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Environmental Management System

Bloomfield Colliery

Rehabilitation Management Plan

Doc No:	EMP002
Doc Owner:	Brad Donoghoe
	Brad Donoghoe
Approval:	
Signed:	
Date:	28/07/2022

	Issue Date	Description	Originator	Reviewed	Approved
0	28/07/2022	Approved	GHD	Bloomfield	Bloomfield

Summary table	
Name of mine	***Bloomfield Mine***
Rehabilitation commencement date	***2/7/2022***
Revision number	***0***
Revision date	***22/7/2022***
Mining leases	***ML 1738 (Expires 2037)*** ***CCL 761 (Expires 2029)*** ***AMA 1001 (Expires 2037)***
Name of lease holder	***Bloomfield Collieries Pty Ltd***
Submission date	***28/7/2022***

Table of Contents

1. Introduction To Mining Project

1.1 HISTORY OF OPERATIONS

1.1.1 Background of the Project

The Bloomfield Colliery (the Colliery) is an existing open cut mining operation located approximately 20 kilometres north-west of Newcastle. The project location is shown on Figure 1.1.

The Colliery is owned and operated by Bloomfield Collieries Pty Limited (Bloomfield), part of the Bloomfield Group of companies.

The Colliery currently operates in accordance with Project Approval (PA) 07_0087 (MOD4) issued under section 75J of the Environmental Planning and Assessment Act 1979 (EP&A Act), with approved production levels of 1.3 million tonnes per annum (Mtpa) of Run of Mine (ROM) coal. Mining operations under PA 07_0087 may take place until 31 December 2030 within the approved Project Area. The Coal Handling and Processing Plant (CHPP), associated infrastructure and tailings dam are approved under the Abel Coal Project (PA 05_0136), which is valid until 31 December 2030.

1.1.2 Existing Operations and Mine History

Records show that mining commenced in the vicinity of the property in the late 1850s. The early mining on the property was by underground methods, with the pits being small and situated predominantly around the outcrops of various seams.

Bloomfield commenced mining the Big Ben seam using the bord and pillar method after taking over the mining lease in 1937. There was a total of three (3) seams mined underground, the Rathluba, Big Ben and Donaldson seams. Mining in the Big Ben underground ceased in 1981, followed by the closure of the Rathluba underground mine in May 1992, and the sealing of the entries thereafter.

Open cut mining operations have been undertaken by the Colliery since 1964 and produces approximately 0.8 to 1.3 million tonnes of ROM coal per year. Product coal is predominantly thermal coal with some soft coking coal for the Asian export market. Current open cut mining operations are located in the southern portion of the CCL 761 and ML 1738 lease area from within the S Cut and Creek Cut open cut pits (Figure 1.2). Coal is extracted from coal seams within the Tomago Coal Measures, including the Buttai, A, B and C, Whites Creek, Elwells Creek, Donaldson and Big Ben seams.

The Colliery is a multi-seam, multi bench system, mining up to 13 seams or splits. Heavy earth moving equipment delivers the ROM coal to the onsite CHPP via internal haul roads. ROM coal is processed at the CHPP. Processing includes size reduction, washing and screening.

Product coal is stockpiled adjacent to the CHPP before being loaded into rail wagons at the Bloomfield rail loading facility and transported by rail to the Port Waratah Coal Services terminal at the Port of Newcastle.

Figure 1.3 provides details of the land ownership and built environment. Approved activities include the continued operation of the following mine infrastructure and related activities:

- The current and ongoing open cut mine areas.

- The workshop.
- The road between the open cut pit areas and the run-of-mine (ROM) coal pad.
- Stockpiles at the washery.
- The road that links the workshop, open cut pits and the washery.

The current operation includes an on-site Coal Handling and Preparation Plant (CHPP) and rail loading facility approved under the Abel Underground Mine Project Approval (MP 05_0136) (Abel Project Approval) which was granted to Donaldson Coal Pty Ltd on 7 June 2007. Bloomfield operates the CHPP and rail loading facility in accordance with the Abel Project Approval Statement of Commitments. The Abel Underground Mine is located south-east of the Colliery and is currently in 'care and maintenance'. The activities undertaken at the Colliery include:

- CHPP and associated water management.
- Rail loading facility.
- Coarse reject and tailings disposal and coal handling.

The Colliery has approval to operate 24 hours per day, seven days per week, and employs approximately 60 personnel over 15 shifts a week across its operations, including the mining, administration and maintenance areas. A range of real time and predictive monitoring is undertaken at the Colliery with the results regularly reviewed and reported annually to ensure the effective and transparent operation of management controls.

Areas within CCL 761 and ML 1738 where mining has been completed have been progressively stabilised and rehabilitated over time. To date, approximately 497 hectares of land within the Colliery area has been rehabilitated. Areas of the rehabilitated land are being used for cattle grazing and for the control of surface runoff to water storage dams or natural watercourses.

Mining at the Colliery is approved to operate until 31 December 2030 under PA 07_0087 (MOD 4).

1.2 CURRENT DEVELOPMENT CONSENTS, LEASES AND LICENCES

Table 1.1 shows the status of the Colliery's current leases, licences and approvals.

Table 1.1 Leases, Licences and Approvals

Statutory Approval	Granted	Expires	Approval Authority
Mining Lease 1738	June 2016	2037	Department of Regional NSW- Division of Mining, Exploration and Geoscience
Mining Lease CCL761	November 1991	2029	Department of Regional NSW- Division of Mining, Exploration and Geoscience
Ancillary Mining Activity 1001	August 2018	2037	Department of Regional NSW- Division of Mining, Exploration and Geoscience
Project Approval PA 07_0087 (MOD 4) Bloomfield Coal Project	September 2009	2030	Department of Planning & Environment
Project Approval PA 05_0136 Abel Coal Project	June 2007	2030	Department of Planning & Environment
Environment Protection Licence No. 396	July 2000	Renewed Annually	NSW Environment Protection Authority
Water licences	Various	Various	DPIE – Water

1.3 LAND OWNERSHIP AND LAND USE

Ashtonfields Pty Ltd owns most of the land at the Colliery covered by ML1738 and CCL761 and has done so since Bloomfield began operations at the Colliery. A long-standing Commercial Lease agreement exists between the companies.

Historic Land Use

Coal has been mined at the Colliery for approximately 170 years. Bloomfield took over the mining lease in the mid-1930s and started mining the Big Ben seam using the bord and pillar method. There was a total of three (3) seams mined underground, the Rathluba, Big Ben and Donaldson seams. Underground mining at the Colliery ceased in 1992.

Based on topographical information from 1939 areas of the Colliery were bush / 'scrub' land prior to the commencement of mining operations. These areas include:

- The former Rathluba pit top
- The CHPP area

The 'U-Cut' area appears on the 1939 topographical map as a quarry.

Current and future land use

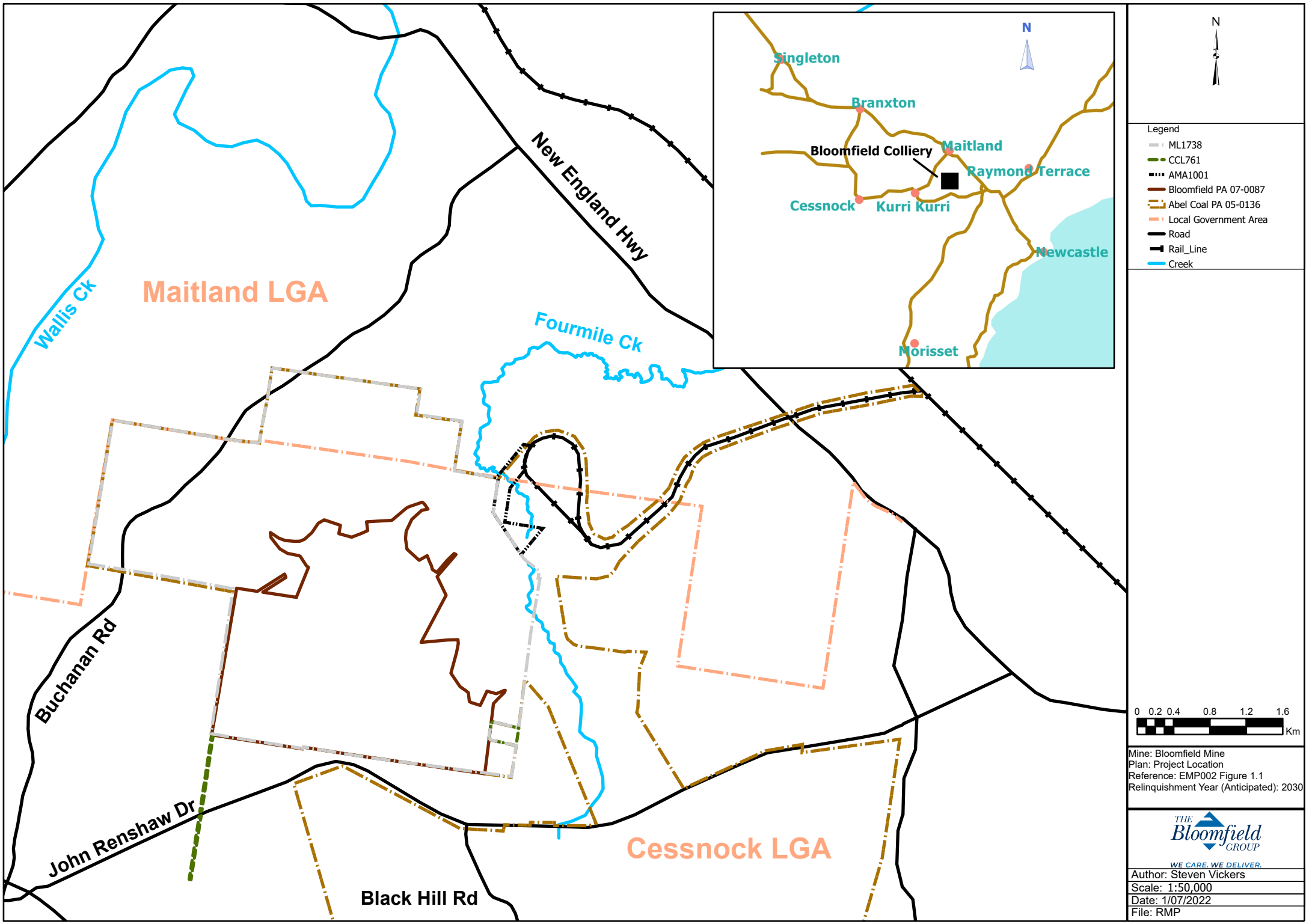
Land use within the Colliery is primarily associated with the extraction, stockpiling and transport of coal. The land consists of active mining areas and associated infrastructure (that is, hardstands, laydown areas, roadways, overburden stockpiles, dams, drains), rehabilitated mined areas and undisturbed vegetated areas (Refer Figure 1.2). There is also a Hunter Water Corporation easement for two water supply reservoirs and trunk mains. A schedule of land ownership is provided in Appendix 1 - Land Ownership and Figure 1.3.

Bloomfield has established one Biodiversity Offset Area, Lot 2371 DP 1170348 at the western end of Thursbys Road, off Congewai Road in the Cessnock Local Government Area. The Biodiversity Offset Area is 40 hectares in size.

Final land uses considered in previous Mining Operations Plan and Environmental Assessment documents for the Colliery include residential, industrial, open forest / bushland or undulating grazing land / rural landscape. Further discussion regarding final land use options is provided in Section 2.2.

As the Colliery and surrounding area has been identified as having potential for future uses that benefit from the post-mining infrastructure and landscape, rehabilitation is to be completed in such a way that does not conflict with this future potential land use.

1.3.1 Land Ownership and Land Use Figures


Maitland LGA
Cessnock LGA
Wallis Ck
Fourmile Ck
New England Hwy
Buchanan Rd
John Renshaw Dr
Black Hill Rd
N
Singleton
Branxton
Bloomfield Colliery
Maitland
Raymond Terrace
Cessnock
Kurri Kurri
Newcastle
Morisset
Legend
ML1738
CCL761
AMA1001
Bloomfield PA 07-0087
Abel Coal PA 05-0136
Local Government Area
Road
Rail_Line
Creek
0 0.2 0.4 0.8 1.2 1.6
Km
Mine: Bloomfield Mine
Plan: Project Location
Reference: EMP002 Figure 1.1
Relinquishment Year (Anticipated): 2030
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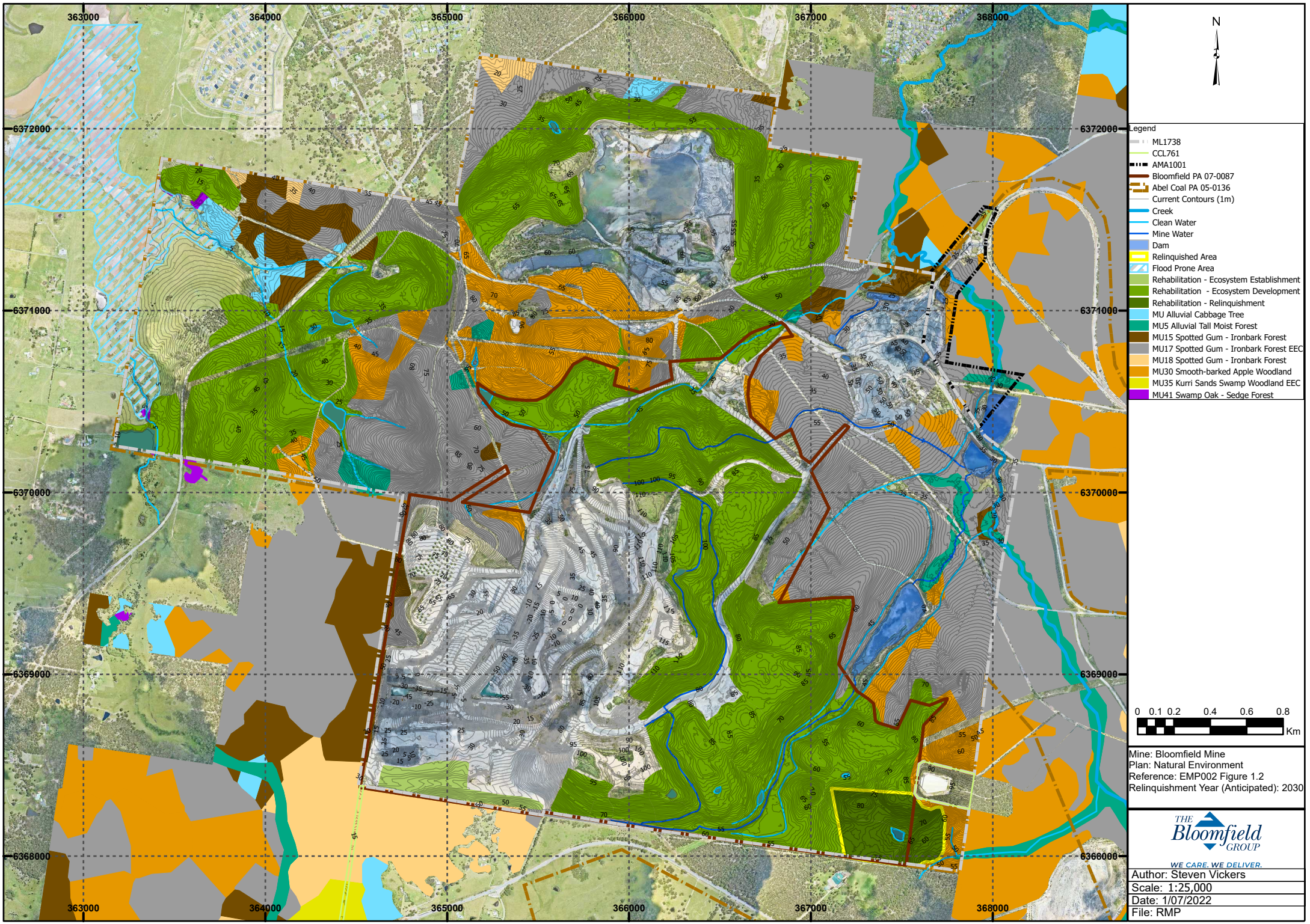

