assess the impacts of closure on those demands and contributions
- the relationships with local suppliers (including arrangements for conducting local business planning workshops prior to closure to assist local businesses to move on from reliance on the mine)
- studies/monitoring of social contributions and sustainability post closure
- development of a stakeholder consultation strategy; and
- stakeholders' final land use perceptions and incorporating their input into development of the Mine Closure Plan.

An operational workforce will be retained until the cessation of mining operations. It is then anticipated that a reduced workforce will be retained to complete any final decommissioning and rehabilitation works.

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The key aspects that will be considered in relation to human resource management during the mine closure phase include:

- Workforce communication. A communication strategy will be developed to inform the workforce of the mine closure process.
- Retaining key technical staff and mine workers required to implement closure of the site.
- Development of a staff redundancy strategy.
- Staff employment transfer possibilities (to other mine sites).
- Counselling, career advice and training services.

In addition to these human resource commitments, MCO will review the outcomes of the SIA to determine potential community funding mechanisms to minimise socio-economic effects.

Mechanisms may include, but not be limited to, a Community Trust Fund, and funding of community programmes.

12.3 FINANCIAL PROVISION FOR MINE CLOSURE

MCO will ensure sufficient financial resources are available to satisfactorily complete mine closure by preparing cost estimates for planned mine closure (assuming full development of the MCC) and for unplanned/imminent mine closure (assuming closure at the current development stage).

Costs for planned mine closure will be calculated on the costs incurred following the cessation of mining operations. All costs incurred until this time, including progressive rehabilitation costs, will be considered as operational costs. These costs will be reviewed annually by MCO and closure accruals adjusted accordingly.

Estimation of costs for imminent mine closure will be undertaken using the RR Security Calculation Tool which will also be reviewed annually and upon preparation of a new or varied MOP.

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12.4 LEASE RELINQUISHMENT

The timing for initiating formal lease and licence relinquishment following mine closure will be dependent on when the site meets the agreed closure completion criteria (including rehabilitation completion criteria). Lease and licence relinquishment may be undertaken as a staged process when completion criteria are met within specific rehabilitation domains.

Once compliance with the agreed completion criteria is achieved, MCO will seek to relinquish its leases and licences. It is anticipated that the lease and licence relinquishment process will include:

- Completion of a Relinquishment Assurance Report consistent with the Guideline: Achieving rehabilitation completion (sign-off) (Resources Regulator 2021) which demonstrates compliance with the relevant closure completion criteria. This report would include supporting documentation such as rehabilitation monitoring data and site contamination assessment results.
- A site inspection and meeting with relevant Resource Regulator representatives (and any other key regulatory agencies or stakeholders) to discuss the Relinquishment Assurance Report.
- RR submission of a recommendation to the Minister for relinquishment of mining tenements (upon agreement that the closure completion criteria have been met).
- MCO submission of formal applications for relinquishment of leases and licences.

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APPENDIX A– LAND OWNERSHIP TABLE