Mine: Bloomfield Mine
Plan: Natural Environment
Reference: EMP002 Figure 1.2
Relinquishment Year (Anticipated): 2030

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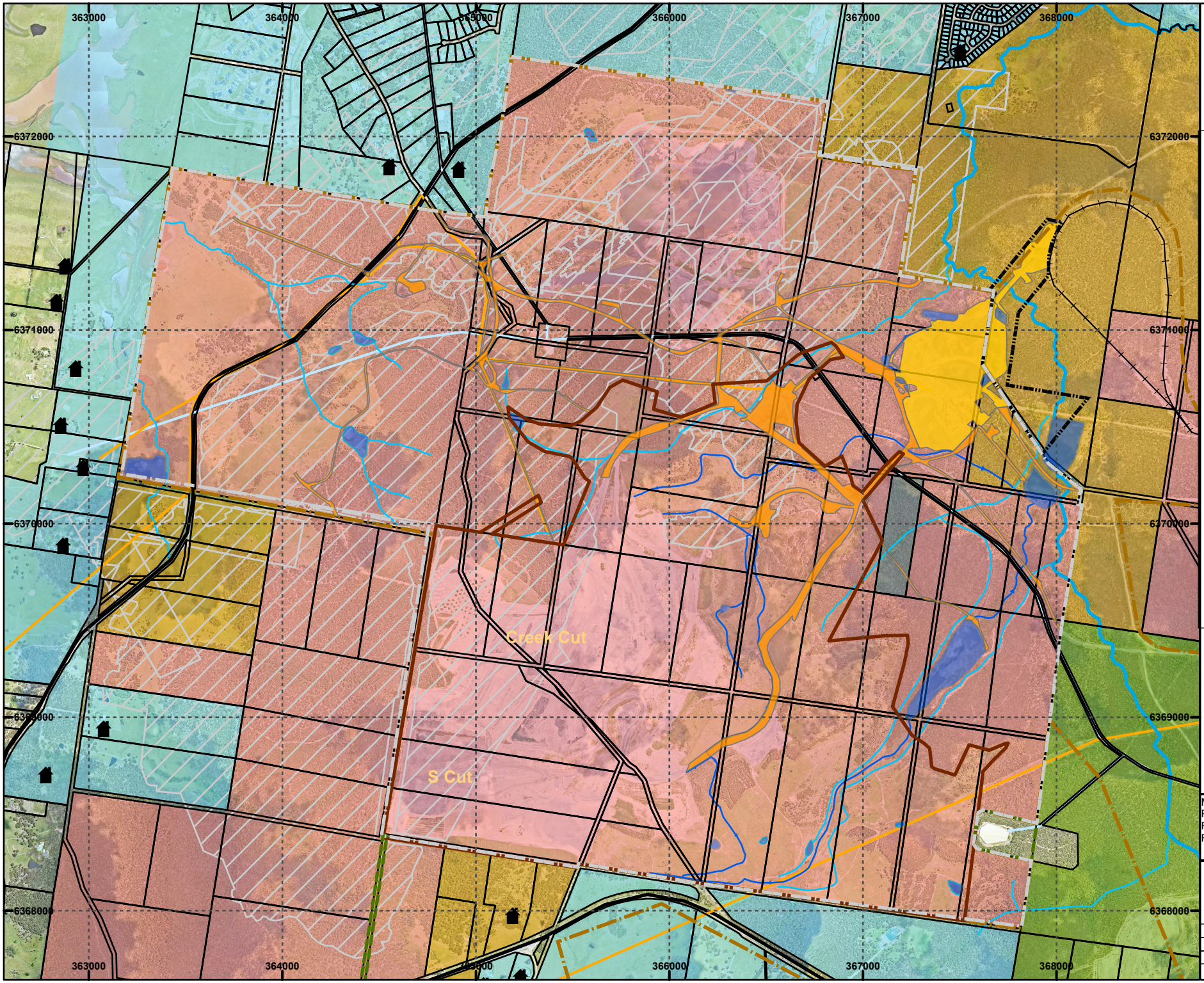

Mine: Bloomfield Mine
Plan: Built Environment
Reference: EMP002 Figure 1.3
Relinquishment Year (Anticipated): 2030

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Scale: 1:25,000
Date: 1/07/2022
File: RMP

2. Final Land Use

2.1 REGULATORY REQUIREMENTS FOR REHABILITATION

The Colliery operates in accordance with a number of developments consents, mining leases, licences and other approvals containing requirements pertaining to rehabilitation at the Colliery. These are listed below and discussed further in Appendix 2 - Regulatory Requirements for Rehabilitation.

- Project Approval PA 07_0087 Bloomfield Coal Project.
- Project Approval PA 05_0136 Abel Coal Project.
- Mining Lease 1738.
- Mining Lease CCL 761.
- Ancillary Mining Activity 1001.
- Environmental Protection Licence No. 396.

A map of the project approval and mining lease areas is presented in Figure 1.1.

2.2 FINAL LAND USE OPTIONS ASSESSMENT

Multiple final land use options were assessed as part of the 2008 EA and 2017 EA (MOD4) with grazing land / rural landscape selected as the approved final land use. Alternative land uses that benefit from the post-mining infrastructure and landscape were considered suitable potential alternatives, and as such, the colliery is to be rehabilitated in a way that does not conflict with these. The final landform will be developed to create a stable, undulating landscape with a mix of pasture and tree areas suitable for grazing. Should no such future development eventuate, the Colliery would remain as a stable, rural landscape. The final landform is presented in Section 5.

2.3 FINAL LAND USE STATEMENT

The final land use and rehabilitation objectives for the Colliery are outlined in Table 5 of Schedule 3 Condition 25 of PA 07_0087 and requires Bloomfield to rehabilitate the site to the satisfaction of NSW Resources Regulator and therefore in accordance with the conditions imposed on the mining lease under the *Mining Act*. The rehabilitation of the site must be consistent with the method described in the EIS Mod 4 (AECOM 2018) and be consistent with the conceptual landform as shown in Appendix 4 of PA 07_0087.

2.4 FINAL LAND USE AND MINING DOMAINS

2.4.1 Final land use domains

In accordance with the Form and Way: Rehabilitation Management Plans for Large Mines guideline (NSW Resources Regulator, 2021), the Mining Domains have been defined on the premise of land management units or areas disturbed for discrete mining related activities within the Colliery. The domains have a unique operational and functional purpose and therefore similar geophysical characteristics. Final land use domains are defined as land management units characterised by a similar post mining land use objective. Final land use domains are described in Table 2.1.

Table 2.1 Final land use domains

Domain	Description
Final Void	Final void located in the northern extension of S Cut where it will join with Creek Cut. Final void dimensions will be determined during detailed closure planning. Design will seek to minimise the overall size and depth of the void. Water holding features of the final landscape. The forecasted peak Final void water level is predicted to be 18 m AHD.
Water Management Areas and Water Storage Area	Water management areas: Existing drainage lines to be retained, or drainage lines to be modified/constructed Water storage area: Lake Kennerson, Lake Foster, W Cut, Possums Puddle and small unnamed dams.
Agricultural - Grazing	Areas rehabilitated to pasture, and areas rehabilitated to trees over pasture for grazing.
Infrastructure	Infrastructure to be retained will be confirmed during detailed closure planning and in agreement with the landowner. Final land use plans indicated that power and water management infrastructure; rail facilities and access roads will be retained following closure. The CHPP may also be retained, dependant on the requirements of Yancoal's Abel Underground Mine.

2.4.2 Mining domains

The Colliery has been split into mining domains for the purpose of rehabilitation. These domains are described in Table 2.2.

Table 2.2 Mining domains

Domain	Description
Infrastructure Area	Major infrastructure on site, including workshop areas, roads, warehouses, utilities and services, etc.
Tailing Storage Facility	Tailings emplacement areas in U-Cut Tailings Storage Facility (TSF). Also includes legacy areas at Save-a-Mile.
Water Management Area	Lake Kennerson and Lake Foster. Also includes major sediment control dams and drainage systems (such as pipes and pumps).
Overburden Emplacement Area	Placement of overburden in areas behind active mining area.
Active Mining Area	The location of current mining activities in S Cut and Creek Cut.
Other – Growth Medium Stockpile Area	Stockpile storage areas around the Colliery.
Beneficiation facility	The CHPP and associated infrastructure.
Underground Mining Area (SMP)	Areas of the Colliery that have been historically mined using underground methods.

3. Rehabilitation Risk Assessment

In accordance with Form and Way: Rehabilitation Management Plans for Large Mines guideline (NSW Resources Regulator, 2021) a Rehabilitation Risk Assessment (RRA) was conducted to evaluate the environmental issues associated with the mining operations. The aim of the RRA is to identify and present effective management protocols for environmental risks to rehabilitation. The following specific aims and objectives have been established for the RRA:

- Identify the activities, aspects and possible impacts to rehabilitation throughout the rehabilitation phases.
- Identify the current controls (that are already in place) to mitigate or minimise the potential for the impacts in order to reduce the risk to as low as reasonably practicable.
- Identify potential controls that may assist to either eliminate or mitigate other likely impacts.
- Determine the residual risk and ensure that is it appropriately low enough given the sensitivities of the project location.
- Identify where each risk and associated risk control is addressed in the RMP.

3.1 REHABILITATION RISK ASSESSMENT

A bowtie risk assessment process was followed utilising the existing RRA to update and meet the requirements for NSW Resources Regulator. The bowtie was pre-populated prior to the workshop with the knowledge from the previous RRA and the guidance material provided by the regulator. The bowtie was then reviewed in a series of workshops held on the 24th and 26th of May 2022.

The workshop was facilitated by an independent risk advisor and used the experience of those in attendance to demonstrate site knowledge and experience.

3.2 RISK WORKSHOP OUTCOMES

3.2.1 Scope

The center of the bowtie (i.e., hazard) was defined as: Failure to relinquish site and successfully rehabilitate.

3.2.2 Causes

Causes were grouped into pathways based on the phase of rehabilitation. The phases were taken from the Guideline for Rehabilitation Risk Assessment (Version 1) by the NSW Resource Regulator, Table 1. A total of 29 causes were identified.

3.2.3 Controls

Controls to the causal events were identified, which included both current and potential future controls. A total of 47 controls were identified. The effectiveness of each existing control was assessed.

3.2.4 Critical Controls

Critical controls were selected based on the ICMM guidelines (International Council on Mining Minerals 2015, Health and Safety Critical Control Management: Good Practice Guide) for critical control selection.

A total of three critical controls were selected on the bowtie diagram and are marked with a red boder. These were:

- Detailed Mine Closure Planning.
- Rehab Monitoring Program.
- Rehabilitation Management Plan.

3.2.5 Consequences

A total of 7 consequences were identified and the associated risk was determined based on the current controls and their assessed effectiveness.

3.2.6 Bowtie Diagram

The RRA bowtie is provided in Appendix 4 - Risk Assessment – Bowtie Diagram.

4. Rehabilitation Objectives and Rehabilitation Completion Criteria

In accordance with the Form and Way: Rehabilitation Management Plan for Large Mines (NSW Resources Regulator, 2021), the objectives, measures and indicators for each domain have been defined. This includes the following:

- Identification of performance indicators of the biophysical environment or where applicable; the built environment that can be measured reliably over time using accepted scientific techniques and standards i.e., Australian Standards.
- Establishment of the performance/completion criteria for each indicator which quantitatively demonstrates rehabilitation.
- Nomination and justification of validation method. Validation measures are used to quantify the rehabilitation and land management programme in terms of efficiency or effectiveness and establish the indicative timeframes for completion, and the standards of completion.

The rehabilitation objectives for the Colliery are described in Schedule 3 Condition 25 Table 5 of PA 07_0087. These objectives are presented in Table 4.1.

Table 4.1 Rehabilitation objectives as described in Schedule 3 Condition 25 of PA 07_0087

Feature	Objective
All areas of the site affected by the project	• Safe, stable and non-polluting • Fit for the intended post-mining land use/s
Areas proposed for native ecosystem re-establishment	• Restore self-sustaining native woodland ecosystems characteristic of vegetation communities found in the local area • Establish areas of self-sustaining: - riparian habitat, within any diverted and/or re-established creek lines and retained water features - potential habitat for threatened flora and fauna species - wildlife corridors, as far as is reasonable and feasible
Areas proposed for agricultural land	• Establish/restore grassland areas to support sustainable agricultural activities • Achieve the nominated land capability classification
Other land affected by the development	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native plant species (unless DRG agrees otherwise)

Final Landform	• Stable and sustainable for the intended postmining land use/s • Integrated with surrounding natural landforms • Incorporate micro-relief and drainage lines that are consistent with surrounding topography, to the greatest extent practicable • Maximise surface water drainage to the natural environment (excluding final void catchment)
Final voids	• Designed as long term groundwater sinks to maximise ground water flows across back filled pits to the final void • Minimise to the greatest extent practicable: - the size and depth of final voids - the drainage catchment of final voids - any high wall instability risk - the risk of flood interaction
Creek restoration works	• Engineered to be hydraulically and geomorphologically stable • Incorporate erosion control measures based on vegetation and engineering revetments • Incorporate structures for aquatic habitat • Revegetate with suitable native species
Surface infrastructure of the development	• To be decommissioned and removed, unless DRG agrees otherwise
Rehabilitation materials	• Materials from areas disturbed under this consent (including topsoils, substrate and seeds) are to be recovered, managed and used as rehabilitation resources, to the greatest extent practicable
Water quality	• Water retained on the site is fit for the intended post-mining land use/s • Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation
Community	• Ensure public safety • Minimise adverse socio-economic effects associated with mine closure

Rehabilitation objectives are also included in the approval for the Abel Underground Mine (PA 05_0136). Objectives of this project approval are consistent with PA 07_0087. Rehabilitation undertaken under PA 05_0136 is the responsibility of Yancoal who operate Abel Underground Mine. The rehabilitation completion criteria have been prepared to set the benchmark values for key indicators, to demonstrate that rehabilitation objectives have been met.

Completion criteria provide a defined end point at which time rehabilitation can be deemed successful and the mining lease relinquishment process can proceed. The rehabilitation completion criteria have been developed to be consistent with the proposed final land use for the site. Rehabilitation objectives and completion criteria will be refined during detailed mine closure planning, based on the outcomes of technical studies, detailed design and consultation with key stakeholders.

This information is provided for all defined final land use domains in Section 2.4.1 .

4.1 Rehabilitation Objectives and Rehabilitation Completion Criteria

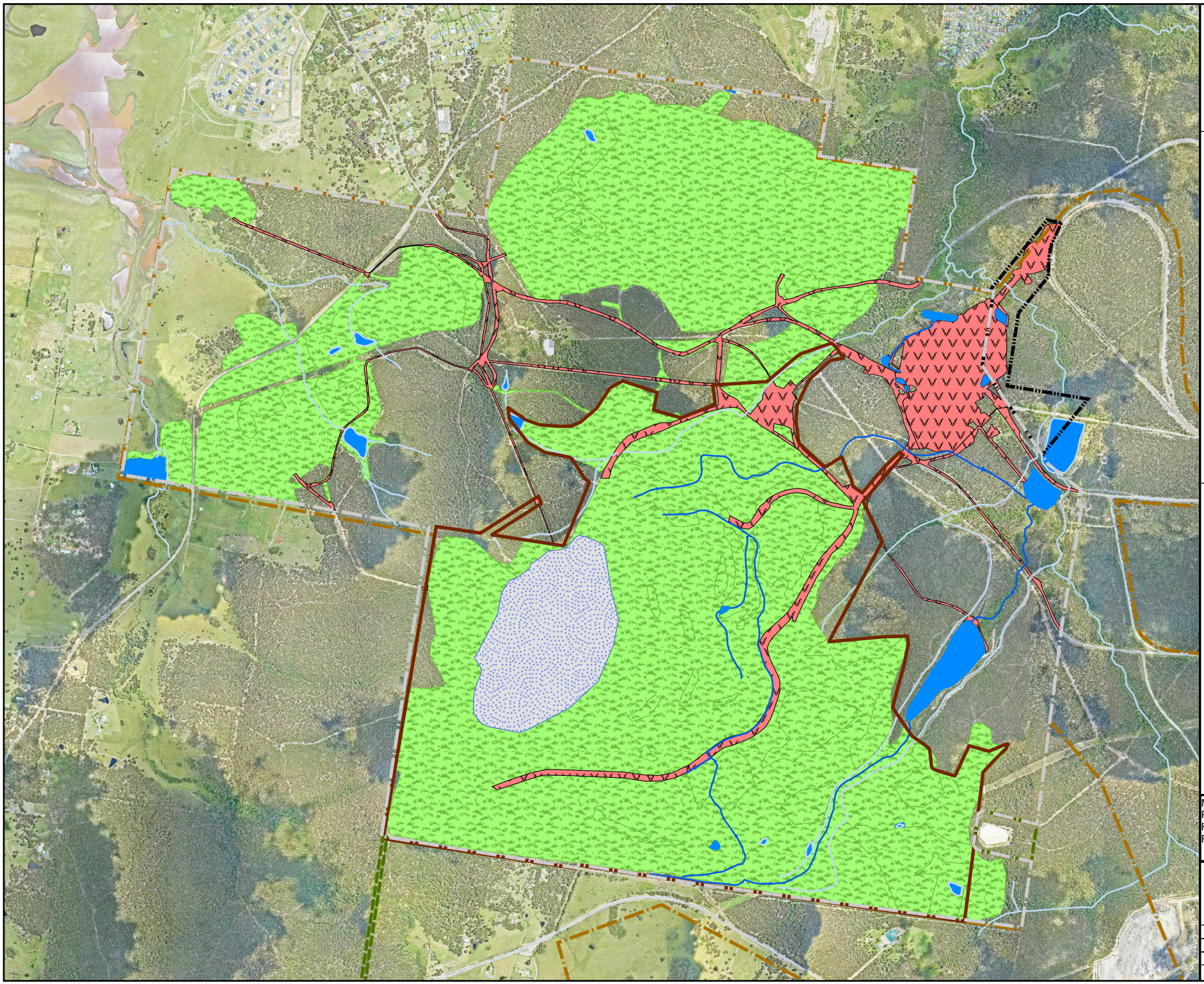
Rehabilitation objectives and completion criteria presented in Criteria will be further refined during detailed mine closure planning and consultation with key stakeholders and are required to be approved by NSW Resources Regulator.

4.2 Rehabilitation Objectives and Rehabilitation Completion Criteria – Stakeholder Consultation

Consultation was undertaken with various stakeholders in the development of the final landform during the Environmental Assessment process. Consultation and outcomes are described in Section 2.2. Rehabilitation objectives for each feature of the final landscape have been approved under PA 07_0087.

5. Final Landform and Rehabilitation Plan

5.1 FINAL LANDFORM AND REHABILITATION PLAN – ELECTRONIC COPY



N

Legend

- ML1738
- CCL761
- AMA1001
- Bloomfield PA 07-0087
- Abel Coal PA 05-0136
- Water Dirty
- Water Clean

Final_Landuse

Final Landuse Domain

- Agricultural – Cropping
- Agricultural – Grazing
- Rehabilitation Biodiversity Offset Area
- Final Void
- Heritage Area
- Industrial
- Infrastructure
- Native Ecosystem
- Water Management Areas
- Water Storage (Excluding Final Void)
- Other

0 0.1 0.2 0.4 0.6 0.8 km

Mine: Bloomfield Mine
Plan: Final Landuse
Reference: EMP002 Figure 5.1
Relinquishment Year (Anticipated): 2030

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N

Legend

- ML1738
- CCL761
- AMA1001
- Bloomfield PA 07-0087
- Abel Coal PA 05-0136
- Final_Landform_Contours

0 0.1 0.2 0.4 0.6 0.8 km

Mine: Bloomfield Mine
Plan: Final Contours
Reference: EMP002 Figure 5.2
Relinquishment Year (Anticipated): 2030

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File: RMP

6. Rehabilitation Implementation

6.1 LIFE OF MINE REHABILITATION SCHEDULE

This section describes the rehabilitation schedule over the life of the mine, from the commencement of the rehabilitation management plan until lease relinquishment.

The current development consent for the Colliery is approved under PA 07_0087 (Mod 4) Bloomfield Coal Project. The CHPP, associated infrastructure and the U-Cut TSF is approved under PA 05_0136 Abel Coal Project. Both approvals are valid until the 31 December 2030.

Mining activities at the Colliery are expected to continue until 2025, with progressive rehabilitation undertaken during the active mining phase. Following cessation of production, priority will be given to the completion of rehabilitation along the southern boundary of the site.

The timing of key activities associated with the rehabilitation schedule are described below and shown in Figure 6.1 to Figure 6.6.

- 2025: Completion of mining and closure of the Colliery.
- 2025-2027: Decommissioning of the Colliery, including:
    - Removal of infrastructure.
    - Capping of U-Cut TSF.
    - Hazardous material remediation and disposal.
    - Optional: Fillings of smaller void with tailings from Abel Underground Mine (if operation restarts).
- Ongoing from 2027: Final landform construction, including:
    - Construction of final void, overburden shaping, bulk earthworks.
    - Progressive rehabilitation where applicable.
    - Continued capping and establishing drainage network at U-Cut TSF.
- Ongoing from 2027: Growth medium and ecosystem development work.
    - This work will follow landform establishment works as they progress.
- 2027-2030 onwards: Ecosystem and land use development until the site meets completion criteria and is relinquished.

The final landform is based on the following assumptions:

- The final landform will be constructed in general accordance with the conceptual final landform as approved under PA 07_0087 Appendix 4 (Plan 4A) with no further allowance for the Abel Coal Project (other than described above).
- The U-Cut TSF as approved under PA 05-0136 Abel Coal Project will be capped.
- Any variation to the final land use outside the Project Approval will require either Project Modification or subsequent separate Development Approval under the *NSW Environmental Planning and Assessment Act 1979.*
- The CHPP, associated conveyors and structures and tailings emplacement areas as approved under PA 05-0136 Abel Coal Project will be demolished and rehabilitated pending requirements of Yancoal. (If a decision is made by Yancoal to continue to utilise the CHPP, Bloomfield will investigate options to transfer the responsibility of the Mining Lease at time of Colliery closure to Yancoal).
- The Bloomfield rail loop is approved under DA 103-5-242-90 (Maitland Council) and is outside ML1738 and CCL761.

The life of mine rehabilitation schedule is shown in plans Figure 6.1 to Figure 6.6 below.