Lot/Deposited Plan	Land Ownership	Land Tenure	Overlapping Lease		
1//1214133	Yancoal	Freehold	ML1605		
1//182395	Ulan Coal Mines Limited	FREEHOLD			
44//736630	Ulan Coal Mines Limited	FREEHOLD			
1//1069300	Ulan Coal Mines Limited	FREEHOLD			
2//1237411	Crown				
88//755442	Yancoal	Freehold			
152//755442	Crown		ML1691		
290//704098	Crown				
65//755442	Yancoal	Freehold			
4//575167	Yancoal	Freehold			
51//755442	Yancoal	Freehold			
64//755442	Yancoal	Freehold			
96//755454	Yancoal	Freehold	ML1715, ML1691		
248//755442	Yancoal	Freehold	ML1691		
229//755442	Yancoal	Freehold	ML1691		
125//755442	Yancoal	Freehold	ML1691		
139//755442	Yancoal	Freehold			
98//755442	Yancoal	Freehold	ML1691		
91//755442	Yancoal	Freehold	ML1606		
42//755454	Yancoal	Freehold	ML1715		
19//755442	Yancoal	Freehold	ML1691		
170//755442	Yancoal	Freehold	ML1691		
44//755442	Yancoal	Freehold	ML1691		
62//755442	Yancoal	Freehold	ML1691		
74//755442	Yancoal	Freehold			
157//755442	Yancoal	Freehold	ML1691		
204//755442	Yancoal Interest - Crown		ML1691		
223//755442	Yancoal	Freehold	ML1715, ML1691		
61//755454	Yancoal	Freehold	ML1715		
228//755442	Yancoal	Freehold	ML1691		
4//115031	Yancoal	Freehold			
45//755442	Yancoal	Freehold	ML1691		
40//755442	Yancoal	Freehold	ML1691		
234//755442	Yancoal	Freehold	ML1715, ML1691		
53//755442	Yancoal	Freehold	ML1691		
172//755442	Yancoal	Freehold	ML1691		
37//755442	Yancoal	Freehold	ML1691		
203//755442	Yancoal	Freehold			
193//755442	Yancoal	Freehold	ML1691		
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17//755442	Yancoal	Freehold	ML1691
167//755442	Yancoal	Freehold	ML1691
3//115031	Yancoal	Freehold	
89//755442	Yancoal	Freehold	ML1691
242//755442	Yancoal	Freehold	ML1628
7009//1025321	Yancoal Interest - Crown		ML1691
110//755442	Yancoal	Freehold	ML1691
205//755442	Yancoal	Freehold	
16//755442	Yancoal	Freehold	ML1691
1//115031	Yancoal	Freehold	ML1691
18//755442	Yancoal	Freehold	ML1691
2//115031	Yancoal	Freehold	ML1691
140//755442	Yancoal	Freehold	ML1691
91//755454	Yancoal	Freehold	ML1715
113//755454	Yancoal	Freehold	ML1715
6//115031	Yancoal	Freehold	ML1691
218//755442	Yancoal	Freehold	ML1715, ML1691
145//755442	Yancoal	Freehold	ML1691
109//755442	Yancoal	Freehold	ML1691
102//755442	Yancoal	Freehold	ML1691
176//755442	Yancoal Interest - Crown		ML1691
36//755442	Yancoal	Freehold	
146//755442	Yancoal	Freehold	ML1691
52//755442	Yancoal	Freehold	ML1691
260//755442	Yancoal	Freehold	ML1691
238//755442	Yancoal	Freehold	ML1691
183//755442	Yancoal	Freehold	ML1691
261//755442	Yancoal	Freehold	ML1691
54//755442	Yancoal	Freehold	
63//755442	Yancoal	Freehold	ML1691
192//755442	Yancoal	Freehold	ML1691
7//755442	Yancoal	Freehold	
1//575167	Yancoal	Freehold	
99//755454	Yancoal	Freehold	ML1715
105//755454	Yancoal	Freehold	ML1715
1//803204	Yancoal	Freehold	ML1691
28//755454	Yancoal	Freehold	ML1715
36//755454	Yancoal	Freehold	ML1715
80//755454	Yancoal	Freehold	ML1715
60//755442	Yancoal	Freehold	ML1691
65//755454	Yancoal	Freehold	ML1715

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3//206588	Ulan Coal Mines Limited	FREEHOLD	
2//755454	Yancoal	Freehold	ML1715
8//755454	Yancoal	Freehold	ML1715
57//755454	Yancoal	Freehold	ML1715
75//755454	Yancoal	Freehold	ML1715
1//755454	Yancoal	Freehold	ML1715
99//755442	Yancoal	Freehold	
33//755454	Yancoal	Freehold	ML1715
79//755454	Yancoal	Freehold	ML1715
54//755454	Yancoal	Freehold	ML1715
12//755454	Wilpinjong Coal Mine		
38//755454	Yancoal	Freehold	ML1715
272//755442	Yancoal	Freehold	ML1628
82//755454	Yancoal	Freehold	ML1715
7//755454	Yancoal	Freehold	ML1715
119//755442	Yancoal	Freehold	ML1691
92//755454	Yancoal	Freehold	ML1715
41//755454	Yancoal	Freehold	ML1715
97//755454	Yancoal	Freehold	ML1715
277//755442	Yancoal	Freehold	ML1606
61//755442	Yancoal	Freehold	ML1691
76//755454	Yancoal	Freehold	ML1715
289//704098	Yancoal	Freehold	
1//206588	Ulan Coal Mines Limited	FREEHOLD	
4//206588	Ulan Coal Mines Limited	FREEHOLD	
119//724657	Crown		
86//755454	Yancoal	Mineral	ML1715
262//755442	Yancoal	Freehold	ML1691, ML1715
95//755442	Yancoal	Freehold	ML1691
2//206588	Ulan Coal Mines Limited	FREEHOLD	ML1628
117//705226	Yancoal	Freehold	ML1715
71//755454	Yancoal	Freehold	ML1715
116//705226	Crown		ML1715
6//206588	Ulan Coal Mines Limited	FREEHOLD	
93//755454	Yancoal	Freehold	ML1715, ML1691
58//755454	Yancoal	Freehold	ML1715
53//755454	Yancoal	Freehold	ML1715
253//755442	Yancoal	FREEHOLD	ML1628, ML1715
63//755454	Yancoal	Freehold	ML1715
30//755454	Yancoal	Freehold	