N
Legend
ML1738
CCL761
AMA1001
Bloomfield PA 07-0087
Abel Coal PA 05-0136
Forecast_Data_Year1
Forcast Area
Forecast Disturbance
Forecast Land Prepared for Rehabilitation
Ecosystem and Land Use Establishment
0 0.1 0.2 0.4 0.6 0.8
km
Mine: Bloomfield Mine
Plan: Forecast Data Year 1 (2022)
Reference: EMP002 Figure 6.1
Relinquishment Year (Anticipated): 2030
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N
Legend
ML1738
CCL761
AMA1001
Bloomfield PA 07-0087
Abel Coal PA 05-0136
Forecast_Data_Year2
Forcast Area
Forecast Disturbance
Forecast Land Prepared for Rehabilitation
Ecosystem and Land Use Establishment
0 0.1 0.2 0.4 0.6 0.8
km
Mine: Bloomfield Mine
Plan: Forecast Data Year 2 (2023)
Reference: EMP002 Figure 6.2
Relinquishment Year (Anticipated): 2030
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N
Legend
ML1738
CCL761
AMA1001
Bloomfield PA 07-0087
Abel Coal PA 05-0136
Forecast_Data_Year3
Forcast Area
Forecast Disturbance
Forecast Land Prepared for Rehabilitation
Ecosystem and Land Use Establishment
0 0.1 0.2 0.4 0.6 0.8
km
Mine: Bloomfield Mine
Plan: Forecast Data Year 3 (2024)
Reference: EMP002 Figure 6.3
Relinquishment Year (Anticipated): 2030
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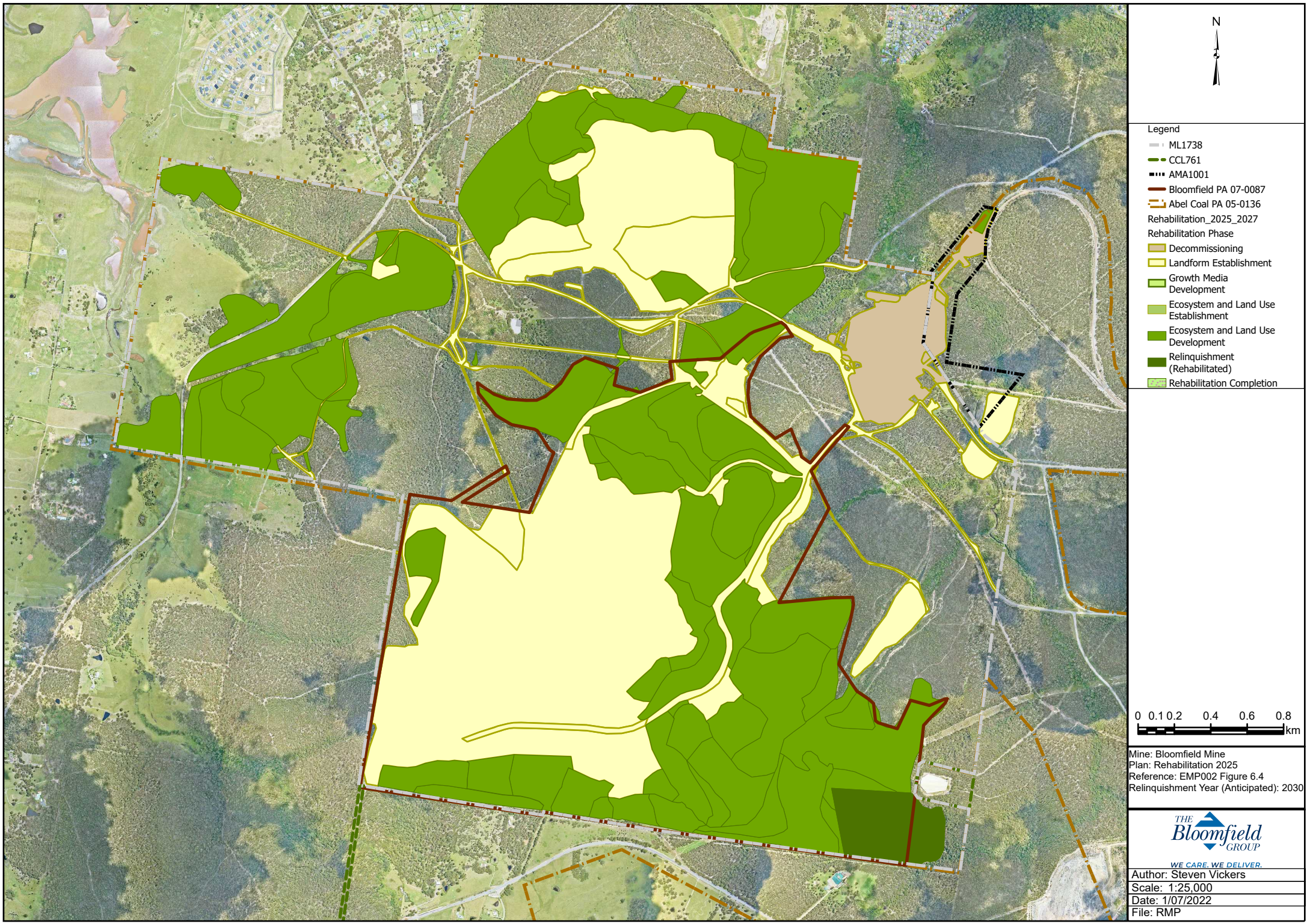
Date: 1/07/2022
File: RMP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ML1738
CCL761
AMA1001
Bloomfield PA 07-0087
Abel Coal PA 05-0136
Rehabilitation_2025_2027
Rehabilitation Phase
Decommissioning
Landform Establishment
Growth Media Development
Ecosystem and Land Use Establishment
Ecosystem and Land Use Development
Relinquishment (Rehabilitated)
Rehabilitation Completion
0 0.1 0.2 0.4 0.6 0.8
km
Mine: Bloomfield Mine
Plan: Rehabilitation 2025
Reference: EMP002 Figure 6.4
Relinquishment Year (Anticipated): 2030
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Date: 1/07/2022
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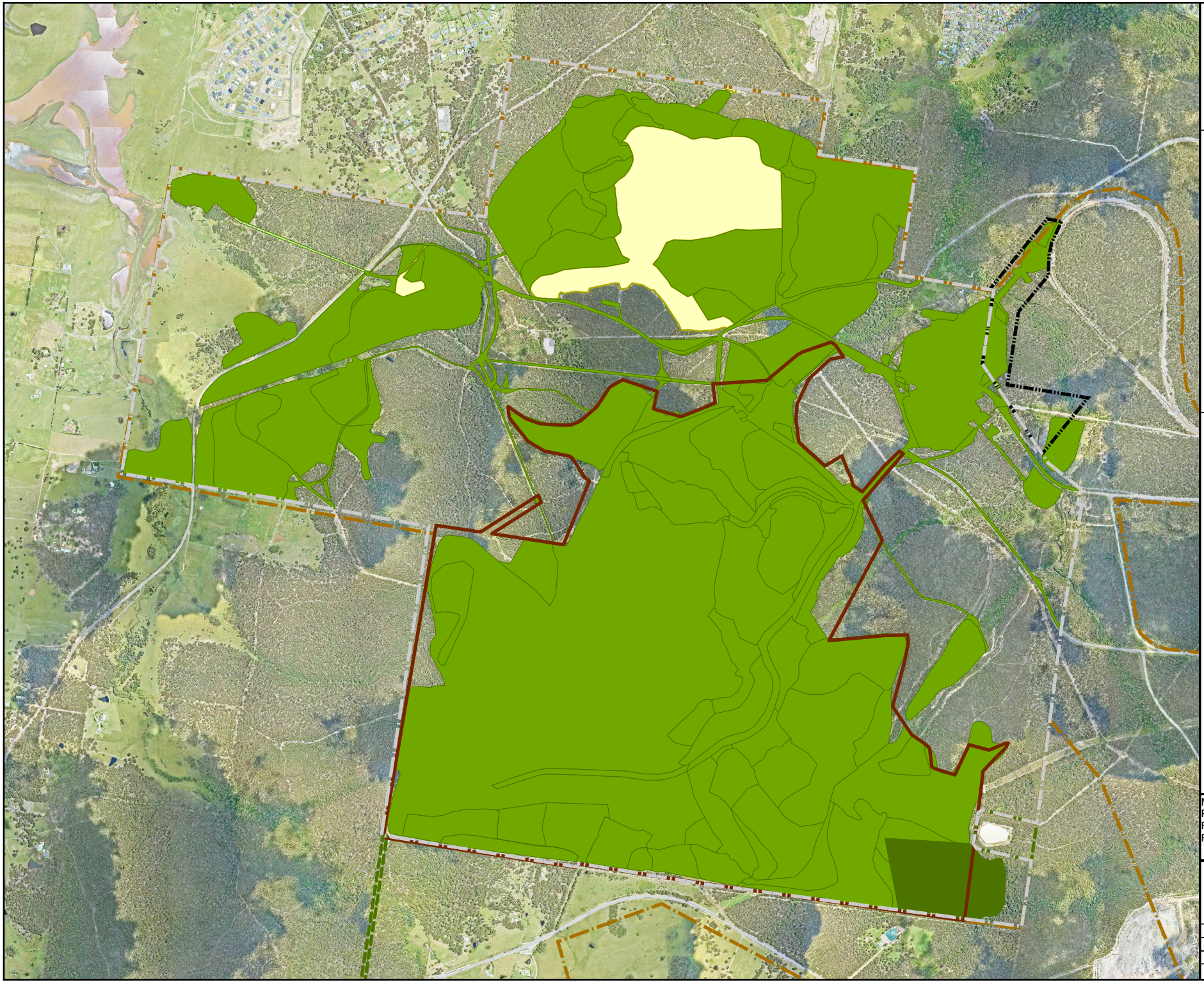
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Legend
ML1738
CCL761
AMA1001
Bloomfield PA 07-0087
Abel Coal PA 05-0136
Rehabilitation_2027_2032
Rehabilitation Phase
Decommissioning
Landform Establishment
Growth Media Development
Ecosystem and Land Use Establishment
Ecosystem and Land Use Development
Relinquishment (Rehabilitated)
Rehabilitation Completion
0 0.1 0.2 0.4 0.6 0.8
km
Mine: Bloomfield Mine
Plan: Rehabilitation 2027
Reference: EMP002 Figure 6.5
Relinquishment Year (Anticipated): 2030
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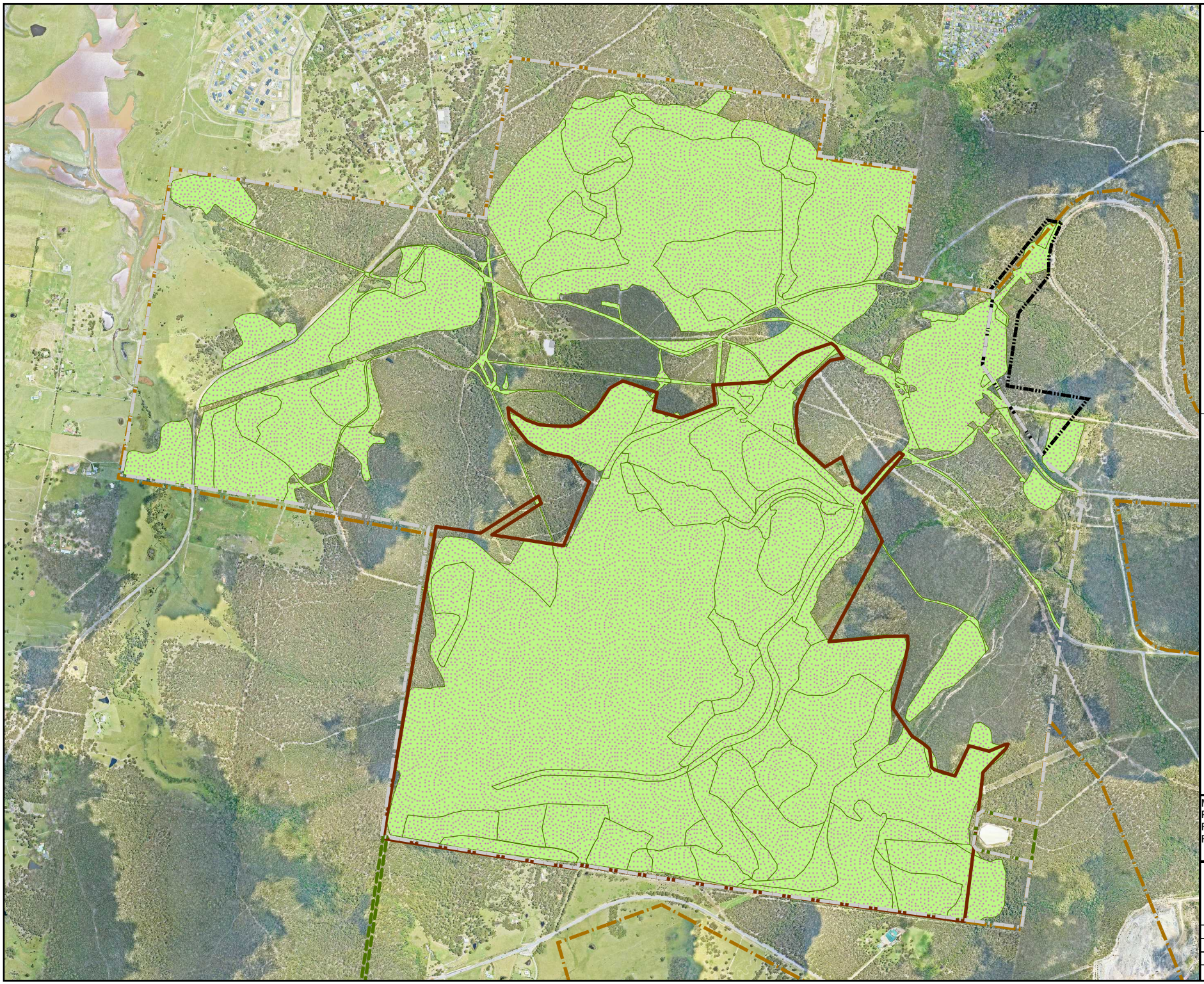
Scale: 1:25,000
Date: 1/07/2022
File: RMP


N
Legend
ML1738
CCL761
AMA1001
Bloomfield PA 07-0087
Abel Coal PA 05-0136
Rehabilitation_2032
Rehabilitation Phase
Decommissioning
Landform Establishment
Growth Media Development
Ecosystem and Land Use Establishment
Ecosystem and Land Use Development
Relinquishment (Rehabilitated)
Rehabilitation Completion
0 0.1 0.2 0.4 0.6 0.8
km
Mine: Bloomfield Mine
Plan: Rehabilitation 2030
Reference: EMP002 Figure 6.6
Relinquishment Year (Anticipated): 2030
THE Bloomfield GROUP
WE CARE. WE DELIVER.
Author: Steven Vickers
Scale: 1:25,000
Date: 1/07/2022
File: RMP

6.2 Phases Of Rehabilitation And General Methodologies

This section describes the phases of rehabilitation that will be undertaken at the Colliery to achieve the rehabilitation outcomes and final land use. The final land use for the Colliery would provide for a safe and stable landform, comparable with the surrounding landscape allowing for a range of possible post-mining land uses. Land capacity would be fit for the post mining land use as described in Section 2.2 and **2.3**. Phases of rehabilitation are described in Table 6.1.

Table 6.1 Rehabilitation phases

Phase	Description
Active mining	Activities undertaken as part of active mining that are associated with rehabilitation include: Topsoil management; flora and fauna management; overburden emplacement; waste management; geology and geochemistry; spontaneous combustion; reject/tailings; erosion and sediment control; biological resources; mine subsidence; cultural heritage and exploration activities.
Decommissioning	Removing infrastructure; hardstands; plant; equipment; buildings and other structures; contaminated and hazardous materials.
Landform establishment	Shaping unformed rock or other sub stratum material into a desired land surface profile including final landform and drainage features. This phase includes substrate material characterization, hazardous material encapsulation and earthworks to achieve safe and stable slopes with the desired gradients and landscape characteristics.
Growth medium development	Establishing and enhancing physical structure, chemical properties and biological properties of a soil stratum for plant growth. This includes placing and spreading soil and applying ameliorants.
Ecosystem and land use establishment	Seeding, planting and transplanting plant species. Incorporates management actions such as weed and feral pest control to achieve species establishment and growth to juvenile communities and habitat augmentation.
Ecosystem and land use development	Applying management techniques to encourage an ecosystem to grow and develop towards a desired and sustainable post mining land use outcome. Incorporates features including species reproduction, nutrient recycling and community structure.
Rehabilitation completion	Completion criteria for rehabilitation are met and the land is determined to be suitable to be relinquished for the mining tenement.

6.2.1 Active Mining Phase

This section summarises the risks and opportunities for rehabilitation associated with the active mining phase across the mining domains.

a. **Soils and materials**

This subsection describes the process currently implemented at the Colliery to identify, quantify, characterise and assess the suitability of material resources for rehabilitation.

The geology of the Colliery is of Paleozoic, Late Permian sandstone which makes up the Tomago Coal Measures. Sediments above between and below the coal seams comprise predominantly interbedded mudstone, siltstone and sandstone. Drainage lines contain Quaternary Alluvial Valley Deposits, which consist of silt, clay, lithic to quartz-lithic sand and gravel. A review of the Soil Landscapes of the Newcastle 1:100 000 Sheet (Matthei, 1995) indicates that the derived soils are comprised of the Shamrock Hill, Beresfield and Wallis Creek soil landscapes. There are several areas of disturbed terrain within the Colliery.

Soil is stripped during the active mining phase prior to open cut mining occurring. Prior to any soil disturbance, a Permit to Disturb is completed to identify environmental issues associated with disturbance. Boundaries of clearing are clearly marked prior to stripping being commenced. The Permit to Disturb is approved by the Environmental Advisor prior to works commencing. Excavated topsoil is placed into haul trucks, transport and then placed on overburden dumps in preparation for rehabilitation. Non-bedrock soil horizons are free dug as they do not require blasting prior to removal. The current soil resource management activities occurring at the Colliery are summarised in Table 6.2.

Table 6.2 Soil Resource Management Activities

Soil stockpile material

Prior to Commencement of Stripping Activities	During Stripping and Stockpiling Activities	Prior to and During Rehabilitation Activities
• Quantify the soil resource including soil testing todetermine of any ameliorants are required. • Characterise the suitability of material for rehabilitationpurposes. • Formulate stripping andstockpiling guidelines specific to each activity. • Guidelines are to include nomination of appropriate depth and scheduling to minimise the total areadisturbed or stockpiled at any one time. • Location of areas to be stripped and stockpile locations mapped.	• Minimise over-clearing. • Keep vehicular traffic to a minimum on the soils to be stripped. Exclude all traffic from soils that are sensitive to structural degradation. • Use loaders and trucks rather than scrapers to minimise structural degradation. • Selective stockpiling of soil according to type (i.e. topsoil, subsoil). • Storage of soil in a manner that does not compromise the long-term viability of the resource. • Weed management to prevent germination/succession of exotic species. • Stripping of soil will occur when the soil is moist to reduce dust and air quality impacts.	• Stockpiles to be sampled prior to re-use to characterise suitability for use in rehabilitation and determine what amelioration may be required. • Implement amelioration measures to ensure the long-term viability of the soil resource and manage salinity. • Progressive rehabilitation of final landforms as soon as practicable after completion of mine-related disturbance activities.

Existing stockpiles on site are used as the primary source of soil for rehabilitation activities. Material in stockpiles has been categorised as Non-Stony Topdressing and Stony Topdressing are characterised in Table 6.3.

Table 6.3 Stockpile characterisation (Landloch, 2021)

Characteristic	Non-Stony Topdressing	Stony Topdressing
Composition	Generally gravelly dark brown, sometimes red, sandy loam to clay loam textured materials with coarse fragment content < 10 %	Coarse fragment content 10-40%
Acidity	Generally, highly acidic (pH1:5 4.3–5.2) with increased potential for aluminium toxicity induced limitations	Comparable to Non-Stony Topdressing
Salt load	Salt levels are moderate (EC < 0.4 dS/m) with low levels of chloride-based salts (chloride < 100 mg/kg)	
Dispersive	Generally non-dispersive and non-sodic	Dispersive and sodic
Organic matter content	Moderate levels of organic matter	Comparable to Non-Stony Topdressing
Nutrient status	Nutrient status is generally low	
Soil erodibility	Soil erodibility K factor 0.021–0.039 (moderate rating)	
Root content	Roots were readily noticeable	

The soil characteristics of the Stony and Non-Stony Topdressing is considered comparable to the non-mined soil samples within the Colliery. Section 6.2.4 outlines how soil will be tested and ameliorated for use in rehabilitation.

Overburden material

After blasting, loose overburden material is removed by excavator and placed onto rear dump haul trucks for hauling to overburden emplacements. Soil characterisation identified two classifications applicable, being Grey Overburden and Brown Overburden. Characteristics of the overburden material are described in Table 6.4.

Table 6.4 Overburden characterisation (Landloch, 2021)

Characteristic	Grey Overburden	Brown Overburden
Composition	Gravelly grey waste rock materials with the fines component clay loam textured	Gravelly brown waste rock materials with fines component clay loam textured
Acidity	Generally, mildly alkaline (pH1:5 7.5–7.9), with highly acidic (pH1:5 4.1) exceptions	Highly acidic (pH1:5 4.6–5.4) with increased for aluminium toxicity induced limitations

Salt load	Salt levels range from low to high (EC 0.1–0.9 dS/m) with low levels of chloride-based salts (chloride < 100 mg/kg)	Salt levels range from low to high (EC 0.1–0.5 dS/m), however chloride-based salts are low (chloride < 100 mg/kg)
Dispersive	Generally non-dispersive and non-sodic	Generally non-dispersive, but sodic
Organic matter content	Low organic matter content	Low organic matter content
Nutrient status	Low nitrogen and phosphorus fertility	Low nitrogen and phosphorus fertility
Soil erodibility	Soil erodibility K factor 0.031–0.037	Soil erodibility K factor 0.034–0.041 (moderate rating)
Root content	Sample locations were absent of vegetation	No vegetation on sample locations

Estimated material quantities

There is approximately 780,000 m^3 of growth medium stockpiled at the Colliery. This would be supplemented by overburden that has been improved though soil amelioration. A strategy for reuse of material potentially adverse to rehabilitation will be developed during detailed closure planning.

The material balance for rehabilitation will be determined following landform evolution modelling.

b. **Flora**

This subsection describes the management of resources required to establish flora species in rehabilitation. Approved final land use at the Colliery is grazing on pasture and trees over pasture. Measures currently implemented at the Colliery to manage flora are:

- All areas that are approved to be cleared are defined prior to clearing.
- Conservation of existing native vegetation in non-disturbed areas of the Colliery.
- Disturbed areas are progressively rehabilitated.
- Rehabilitation and disturbance are scheduled to reduce the footprint of the mining operations.
- Access is restricted around rehabilitated areas.
- Vegetation control for bushfire management, in consultation with the Rural Fire Service (RFS).
- Noxious weeds are controlled by various means, including:
    - Regular inspections for weeds, particularly in revegetated areas.
    - Slashing and spraying areas identified as containing weeds.
- Stock is excluded from areas under rehabilitation.

Seed for rehabilitation is procured though local suppliers or collected from species on site if seasonal conditions permit. Pasture seed is procured through local suppliers.

c. **Fauna**

This subsection describes the management of fauna, including habitat management, habitat augmentation and pest control.

Measures currently implemented at the Colliery to manage fauna impacts are:

- In approved clearing area, removal of mature trees is undertaken in late spring to early autumn where possible, to avoid spring nesting birds and disturbance to roosting bats over the winter period.
- Prior to clearing commencing, mature trees are inspected for nesting or roosting habitat prior to each clearing event.
- Nesting or roosting hollows as well as nests are relocated to nearby locations.
- Felled hollow-bearing trees, hollow logs and rocks are salvaged during clearing. These habitat features are moved to nearby rehabilitated areas for habitat enrichment.
- Implement weed control as per Section 6.2.1 b.
- Implementation of progressive rehabilitation.

In addition to the measures above, feral dog baiting is undertaken at the Colliery. This is done in conjunction with surrounding mines and is undertaken on an as needs basis.

d. **Rock overburden and emplacement**

This subsection describes the areas identified for emplacements and capping, the sequencing of construction and management to facilitate sustainable landform design.

Mining domains identified for overburden emplacement are:

- Overburden Emplacement Area.
- Active Mining area.

Overburden dumps are recontoured into the final landform during active mining. Slopes of the overburden emplacement are generally less than 10 degrees and up to a maximum of 18 degrees. Any coarse reject emplacements integrated into the final landform is covered by at least two metres of material based on previous rehabilitation activities undertaken at the Colliery.

Once bulk reshaping is completed, the landform is deep ripped if required and the final trim/rock raking undertaken. Rock raking the final stage of reshaping removes or buries exposed surface rock greater than 200 mm in diameter. This raking is usually done along the contour, leaving a cultivated surface that assists with erosion minimisation until vegetation can be established.

There is one tailings emplacement area within the Colliery (U-Cut TSF). The U-Cut TSF has been partially capped during the active mining phase as areas have reached capacity. There is also a legacy tailings emplacement area at Save-a-Mile.

Capping of the U-Cut TSF is described in Section 6.2.3c.

The final landform was developed to accommodate the cut/fill balance of the Colliery.

e. **Waste management**

This subsection outlines the waste disposal and materials handling practices implemented to minimise adverse impacts to rehabilitation.

General waste minimisation principles (i.e., reduce, re-use and recycling) are currently implemented at the Colliery to minimise the quantity of wastes that require off-site disposal.

Key waste streams currently being produced at the Colliery include:

- Waste Oil and oil filters: Stored in specific receptacles and collected periodically by licensed waste contractors.
- Waste metal: The Colliery has a scrap metal program which has a high rate of onsite re-use of steel. If steel is deemed not suitable for re-use, scrap metal is stored in specific receptacles and sold for recycling.
- Waste tyres: up to 50 tonnes of used tyres can be disposed in the mine void. In accordance with EPL requirements, waste tyres will be covered by at least 20 m of inert material beneath rehabilitated surfaces. Disposal volumes reported annually to the EPA.
- Hydrocarbon contaminated soils: Hydrocarbon contaminated soils will be treated on-site and tested in a land farm facility as per the Rehabilitation Action Plan (RAP) before disposal in open cut pit.
- General waste: General waste is placed in 1.5m^3 and 3m^3 bins and collected by licensed waste contractor for disposal.
- Wastepaper and cardboard: Recycling bins are provided for wastepaper and cardboard. These are regularly serviced by a licensed waste contractor.

All general domestic waste and general recyclable products will continue to be collected by an appropriately licensed contractor. Records are maintained of waste streams collected by the licensed waste contractor for disposal.

f. Geology and geochemistry

This subsection describes the geophysical and geochemical risks related to waste emplacements and outlines the management measures being implemented at the Colliery.

The target coal seams within the Colliery area are within the Tomago Coal Measures. The Tomago Coal Measures were formed in terrestrial, lower delta plain and brackish marine environments. The coal seams worked by Bloomfield, in descending order, are as follows:

- Buttai Seams (E and F Seams).
- A, B, and C Seams.
- Whites Creek Seam.
- Elwells Creek Seam.
- Donaldson Seam.
- Big Ben Seam.
- Rathluba Seam.

Seams present as either complete seams, a number of splits of the seam, or a collection of dispersed coal bands. The Rathluba Seam is not proposed to be mined under the current mine plans.

Geology is typified by moderately dipping strata from the eastern and western sides of the lease, forming a syncline running axially from the north-east to the south-west of the lease. There is a well-defined dyke and fault structure running from the north-north-west to south-south-east through areas where mining has been completed through both open cut and underground methods. The remaining coal reserves have no known major geological impediments. As noted in Table 6.3 and Table 6.4 various soils within the Colliery have been identified as having geochemical limitations, such as being acidic or sodic. These soils are subject to amelioration.

A comprehensive and strategic mineral waste sampling and analysis program is currently being undertaken whereby materials posing a geochemical risk to site rehabilitation will be identified, with an appropriate management strategy, derived from the analytical results, articulated in forward versions of the RMP.

g. Materials prone to spontaneous combustion

This subsection describes the potential for spontaneous combustion at the Colliery.

Adiabatic self-heating testing has been undertaken on a known seam which occasionally displays some spontaneous combustion when not recovered. This seam, known as the “B” seam, shows a low propensity to spontaneously combust. Furthermore, the Colliery has undertaken adiabatic self-heating testing on rejects with results also showing a low propensity to spontaneously combust. The Colliery has also completed adiabatic self-heating testing on fine tailings material to determine its propensity to spontaneously combust. Tailings materials was identified as having a very low propensity for spontaneous combustion.

Experience in the stockpiling of coal at the Colliery indicates that stored coal has a low propensity for spontaneous combustion. The following safeguards, controls and management measures are implemented:

- Minimising the length of time coal is held in stockpiles.
- Monitoring coal stockpiles for signs of spontaneous combustion.
- Immediately reporting incidents.
- Extinguishment by excavation, spreading and saturation with water.

Spontaneous combustion from carbonaceous material in coarse rejects produced by the CHPP is managed by incorporating the rejects with overburden prior to burying. The management measures include:

- Potential spontaneous combustion material is placed in thin layers, only in the designated active emplacements, and is rapidly buried with inert cover of at least 5 metres depth.
- Regular inspections of disposal areas to identify and monitor indicators of spontaneous combustion, including surface cracking, visible smoke, and carbonaceous combustion odour.
- Corrective actions should significant spontaneous combustion be identified.
- Reporting of area of active spontaneous combustion in the Annual Review.
- Material to be paddock dumped to minimise internal heating, and at the toe of a dump to provide compaction.

A comprehensive and strategic mineral waste sampling and analysis program is currently being undertaken whereby materials posing a risk of spontaneous combustion as it would relate to site rehabilitation would be identified, with an appropriate management strategy, derived from the analytical results, articulated in forward versions of the RMP.

h. **Materials prone to generating acid mine drainage**

This subsection identifies the presence of any potential acid forming (PAF) materials, acid rock drainage issues and other geochemical issues of concern at the Colliery.

Historically, there has been no evidence of acid generation from overburden or interburden at the Colliery. The MOP for Abel Underground Coal Mine (Yancoal 2021) located south-east of Colliery, indicated that no acid mine drainage issues have been encountered associated with the mining of the Donaldson Seam at that site. As such, the potential for acid rock drainage problems arising from the waste rock emplacements is considered to be low.

Soil stockpile testing was undertaken by Bloomfield in 2020 around the U-Cut TSF. Low pH values were detected, indicating the presence of acid generating material.

Bloomfield also undertook investigations in 2021 which identified that low pH values were detected in seepage from the chitter placed around the workshop depot and CHPP, suggesting that acid generating mineral wastes may be present at these locations. Surface water with low pH is retained on site, and only discharged off site if in compliance with the criteria of EPL 396.

A comprehensive and strategic mineral waste sampling and analysis program is currently being undertaken whereby materials posing a geochemical risk to site rehabilitation would be identified, with an appropriate management strategy, derived from the analytical results, articulated in forward versions of the RMP.

i. **Ore beneficiation waste management (reject and tailings disposal)**

This subsection describes the geophysical characteristics of the beneficiation waste stream and how it is managed, as well as stability issues and management of the U-Cut TSF.

During the coal washing process, waste coal material is produced in solid and more liquid (slurry) form. The solid material is termed coarse reject. The slurry material, a mixture of fine mineral waste and water, is termed tailings. The percentage of coarse rejects and fine tailings varies depending on the source of the coal and the mining method. Based on experience at Bloomfield CHPP and other mines in the area mining the same seams, the estimated average proportions of coarse rejects and fine tailings are:

- Open Cut ROM coal 21% coarse rejects, 14% fine tailings.
- Underground coal 12% coarse rejects, 8% fine tailings.

As Abel Underground Mine is in care and maintenance, rejects from underground coal are not currently produced.

Coarse reject is currently co-disposed with overburden material and placed back into open cut pits. It is proposed to continue this process, which assists in filling voids in preparation for surface rehabilitation, including revegetation.

Tailings are currently placed in the U-Cut TSF, which has sufficient capacity for the remaining life of mine. Decommissioning of the U-Cut TSF area has commenced and is forecast to continue during the active mining phase. As the fine tailings consolidate within the TSF, excess water is decanted off and returned to the CHPP water storage dam for re-use.

The geochemical properties of the tailings remain subject to the results of the comprehensive and strategic mineral waste sampling and analysis program currently being undertaken. Presently, pH values from the surface and groundwater monitoring program are the only indicators of the risk of acid drainage from the fine tailings. Acidic pH values have presented from time to time in water quality monitoring data, however, it remains inconclusive as to the source of the acidity until such time as the fine tailings geochemical data is interpreted and reported on is being investigated. Management of geochemical constraints will be contained in detailed closure planning.

Decommissioning of the U-Cut TSF has commenced and is expected to continue during the active mining phase. The U-Cut TSF will be decommissioned in stages with material being sourced from open cut mining operation, redundant infrastructure and adjacent spoil areas.

In areas of the U-Cut TSF that have been successfully rehabilitated, geotechnical properties of the tailings have been characterised prior to rehabilitation works. Methods such as secondary flocculation, dewatering and drying are implemented to increase strength of emplaced tailings.

j. **Erosion and sediment control**

This subsection describes how erosion and sediment controls are implemented at the Colliery to reduce impacts to rehabilitation or rehabilitated areas.

Water management at the Colliery aims to separate clean and mine water, provide safe storage of mine water and comply with the requirements of the Environmental Protection Licence (EPL) 396 to protect environmental values of Four Mile Creek. Clean water is defined as surface water runoff coming from areas where no coal handling or disturbance has occurred. Clean water is diverted around operational areas and mine water storage to avoid mixing. Mine water is managed on site and when license criteria are met, may be discharged into Four Mile Creek at the licensed discharge point (LDP) under EPL 396.

Erosion and sediment impacts at the Colliery are managed under the Water Management Plan (WMP), which includes an Erosion and Sediment Control Plan (ESCP).

Prior to the disturbance of land associated with any mining activities at the Colliery, appropriate erosion and sediment controls are established. Where feasible, runoff from undisturbed catchments is diverted around the mining activities via diversion drains and banks which direct water into the natural watercourses. Runoff from disturbed areas is retained at the Colliery in sediment dams and allowed to settle prior to discharge into the natural system. Drains, diversion banks and channels are compacted and stabilised as they are constructed.

General measures in place to minimise erosion and sediment mobilisation during operation include:

- Installing temporary erosion and sediment controls prior to the disturbance of any land.
- Minimising the extent of disturbance to the extent that is practical.
- Reducing the rate of water flow across the ground particularly on exposed surfaces and in areas where water concentrates.
- Progressively rehabilitating disturbed land and constructing drainage controls to improve stability of rehabilitated land.
- Ripping of rehabilitation areas to promote infiltration.
- Protecting natural drainage lines and watercourses by constructing erosion control devices which include sediment retention dams and diversion banks and channels.
- Restricting access to rehabilitated areas.
- Maintenance of erosion and sediment control structures.

- Minimise the time prior to establishing vegetation.

Sediment detention basins are constructed in the flow lines and used along haul roads and around areas of disturbance; these structures are de-silted as necessary.

k. **Ongoing management of biological resources for use in rehabilitation**

This subsection describes how biological resources (such as growth medium and habitat features) are managed during the active mining phase.