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32//633148	Yancoal	Freehold	
43//755454	Yancoal Interest - Crown		ML1715
90//755454	Yancoal	Freehold	ML1715
34//755454	Yancoal	Freehold	ML1715
7010//1025345	Crown		ML1628
92//755442	Yancoal	Freehold	ML1606
50//755442	Yancoal	Freehold	
77//755454	Yancoal	Freehold	ML1715
40//755454	Yancoal	Freehold	ML1715
62//755454	Yancoal	Freehold	ML1715
85//755454	Yancoal	Mineral	ML1715
29//755454	Yancoal	Freehold	ML1715
8//626648	Yancoal	Freehold	
7//206588	Ulan Coal Mines Limited	FREEHOLD	
5//206588	Ulan Coal Mines Limited	FREEHOLD	
120//724656	Yancoal	Freehold	ML1715
93//755442	Yancoal	Freehold	ML1715, ML1691
4//755454	Yancoal	Freehold	ML1715
74//755454	Yancoal	Freehold	ML1715
107//755454	Yancoal	Freehold	ML1715
21//755454	Yancoal	Freehold	ML1715
112//755454	Yancoal	Freehold	ML1715, ML1691
50//755454	Yancoal	Freehold	ML1715
123//724655	Crown		
1//1089166	Yancoal	Freehold	ML1628
1//1099037	Yancoal	Freehold	ML1606
2//1143354	Yancoal	FREEHOLD	ML1715
44//755454	Yancoal Interest - Crown		ML1715
179//755442	Yancoal	Freehold	ML1606
121//724656	Crown		
118//724657	Yancoal	Freehold	
5//750773	Ulan Coal Mines Limited	FREEHOLD	
2//722882	Yancoal	FREEHOLD	ML1715
56//722795	Crown		
20//755439	Yancoal	Freehold	ML1605
33//755439	Crown		
2//750773	Ulan Coal Mines Limited	FREEHOLD	
55//722794	Crown		
75//750773	Ulan Coal Mines Limited	FREEHOLD	
45//736630	Yancoal	Freehold	ML1605
26//755439	Privately Owned	FREEHOLD	

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1//720334	Ulan Coal Mines Limited	FREEHOLD	
1//720332	Ulan Coal Mines Limited	FREEHOLD	
1//750773	Ulan Coal Mines Limited	FREEHOLD	
7005//1096180	Crown		ML1605
7004//1116207	Crown		ML1605
7302//1143562	Crown		
7303//1143562	Crown		
5//878678	Yancoal	FREEHOLD	ML1715
13//1152406	Yancoal	FREEHOLD	ML16036, ML1715
178//755442	Yancoal	Freehold	ML1606
16//1140073	Yancoal	LOCAL GOVERNMENT AUTHORITY	ML1606
1//722881	Yancoal	Freehold	ML1606
3//722880	Ulan Coal Mines Limited	FREEHOLD	
2//722880	Ulan Coal Mines Limited	FREEHOLD	
2//182395	Ulan Coal Mines Limited	FREEHOLD	
4//182395	Ulan Coal Mines Limited	FREEHOLD	
3//182395	Ulan Coal Mines Limited	FREEHOLD	
292//719007	Crown		
2//432146	Ulan Coal Mines Limited	FREEHOLD	
95//755454	Yancoal	Freehold	ML1715
78//755454	Yancoal	Freehold	ML1715
106//755454	Yancoal	Freehold	ML1715
4//1214133	Ulan Coal Mines Limited	FREEHOLD	
34//755439	Crown		
1//1246895	Yancoal		ML1691
2//1246895	Yancoal		
1//817487	Yancoal	FREEHOLD	ML1715
3//722882	Yancoal	FREEHOLD	ML1715
17//1140073	Yancoal	LOCAL GOVERNMENT AUTHORITY	ML1715
20//1140073	Yancoal	LOCAL GOVERNMENT AUTHORITY	ML1715
3//1214133	Yancoal	FREEHOLD	ML1606
2//1246858	Yancoal	FREEHOLD	ML1605, ML1715
5//1246858	Yancoal	FREEHOLD	ML1715
8//1246858	Yancoal	FREEHOLD	ML1715
9//1246858	Yancoal	FREEHOLD	ML1715
11//1246858	Yancoal	FREEHOLD	ML1715
6//878678	Yancoal	FREEHOLD	ML1715
7//878678	Yancoal	FREEHOLD	ML1715

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208//755442	Yancoal	Freehold	
2//1023568	Yancoal	Freehold	ML1715
1//1023568	Yancoal	Freehold	ML1715
43//736630	Crown		
2//1214133	Ulan Coal Mines Limited	FREEHOLD	
1//1237411	Crown		
1//1246858	Yancoal	FREEHOLD	ML1715
4//1246858	Yancoal	FREEHOLD	ML1715
108//755442	Yancoal	Freehold	
107//755442	Yancoal	Freehold	
7008//1128119	Crown		
7009//1128119	Crown		
32//755454	Yancoal	Freehold	ML1715
Munghorn Gap Nature Reserve	Nature Reserve		
	Yancoal Interest - Crown	Crown	ML1715
4226 - 2125 R	Yancoal Interest - Crown	Crown	ML1605
	Yancoal Interest - Crown	Crown	ML1715
31//755439	Yancoal Interest - Crown		ML1628
UNIDENTIFIED	Yancoal Interest - Crown		ML1628
1//1266407	Yancoal	Freehold	ML1715
2//1266407	Yancoal	Freehold	
3//1266407	Yancoal	Freehold	
5//1266407	Yancoal	Freehold	
6//1266407	Yancoal	Freehold	
4//1266407	Yancoal	Freehold	ML1715
5//1240416	Yancoal		ML1605
Goulburn River State Conservation Area	State Conservation Area		
Goulburn River National Park	National Park		

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