Stockpiles are currently managed at the Colliery in the following ways:

- Growth medium stockpiles are located outside of proposed mining areas and away from slopes and drainage lines to prevent runoff.
- Stockpiles are constructed with a rough surface condition.
- Constructed no higher than 3 metres.
- Stockpiles are re-seeded and revegetated to provide stability and protection from weeds.
- Stockpiles are regularly maintained for weeds.
- Vegetation cover of stockpiles will be implemented for soil protection purposes and improvement in organic matter levels.
- Stockpiles which are identified to be inactive for extended periods of time are seeded with the final species mix.
- New stockpiles are surveyed to estimate volume after soil stripping campaign.

Soil Ameliorants

Soils throughout the Colliery are generally low in organic matter and nutrients suitable for the establishment of pastures and overstorey species. These factors reduce the availability of nutrients for germination of plant seeds. Soil ameliorants are further discussed in Section 6.2.4.

Growth medium application

During application, growth medium is applied to a thickness of no less than 100 mm. Following application of the growth medium, the surface is ripped for incorporation. Growth medium development is described in more detail in Section 6.2.4.

Management of habitat features

Prior to clearing commencing, pre-clearance surveys are undertaken to identify habitat features that may be impacted. If hollow bearing trees or hollow logs are impacted by clearing, they are salvaged and moved to nearby rehabilitation areas.

l. **Mine subsidence**

This subsection summarises existing mine subsidence at the Colliery, and measures that are being implemented to manage impacts. There is no active underground mining being undertaken at the Colliery.

Mine subsidence can occur due to the presence of underground voids created in the process of mining coal. Several measures have been identified to address mine subsidence as it relates to underground mining resulting in surface expressions of subsidence which can cause hazards to people and property.

Historical subsidence

Sink holes associated with shallow workings occur infrequently in the rehabilitated areas on the western side of the Mining Lease. Operations currently being undertaken at the Colliery do not include underground mining, and therefore risk of subsidence is not increased.

Potential subsidence impacts

Many of the areas outside the active mining area has been impacted by underground workings. Surface features above previous underground workings include:

- Rehabilitation areas.
- Unnamed tributaries of Buttai Creek.
- Ellwells Creek.
- Surface waterbodies.
- U-Cut TSF area.
- Access roads.
- Workshop area.
- Powerlines.
- Hunter Water Pipeline.

Subsidence mitigation

If subsidence potholes are identified, the standard management procedure is to flag off and isolate the depression from access, back fill and monitor the area for further subsidence. Once deemed stable, the area will then be rehabilitated, and periodic inspections will continue.

Waste emplacement areas are monitored for signs of uneven or excessive displacement that may alter drainage patterns or present a safety risk. If excessive displacement is identified, then repair works will be carried out.

m. **Management of potential cultural and heritage issues**

This subsection describes how cultural and heritage issues are managed at the Colliery.

Aboriginal and cultural heritage at the Colliery is managed under the approved Aboriginal Cultural Heritage Management Plan (ACHMP). The ACHMP sets out the procedures for the protection of Aboriginal sites as well as the salvage and care of Aboriginal objects found within the operational activities.

The Mine Manager and Environmental officer are responsible for implementing and maintain the plan, as well as coordinating activities and investigations required under it. The Company Director is responsible for consultation with Mindaribba Local Aboriginal Land Council (LALC) and the General Manager Technical Services is responsible for maintaining records of Aboriginal Heritage Importance.

Supervisors are responsible for informing staff and contractors about their responsibilities under the ACHMP. All staff are expected to implement the requirements of the plan. European heritage is managed under the Historical Heritage Conservation Management Plan (HHCMP). There are two European heritage items covered by the plan including the Hunter Water Buttai No 1 and No 2 Reservoirs and Buttai Cemetery.

The aim of the plan is to facilitate the management of historic heritage impacts because of the Colliery's activities. The Environment Manager is predominantly responsible for the implementation of this plan, along with support from the Shift Supervisors. The Mine Manager is responsible for ensuring that adequate resources are provided so that the plan be implemented. All staff have a responsibility to act in accordance with the requirements of the HHCMP.

No items of European Heritage are present within the operational areas.

n. **Exploration activities**

No further exploration activities are planned for the Colliery.

6.2.2 Decommissioning

Following the cessation of active mining, the Colliery will be progressively decommissioned.

A detailed Mine Closure Plan and Demolition Strategy will be developed in consultation with government, specialist contractors and other stakeholders and will include details covering the evaluation of re-use opportunities for facilities, infrastructure and services on the site. Most decommissioning will be planned and undertaken as soon as practicable following the cessation of mining, unless alternative post-mining uses are identified or proposed for these assets at the time.

a. **Site security**

Security features such as fences and gates will remain in place after the active mining phase.

b. **Infrastructure to be removed or demolished**

This subsection identifies site features and structures to be removed to facilitate the final landscape design.

During decommissioning, the following infrastructure would be decommissioned or removed, in accordance with the development consent granted under the *Environmental Planning and Assessment Act* 1979, mining lease conditions, commercial lease agreement and the agreement of the landowner:

- Workshop area.
- Dangerous Goods storage areas (Ammonia Nitrate and Emulsion Depots, hydrocarbon storage etc.).

- all water reticulation infrastructure, including pumps and pipes associated with water management (except Lake Foster pumps).

All demolition will be undertaken in accordance with Australian Standard *AS2601: The demolition of structures (AS 2601).* All structures will be inspected for the presence of hazardous materials prior to demolition.

As discussed in Section 1.2, two project approvals apply to the mining lease. The Open Cut Areas as approved under PA 07_0087 (Bloomfield Coal Project) will be closed and rehabilitated with no further access provided for Yancoal's Abel Mine tailings, unless agreed otherwise.

U-Cut TSF as approved under PA 05-0136 will be rehabilitated. The coal handling preparation plant and associated conveyors and structures as approved under PA 05-0136 will be demolished and rehabilitated pending requirements of Yancoal (If a decision is made by Yancoal to continue to utilise the CHPP, the Mining Lease may be transferred to Yancoal at the time of Colliery closure).

The Bloomfield rail loop is approved under DA 103-5-242-90 (Maitland Council) is outside ML1738. Future use of the rail loop is outside the scope of this plan.

Any variation to the final land use outside the Project Approval will require either Project Modification or subsequent separate Development Approval under the NSW *Environmental Planning and Assessment Act 1979.*

c. **Buildings, structures and fixed plant to be retained**

This subsection identifies areas and structures to be retained for future use as part of the final land use. Infrastructure to be retained subject to landowner's approval include:

- High voltage power lines and substation.
- Rail facilities.
- BLM homestead (main office).
- Lake Foster pumps.
- Potential to retain CHPP office & workshop, pending requirements of Yancoal.
- Access roads.
- Dams - Lake Foster and Lake Kennerson.

Structures to be retained within the final landform are minor built features. Structural adequacy assessment of built features will be undertaken to ensure that remaining structures are in a safe condition. Remaining structures will be surveyed and recorded on a plan, which will be agreed with Ashtonfields Pty Ltd. The plans would contain a suitable caveat developed to provide that they are readily identifiable for future land holders.

The retainment of these structures in the final landform poses limited risk to rehabilitation and the public.

d. **Management of carbonaceous and contaminated material**

This subsection describes the process that will be implemented to identify and appropriately manage risks associated with the potential occurrence of carbonaceous and or contaminated material.

A Contamination Assessment (GHD, 2022a) has been undertaken to assess materials to be remediated or removed from the Colliery. Soils were assessed against health and ecological levels outlined in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (referred to herein as the NEPM). This criteria has been revised and updated in 2013 by way of the National Environmental Protection (Assessment of site Contamination) Amendment Measure 2013 (NEPC 2013).

Not all areas of the site were assessed (such as inaccessible areas under buildings or machinery). As such there is a potential for impacts to be present in areas that have not been assessed that may exceed the health assessment criteria. A Remediation Action Plan (RAP) and Unexpected Finds Protocol is being developed.

Removal of carbonaceous or contaminated material

Based on the investigations completed to date, soils that will require remediation are those with either elevated TRH or heavy metals above the nominated guidelines or those that are considered aesthetically unsuitable due to hydrocarbon odours or staining. Remediation works will be completed in accordance with the remediation action plan (RAP), which will detail the procedures and requirements of remediation works. Soil remediation will involve:

- Bioremediation of hydrocarbon impacted soils: Soils that are impacted with hydrocarbon contaminated soils will be removed to a designated area and set up as a land farm for bioremediation (bioremediation pad). The bioremediation pad will be located on a hardstand to prevent contamination of surface soils under the stockpile. Soils within the landfarm will be spread at a thickness of no greater than 0.5 m and regular tilling with the addition of nutrients and hay will be undertaken to hasten bioremediation. Soils will be sampled after bioremediation to confirm concentrations have reduced and are suitable for re-use on site.
- Excavation and off-site disposal – This process involves excavation of impacts and off-site disposal to an NSW EPA approved landfill disposal as per the NSW EPA Waste Classification guidelines and *Protection of the Environment Operations (Waste) Regulation 2014*. This option will be applicable to those contaminants that cannot be remediated via bioremediation, such as selected heavy metal impacts or asbestos (if identified).

The RAP will also include a remediation contingency plan to allow for unexpected situations that may be encountered.

e. **Hazardous material management**

This subsection details the process that will be implemented to identify and appropriately manage hazardous materials (e.g. hydrocarbons and chemicals) that exist following the cessation of an operation.

Hazardous materials have not been identified within the Colliery. Prior to demolition, a hazardous material survey will be done on all infrastructure to be removed as described in the RAP. Hazardous materials stored on site will removed by a licenced waste contractor prior to decommissioning occurring.

Removal of workshop and operational areas will involve the removal of hydrocarbon storage areas. Hydrocarbon storage receptacles and waste will be removed by a licenced waste contractor. Oily water separators and sewage systems will be pumped out to remove hazardous liquid waste.

Where chemically reactive materials identified under the geochemical sampling and analysis program currently underway, they will be factored into the materials balance for final rehabilitation planning and execution. For example, the placement of pyritic material in mine voids at depth in compacted, thin lifts, significantly reduces the availability of oxygen, and therefore, lowers the risk of sulfides oxidising and generating acidic, metalliferous, saline and/or neutral drainage as well as reducing the spontaneous combustion risk. If emplaced below the level that groundwater would naturally rebound to, those risks are further reduced.

This subsection describes how historic underground mining entries and infrastructure will be decommissioned to achieve the final land use.

An assessment of the underground mine entries (as defined in MDG6001 - Guideline for Permanent Fill and Capping of Surface Entries to Coal Seams) is proposed for mine closure. This includes a desktop review to assess the characteristics and status of mine entries, and investigation work (where required) to inform development of permanent seal designs and documentation or an assessment of the existing seals or status of the entry for submission to the Resource Regulator. Where required, mine entries will be sealed or filled, or provided with an enclosure, barrier, plug or seal approved by the Chief Inspector with consideration of MDG6001.

f. **Underground infrastructure**

This subsection describes how historic underground mining entries and infrastructure will be decommissioned to achieve the final land use.

An assessment of the underground mine entries (as defined in MDG6001 - Guideline for Permanent Fill and Capping of Surface Entries to Coal Seams) is proposed for mine closure. This includes a desktop review to assess the characteristics and status of mine entries, and investigation work (where required) to inform development of permanent seal designs and documentation or an assessment of the existing seals or status of the entry for submission to the Resource Regulator. Where required, mine entries will be sealed or filled, or provided with an enclosure, barrier, plug or seal approved by the Chief Inspector with consideration of MDG6001.

All underground infrastructure has been removed.

6.2.3 Landform establishment

The following subsections provide an overview of the key characteristics of the final landform and the process of landform establishment.

a. **Water management infrastructure**

This subsection details the location, treatment and rehabilitation of water management infrastructure.

The current water management at the Colliery includes both clean and mine water management systems. The water management system has been designed with three primary goals and objectives:

- Separation of clean water and mine water.
- Safe storage and priority use of mine water on-site.
- Management of water that is discharged so as to preserve the environmental values of Four Mile Creek and comply with the conditions of Environment Protection Licence (EPL) 396.

Surface water runoff from areas where there has been no coal handling or any disturbance is considered clean water and is diverted around operational areas. Generally, no clean water is accessed for operational purposes, though may be used during times where mine water cannot be used or is not available.

Mine water is runoff from disturbed areas and areas likely to contain levels of key contaminants or poor water quality (typically salinity, measured as electrical conductivity) that make it unsuited for discharge to the receiving environment except under specific conditions outlined in the EPL. Discharges from mine water management system are undertaken in accordance with the conditions of EPL 396. Water sampling is undertaken during discharge, and a monitoring station continuously monitors electrical conductivity (EC) and water level.

Creeks and drainage lines

The major natural creek running through the Colliery is Four Mile Creek. Most of the operational mining areas at the Colliery are located within the catchment of Four Mile Creek. A series of drains and levees direct Four Mile Creek around Lake Foster and into Possums Puddle. Wallis Creek and Buttai Creek catchments are also within the Colliery.

Mine water is transported to Lake Kennerson via open drains. Mine water is discharged, via lockable valve pipes, into an open drain that flows to Four Mile Creek. Run off from undisturbed and rehabilitated areas is directed away from operational areas and mine water storages via diversion banks and channels which direct into natural water courses.

Existing drains may be modified during landform establishment. A typical drainage alignment template for the final landform has been developed based on the design criteria and preferred construction methods at the Colliery (GHD, 2022b). Key features of the drainage alignment template for the final landform are:

- The channel will convey a 1% AEP storm event and be compliant with industry standards for the rehabilitation of waterways (ACARP 2014) which considers 2% AEP criteria.
- For the reinstatement of drainage lines, the channels will be generally trapezoidal in shape with batters no steeper than 5.76:1 (H:V) for channel banks and base widths of at least 3.5 m.
- Natural meanders will be used instead of straight lines to reflect natural stream characteristics.
- The channel bed will be rock lined where required and constructed in accordance with the design criteria, including the placement of appropriately sized rocks above a filter layer of suitable geotextile. Exposed earth bed and banks are not appropriate given the dispersive nature of the soils and hence must be avoided.
- Soil will be packed in between rocks to allow sedges and grasses to be established within the channel to provide for the long-term channel stability.

Revegetation around riparian areas is important to achieve stream rehabilitation. Key aspects of revegetation to be implemented during landform establishment:

- Place naturally occurring soil to the riparian corridor, i.e. stripping of topsoil won from pre-disturbance areas.
- Restore the natural ecotone between the riparian and terrestrial areas (20 m from top of bank).
- Establish a range of locally occurring vegetation species including trees, shrubs and grass covers.
- Maintain the rehabilitated riparian corridor for two years after initial rehabilitation.
- Vegetation species to be in accordance with species in Table 6.6.

Sufficient sediment control structures should be integrated into the drainage system to reduce, or intercept, sediment load being transported by surface run-off. It is not expected that establishment of sediment dams or additional reticulation into the existing mine water management system would be required. Works on existing drainage lines will follow this general staging:

- Drainage lines outside the U-Cut catchment area will be established and stabilised prior to the introduction of flows off the U-Cut TSF.
- The drainage lines within the existing catchment of the U-Cut TSF will be established and stabilised prior to release of flows from the surface of the U-Cut TSF.

- The runoff from the surface of the tailings dam may temporarily report to localised low points for reticulation into the existing mine water management system.
- The drainage lines within the existing catchment of the final void will be established and stabilised prior to release of flows from the final void diversion drain. The discharge from the final void diversion drain may temporarily report to the final void prior to the downstream section of the diversion drain being completed and runoff released off site. The final void diversion drain is described in Section 6.2.3e.

Water Dams

The Colliery contains two main dams, Lake Kennerson and Lake Foster. Lake Kennerson receives mine water from creeks and drainage lines described above. Lake Foster receives decant water from the U-Cut TSF and water from sediment dams which collects the runoff from the CHPP and coal stockpile pads. Lake Foster also receives water from Lake Kennerson via a valve-controlled pipes. Mine water is pumped, primarily from Lake Foster, to the CHPP for use in coal processing and for dust suppression spraying on the coal stockpile pads.

The major clean water storage dam is Possums Puddle. No clean water is accessed for operational purposes and this dam overflows into Four Mile Creek. Further isolation of smaller rehabilitated catchment areas from the mine water system will continue as rehabilitation work progresses.

Discharge of water is still required to be within limits in the EPL.

b. **Final landform construction: general requirements**

This subsection describes how the final landform design will be constructed to address geotechnical/geochemical issues, surface water management and incorporation into the existing landform. Previous rehabilitation that has occurred within the Colliery site has involved the reshaping of overburden to generally match the surrounding landform. Existing and proposed slope gradients were assessed in 2022 (Landloch, 2022). The study identified five representative slopes across the Colliery to determine the groundcover required for them to be stable. Generalised batter slopes were identified as having a mean gradient of less than 10 degrees, and a maximum gradient of 12 degrees of less. Slopes with steeper gradients represent batter slopes with higher topographical erosion risk.

During final landform establishment, overburden dumps will be recontoured into the design shape for final land use. Slopes will generally be consistent with the generalised batter slope or erosion control measures defined in Landloch (2022), though sometimes this may not be possible due to integration into surrounding landforms or the final void. Final landform will be generally consistent with the approved conceptual final landform.

Surface water features may be modified (in the case of existing features) or constructed (in the case of the final void diversion drain) during this stage.

Once bulk reshaping has been completed, the landform will be deep-ripped and final trim/rock raking undertaken.

Rock raking the final stage of reshaping removes or buries exposed surface rock greater than 200 mm in diameter. This raking is usually done along the contour, leaving a cultivated surface that assists with erosion minimisation until vegetation can be established.

Growth medium will be applied to this prepared surface, which is described further in Section 6.2.4.

Available suitable material required to stabilise slopes was charactarised in the Landloch 2022 study. As described in Section 6.2.1a, soils to be used in rehabilitation were classified into four categories:

- Non-stony Topdressing.
- Stony Topdressing.
- Grey Overburden.
- Brown Overburden.

All soil types were rated as moderate or greater soil erodibility factor. Non-stony Topdressing was the most erodible, and Grey Overburden the least erodible.

Batter slope is a key factor in erosion risk. Water Erosion Prediction Project (WEPP) runoff/erosion model was used to determine erodibility of landforms. Simulations showed acceptable soil loss rates on these batters for all growth media when the level of groundcover was 70% or greater.

Overburden material may be used as a primary growth media on 'general' batters, however it is not considered suitable for 'high risk' batters.

Contaminated materials or chemically unstable material (such as areas susceptible to spontaneous combustion or acid mine drainage) would be identified and selectively managed as described in Section 6.2.2 d and 6.2.2e.

c. **Final landform construction reject emplacement areas and tailings dams**

This subsection describes the measures that will be implemented during U-Cut TSF capping and how reject emplacement areas are incorporated into the landscape.

The U-Cut TSF will be progressively rehabilitated as areas reach capacity. Areas that have reached capacity are allowed to dry and crust prior to material emplacement. The tailings area is bound by a combination of highwalls (at a slope of 75 degrees) spoil material at natural rill angles and engineered dam walls.

The geochemical properties of the tailings remain subject to the results of the comprehensive and strategic mineral waste sampling and analysis program currently being undertaken. Surface water monitoring has identified acidic pH from time to time. As of the acidity is currently inconclusive, geochemical analysis of fine tailings will be undertaken to determine if it is the source of acidity. This data will be reported in forward program and annual rehabilitation report. If risks are identified, U-Cut TSF capping design would accommodate them such that the exposure to atmospheric oxygen was minimised, along with the adoption of other strategic risk reduction mitigation strategies.

The U-Cut TSF will be completed with a capping layer during the final landform construction phase. The capping layer will be constructed of overburden/growth medium material spread over the tailings and contoured. The capping layer will be at least 2 metres of inert material in depth based on previous studies at the Colliery, which identified this depth as the minimum for vegetation establishment. It is estimated that approximately 1.5 million m^3 of material will be required to cover the U-Cut TSF.

The final landform for the U-Cut TSF has been designed to provide a free draining shape. Slopes of the U-Cut TSF will be generally less than 10 degrees and no greater than 18 degrees. Geotechnical surveys will be undertaken on the U-Cut TSF prior to work commencing. Final design and construction of the U-Cut TSF will be compliant with ANCOLD guidelines.

During capping, material will be pushed out in a single layer with tracked dozers or equivalent. Works will work from the outermost point towards the middle of the area. Regular inspections of the non-engineered cap will occur during and post work. The work schedule for final landform establishment at the U-Cut TSF will be:

- 2022 – 2025: Progressive capping on areas within U-Cut TSF that have reached capacity while active mining is occurring.
- 2025-2027: Dewatering and continued capping of U-Cut TSF.
- 2027 onwards: Finalisation of capping and establishment of drainage networks.

The following general management measures are proposed to overcome the constraints of the U-Cut TSF:

- Work to U-Cut TSF embankments will be avoided due to steep slopes and risk of disturbance.
    - If works are required on the steep embankments, erosion and sediment controls downslope will be implemented prior to work commencing. All work areas will be stabilised following work (this may take the form of seeding/vegetation establishment or rolled erosion products).
- Any areas that retain water during capping works will either be regraded to provide effective drainage or pooled water will be pumped to the mine water system.
- Drainage design will be integrated with drainage features of the surrounding area.

d. **Final landform construction: final voids, highwalls and low walls**

This subsection describes the key features of the final void.

The final void is included as a requirement of Schedule 3 Condition 25 of PA 07_0087. There will be one final void remaining post closure, located in the northern extension of S Cut (Active Mining Area Domain) where it will join with Creek Cut within the PA 07_0087 area. If Abel Underground Mine were to restart operations, a second void to the south would be utilised for tailings emplacement. This void would gradually be filled and would not be a feature of the landscape in the long term. Options assessment for the different configurations of the final void is detailed in Section 2.2.

The final void is designed as a permanently opened void that acts as method of lowering water levels in the vicinity of the Colliery over a long-term period. Slope gradients of the final void walls will be 18 degrees or less. Specific design features, such as size, depth and orientation will be developed prior to mine closure. The final void will not contain any highwalls in order to eliminate steep slopes that may cause a risk to public and personal safety.

The 2018 Environment Assessment (AECOM, 2018) provides that the final void catchment size would be approximately 52 hectares. Further assessment and consideration of the proposed final landform undertaken in the Groundwater Assessment identified that the final void has a catchment of 121.4 hectares (GHD, 2022c).

Bloomfield hold 20BL172035 for the Colliery, which provides approval for the interception and extraction of up to 500 ML/year of groundwater. Bloomfield are required to consult with WaterNSW to determine if a modification to this licence is required for the final void.

Preliminary studies have been undertaken to determine long term final void water levels. Following completion of mining, groundwater levels across the colliery will begin to rise due to the cessation of pumping. Groundwater levels would begin to fill the final void. The forecasted peak final void water level is predicted to be 18 m AHD.

Geotechnical studies regarding stabilisation and public safety measures will be undertaken prior to mine closure, with findings being implemented to final void and landform design.

Where chemically reactive materials have been identified under the geochemical sampling and analysis program currently underway, they would be factored into the materials balance for final rehabilitation planning and execution. If emplaced below the level that groundwater would naturally rebound to, those risks are further reduced.

Water quality monitoring during rehabilitation is described in Section 8.2.

e. **Final landform construction: Construction of creek/river diversion works**

This subsection describes the construction of creeks during landform establishment.

Water management infrastructure currently on site will generally be retained in the final landform. Clean water diversions are currently in place to manage concentrated flow around the S Cut and Creek Cut overburden emplacement area domain in the form of embankments. These embankments protect the emplacement area from runoff from the catchments from the northwest of the overburden emplacement area.

The final landform includes the modification of these drainage lines to create a final void diversion drain on the eastern edge of the final void. The intent of this drain is to minimise catchment flow into the final void. The diversion drain will allow concentrated flow to be directed around the final void and towards Wallis Creek.

Detailed design of the final void diversion drain is such to convey flows along the bench on the side of the final void.

General channel dimensions for the drain will be a depth of more than 2 metres, a base width of approximately 10 metres, and an average longitudinal grade of 1 percent. Peak flow estimates for 1% AEP of the final void diversion drain is 28.5 m^3/s (GHD, 2022b).

The diversion drain is not considered to be utilised as habitat by aquatic species, and therefore no instream habitat augmentation is proposed.

Measures to reduce construction impact of the final diversion drain are discussed in Section 6.2.3a.

6.2.4 Growth medium development

This subsection outlines how rehabilitation areas will be prepared with growth media suitable for establishing vegetation in accordance with the approved final land use.

Existing growth medium stores at the Colliery are stored in stockpiles as described in Section 6.2.1 k. Analysed soil types and characteristics are described in Section 6.2.1 a. Topdressing will be spread at an even layer no less than 100 mm thick.

Soil Ameliorants

Soils throughout the Colliery site are generally low in organic matter and nutrients suitable for the establishment of pastures and overstorey species. These factors reduce the availability of nutrients and may create an unfavourable microclimate for germination of plant seeds. Ameliorants such as gypsum and bio-solids are used to reduce soil dispersion and improve soil structure and suitability as a growth medium. Spreading and integration of ameliorants into the soil/ spoil surface layer to address soil acidity and assist with soil structural properties. Ameliorants proposed include lime and/or gypsum at a rate of up to 200kg per hectare, ploughed into the top 30 cm of the profile.

Biosolids or biosolid and mulch mixes/compost may also be used to improve soil structure and act as a source of nutrients, improving established vegetation. Biosolids are applied using a tractor towed spreader trailer. A biosolids and mulch/compost mix (1:1 ratio) has been shown to be a very successful growth medium supplement and is usually applied at a rate of 0 – 250 tonnes per hectare.

Prior to application, soil is tested to determine exact application rates.

Topdressing

Following amelioration, the surface will be ripped to integrate growth medium with subsoil. Ripping will occur along the contour of any slope, not up and down. This assists in binding the topdressing material with the underlying spoil and is a requirement of the EPA biosolids guidelines. The area is then contour cultivated to create seed entrapments and microclimates prior to sowing with the selected seed mixes (refer to Table 6.6). These works are undertaken shortly after spreading the growth medium to avoid loss in activity of pre-existing micro flora and minimising the loss of growth medium due to wind and rain action. Fertiliser is not required where biosolids has been applied.

Erosion and sediment control

Earthworks required in this phase will pose a risk to erosion and sedimentation. Key erosion and sediment control measures that will be implemented to mitigate this risk will include:

- Rehabilitation at the Colliery will be undertaken in a progressive manner.
- Stockpiles will be placed away from waterways and drainage lines.
- Water management infrastructure will be incorporated into the final landform (refer to Section 6.2.3a).
- Installation of temporary controls such as temporary check dams and sediment fences.
- Installation of scour protection along drainage lines.

All erosion and sediment controls will be implemented in accordance with Managing Urban Stormwater, Soils and Construction Volume 1 (Landcom, 2004) and Volume 2E: Mines and Quarries (DECC, 2008). If prolonged periods of rainfall are predicted, rehabilitation work and soil disturbance may be temporarily delayed mitigating erosion and sediment risk.

Weed control

Weed control will be implemented to ensure that vegetation communities can be established quickly. A Weed Management Plan has been developed to provide a plan for weed management at the Colliery. The purpose of the Weed Management Plan is to conduct regular surveys to identify weed species requiring control, identify and map weed infestation locations, and implement a weed control priority action plan to control weeds. Bloomfield undertakes regular inspections and has a treatment program to control weeds across the Colliery. A contract weeds sprayer is employed in addition to mechanical support from a slasher when required.

Prior to topdressing, inspections for weeds will be undertaken. Soils will be treated if weeds are present to ensure that growth medium used in rehabilitation works is weed free. Weed control will be undertaken in accordance with the requirements of the Noxious Weeds Act 1993 and the Biosecurity Act 2015. Following seeding, rapid establishment of native ground cover species will be encouraged to outcompete potential weeds. Weed species previously identified at the Colliery are presented in Table 6.5. No Class 1 or Class 2 declared weeds were identified onsite.

Table 6.5 Weed species present at the Colliery

Common name	Scientific name	Priority level
Lantana	*Lantana camara*	High
African daisy	*Senecio pterophorus*	Medium

Blackberry	*Rubus fruticosus*	Medium
Castor Oil Plant	*Ricinus communis*	Low
Crofton Weed	*Ageratina adenophora*	Low
Farmers Friend	*Bidens pilosa*	Low
Giant Paramatta Grass	*Sporobolus fertilis*	Low
Mother of Millions	*Bryophyllum delagoense*	Low
Pampas grass	*Cortaderia selloana*	Low
Morning Glory	*Ipomoea indica*	Low
Tobacco Bush	*Solanum mauritianum*	Low

Habitat augmentation

As described in Section 6.2.1c, habitat enrichment through the placement of logs and hollows generally occurs immediately following clearing. Once active mining has ceased, habitat augmentation and enrichment is not proposed. Features of the final landform such as vegetation and retainment of drainage lines will provide some habitat value in the rehabilitated landscape.

Management of rehabilitation area

Monitoring of top-dressed areas is discussed in Section 8.2. Erosion and sediment controls will remain in place until lands have been stabilised. Where erosion has been observed, additional earth and revegetation works will be undertaken. Dust may be generated in the interim between top dressing and vegetation establishment. Measures to mitigate dust generation that will be implemented are:

- Where practicable, soil stripping will be undertaken at a time when there is sufficient soil moisture to prevent significant lift-off of dust.
- Bloomfield will avoid stripping soil and ripping of overburden in periods of high winds.
- Avoiding directing the placement of overburden into high emplacement dumps during periods of high wind.
- Progressive rehabilitation will include stockpile areas as they are used for rehabilitation in other areas of the Colliery.

6.2.5 Ecosystem and land use establishment

This subsection describes how the target vegetation associated with the final land use will be established and managed to progress to the ecosystem and land use development phase.

Revegetation methodologies

Direct seeding will occur following top dressing. Immediately following ripping and seed application, areas are rolled to spread seed, increasing seed contact with the soil, and increasing the probability of germination. Seed mix applied will be dependent on the final land use of the area (refer to Section 2.4). Pasture grass may also be sown in localised areas to stablise soils and prevent erosion.

Tree seed mix will generally be sown to establish tree communities on areas such as upper slopes, hill tops and flatter areas. This assists in breaking up landform profiles and increasing habitat areas in areas of lower risk of erosion.

An indicative species list for rehabilitation species is presented in Table 6.6. Species mixes will be drawn from those nominated on this list dependent upon seasonal and/or commercial availability.

Table 6.6 Species list

Pasture	Native
Wimmera Rye Grass	*Acacia implexa*
Haifa Clover	*Acacia decurrens*
Couch Grass	*Acacia falcata*
Kikuyu	*Acacia longifolia*
Green Panic	*Acacia sophorae*
Phalaris	*Acacia mearnsii*
Lucerne	*Acacia myrtifolia*
Selphi Medic	*Acacia ulicifolia*
Tall Fescue	*Acacia irrorata*
	Acacia suaveolens

	Angophora costata
	Casuarina torulosa
	Leptospermum polygalifolium
	Syncarpia glomulifera
	Corymbia maculata
	Eucalyptus tereticornis
	Eucalyptus.saligna
	Eucalyptus.acmenoides
	Eucalyptus crebra
	Eucalyptus fibrosa
	Eucalyptus pilularis
	Eucalyptus punctata
	Eucalyptus haemostoma
	Eucalyptus resinifera
	Eucalyptus gummifera

Seasonal considerations are of particular importance to soil viability when establishing ecosystems from seed. Long term weather data indicates that January to March is the wettest quarter of the year, and July to September is the driest. Revegetation seeding will be planned for spring and autumn, though may occur all year around to quickly establish groundcover on exposed soils. Seeding will be postponed during droughts or times where conditions are not suitable for growth establishment. Following a drought, areas of the Colliery will be reseeded with a selection of drought tolerant species to ensure that soils are stabilised.

Seed management

Seed mixes will be sourced though local suppliers, or if deemed feasible, seed collection will be undertaken locally. Seed collection will focus on local native plant species representative of the surrounding native vegetation communities. Seed will be procured in advance of rehabilitation so it can be spread following growth media development. Where adverse seasonal conditions (for example drought) affect seed production in the project area, local provenance seed will be sought.

Pasture seed will be purchased through local agricultural suppliers. Germination Quality Assurance documentation will be provided by the supplier to ensure that the seed is fit for rehabilitation.

The rehabilitation areas will then be sown and fertilised with the selected grass and/or tree seed mixes described in Table 6.6.

Vegetation establishment and growth

The progress of rehabilitated areas will be monitored as part of the ongoing assessment program which will be used to collect sufficient data on the rehabilitated land to compare against the completion criteria to assess rehabilitation development, sustainability and suitability for sign-off. Further details are provided in Section 8.

In pasture rehabilitated areas the ongoing maintenance program may also include slashing to reduce the bulk vegetative matter. As well as providing surface mulch, this also reduces the fire hazard of those areas. Grazing on older established rehabilitation areas may also be conducted to reduce fuel loads.

Weed and pest management

A Weed Management Plan has been developed to provide a plan for weed management at the Colliery. Weed control will continue as described in Section 6.2.4. Rehabilitated areas will also be inspected for predation from insects.

Periodic feral animal control programs are undertaken in conjunction with neighboring mines and landowners. Activities include feral dog baiting programs. These programs are conducted annually in consultation with Local Land Services.

6.2.6 Ecosystem and land use development

This subsection details how rehabilitated lands will be actively managed to achieve the approved final land use.

Environmental monitoring

During this phase maintenance fertilising will continue in areas that have not been fully established. Areas that meet completion criteria will not need maintenance fertilising.

Rehabilitation monitoring is undertaken to confirm that the Colliery rehabilitation is progressing towards completion criteria. This monitoring is described in more detail in Section 8.2. If the results of rehabilitation monitoring indicate that the Colliery is failing to reach criteria or where key species are underrepresented, then maintenance or rework based on the Trigger Action Response Plans (TARPs)

in Section 10 will be implemented. Any actions arising from the TARPs will be implemented and documented as record of rehabilitation activities.

Areas identified for re-establishment may be the subject of current rehabilitation research, modelling and trials to understand why initial efforts failed. This process is described in more detail in Section 9.2. Outcomes from this research will be implemented during the reseeding of the areas.

Weed and feral animal control will occur as described in Section 6.2.4 and 6.2.5.

Surface water, groundwater, grazing cattle and rehabilitation monitoring will continue to be undertaken in this phase of rehabilitation. The frequency and scale of monitoring may be reduced as rehabilitated areas reach an acceptable level of establishment when monitoring will be undertaken periodically.

Erosion and drainage controls

Vegetation establishment on rehabilitated areas will reduce the likelihood of erosion and sedimentation during the final stages of rehabilitation and into the future. Erosion and sediment controls will remain until rehabilitation establishment meets the appropriate criteria.

The final landform will be shaped to contain drainage lines and sediment detention basins to manage erosion and sediment at the Colliery. Surface water features, such as the dams described in Section 6.2.2c, will be retained. The final void will remain as a long term groundwater sink at the conclusion of rehabilitation.

Property management

In pasture rehabilitated areas the ongoing maintenance program may also include slashing to reduce the bulk vegetative matter. As well as providing surface mulch, this also reduces the fire hazard of those areas. Grazing on older established rehabilitation areas may also be conducted to reduce fuel loads.

6.3 REHABILITATION OF AREAS AFFECTED BY SUBSIDENCE

An assessment of mine subsidence susceptibility and compatibility with the future land use is proposed for mine closure, including identification of existing subsidence features.

Where mine subsidence risks are identified that conflict with the final landform or final land use, additional investigation and assessment may be required to inform rehabilitation measures.

7. Rehabilitation Quality Assurance Process

This section describes the processes for rehabilitation quality assurance that will be implemented throughout the life of the Colliery. Quality assurance processes for each mining phase are provided. The purpose of this process is to:

- Implement the rehabilitation in accordance with the nominated methodologies
- Adequately identify risks to rehabilitation before proceeding to the next phase of rehabilitation.

Quality assurance processes are presented in Table 7.1.

Table 7.1 Rehabilitation quality assurance processes

Phase	Quality assurance process	Responsibility for implementation	Method for documenting and recording process	Method and timeframe for reviewing and refining process
Active mining phase	Visual inspections Up to date mine plans Pre-clearance surveys Regular inspections of stockpiles to inform weed maintenance or stabilisation scheduling Maintenance of growth medium inventory Inspections of erosion and sediment controls Weed and pest management	Environmental advisor Mine planner	Documentation of visual inspections Annual reporting of progress in forward program and annual rehabilitation report Soil characterisation documentation Ecological pre-clearing survey forms Weed and pest management documentation Waste management documentation	Process reviewed annually and/or following an incident
Decommissioning	Hazardous materials survey prior to demolition Inspection and demolition reports for all infrastructure to be removed Agreement with landowner on infrastructure to be removed and retained Structural adequacy assessment of built features to be retained	Project engineer	Statement provided and before/ after photos Hazardous materials survey report Structural adequacy report Validation report Waste management documentation	Process reviewed annually and/or following an incident

Phase	Quality assurance process	Responsibility for implementation	Method for documenting and recording process	Method and timeframe for reviewing and refining process
	Validation testing confirming that contaminated areas are fit to progress to next phase of rehabilitation Waste management and disposal		Copy of notification to local Council and Dial Before You Dig for underground services retained (if applicable) Engineering report/ statement, plug and abandonment log, photos, as-constructed drawings, records of fill materials and concrete plugs, filling methods	
Landform establishment	Visual inspections Survey and preparation of as-constructed drawings of final constructed slopes, landforms and water drainage structures as per creek stability assessment An engineering assessment undertaken by a suitably qualified person concludes that high risk landforms (such as steep slopes, high walls) have been constructed in accordance with geotechnical design U-Cut TSF capping inspections	Mine planner	Documentation of visual inspections Photos As-constructed surveys/aerial survey Independent geotechnical reports (where required) Landform evolution modelling reports, Monitoring Capping inspection reports, survey reports and an annual geotechnical report	Process reviewed annually and/or following an incident

Phase	Quality assurance process	Responsibility for implementation	Method for documenting and recording process	Method and timeframe for reviewing and refining process
Growth medium development	Soil testing prior to application of growth medium to land Erosion and sediment control inspection Weed management of growth medium stockpiles prior to application Recording depths of ripping and rehabilitation	Environmental advisor	Soil testing reports Biosolid/Ameliorant application reports Records of erosion and sediment control inspections Growth medium inventory Annual reporting of progress in forward program and annual rehabilitation report Weed and pest management documentation	Process reviewed annually and/or following an incident

Phase	Quality assurance process	Responsibility for implementation	Method for documenting and recording process	Method and timeframe for reviewing and refining process
Ecosystem and land use establishment	Visual inspections Collection of quality assurance documentation for seed sourced from suppliers (such as batch of seed, germination cert) Initial rehabilitation inspection three months after growth medium application and seeding of an area Regular inspections of rehabilitated areas to assess soil conditions and erosion, drainage and sediment control structures, runoff water quality, revegetation germination rates, plant health and weed infestation Rehabilitation monitoring Weed and pest management	Environmental advisor	Documentation of visual inspections Annual reporting of progress in forward program and annual rehabilitation report Rehabilitation establishment documentation Quality assurance documentation from suppliers Rehabilitation inspection reports Before and after photos Weed and pest management documentation	Process reviewed annually and/or following an incident

Phase	Quality assurance process	Responsibility for implementation	Method for documenting and recording process	Method and timeframe for reviewing and refining process
Ecosystem and land use development	Visual inspections Rehabilitation monitoring Weed and pest management	Environmental advisor	Documentation of visual inspections Annual reporting of progress in forward program and annual rehabilitation report Rehabilitation monitoring results Before and after photos Weed and pest management documentation	Process reviewed annually and/or following an incident

8. Rehabilitation monitoring program

8.1 ANALOGUE SITE BASELINE MONITORING

Analogue and baseline monitoring is currently undertaken to provide qualitative and quantitative data to assess the progression of rehabilitation at the Colliery. This monitoring includes rehabilitation and water quality monitoring.

The current rehabilitation program is documented in the Standard Monitoring Protocol (SMP) which is detailed in Appendix 2 - Regulatory Requirements for Rehabilitation of the existing Rehabilitation Management Plan (Ver 10) prepared as a requirement of PA 07_0087. Monitoring events commenced in 2011 and occur within the first 12 months of rehabilitation establishment, then every two years thereafter.

Approved final land use in the development consent is a mixture of pasture and trees over pasture to be utilised for grazing and does not conflict with future land use. Under the current cattle grazing monitoring program, four analogue sites have been selected to compare rehabilitated grazing areas to. These analogue sites have been chosen as they are good examples of the surrounding pasture community within the locality and have been used to establish benchmark and completion criteria. An additional four trees over pasture analogue sites will be identified which provide good examples of grazing land use and trees over pasture to be included in subsequent monitoring. Appropriate completion criteria will be nominated following a full set of seasonal monitoring based on the results from these new analogue sites.

8.2 REHABILITATION ESTABLISHMENT MONITORING

Rehabilitation monitoring has been undertaken at the Colliery in areas that have been rehabilitated. The monitoring program involves systematic and repeatable surveys at permanent monitoring sites and collects both qualitative and quantitative data to assess progress against performance indicators, rehabilitation objectives and completion criteria. The existing program consists of monitoring a permanent 50 m transect in rehabilitated and analogue sites. Soil samples are taken every 10 m and photo points are taken at the start and end of each transect. Values recorded are:

- Presence of noxious weeds.
- Fauna present.
- Vegetation establishment, ground cover, health and tree number.
- Nutrient recycling including litter and cryptograms.
- Soils/ surface conditions.
- Erosion and stability.
- Land and soil capability.

Twelve months after completion of this ecosystem and land use establishment phase, soil samples are analysed to characterise the material to determine whether the above treatments have been effective. Further application of ameliorants may be required to improve soil health. The monitoring program will also identify plant species along the transect.

Cattle grazing monitoring is undertaken yearly to identify capability of the rehabilitated pastures for supporting cattle enterprises. Pasture data including the stability, sustainability and productivity of

the pastures on the rehabilitated land will be assessed. The monitoring will provide feedback for management of the land and provide early indicators to initiate changes in management if required and compare against the completion criteria.

Grazing monitoring includes:

- Sampling in each season to capture seasonal pasture growth.
- Soil analysis with samples collected from 2 transects in each location and for essential plant nutrients including trace elements.
- Groundcover.
- Plant species.
- Existence of perennial or annual species.
- Photographs.
- Cattle monitoring.

The monitoring program will be undertaken within rehabilitated and analogue sites until it can be demonstrated that rehabilitation has satisfied the rehabilitation objectives and completion criteria.

Bloomfield currently monitor surface water quality as per PA 07_0087 and EPL 396. The existing surface water monitoring program is detailed in the WMP. Surface water quality monitoring is required to continue following decommissioning as several watercourses have been incorporated into the final landform. The monitoring program proposed in the Surface Water Assessment (GHD, 2022b) will be implemented during and after landform establishment, in addition to responsibilities under PA 07_0087 and EPL 396 and continue until mine lease relinquishment. The monitoring program in the Surface Water Assessment proposed two new monitoring points to be established. WMA will be established at Culvert A along Mount Vincent Road. WMB will be established where the Final Void Diversion Drain meets Buttai Creek.

Monitoring of watercourse stability will include annual monitoring events documenting the condition of the rehabilitation works, noting any damage or signs of poor performance. If annual monitoring indicates that rehabilitation has been stable for a period, the monitoring frequency may be reduced until the Colliery is fully rehabilitated.

Results from the rehabilitation monitoring are assessed to determine:

- If there are any emerging risks to rehabilitation, including areas where rehabilitation may be failing and require early intervention.
- Identify if triggers have been met for preventative or mitigation controls to minimise the impacts of emerging issues in accordance with the TARPS outlined in Section 10. Provide data that may inform continuous improvement of rehabilitation records.

8.3 MEASURING PERFORMANCE AGAINST REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

Monitoring events will occur as per Section 8.2 on a biannual basis. The objective of the rehabilitation monitoring program is to track the progress of rehabilitation and document any changes and trends in relation to rehabilitation objectives and completion criteria. Following completion of monitoring events, data will be reviewed and compared to previous years to identify long term trends in rehabilitation development. Once a number of datasets have been acquired, they will be compared with rehabilitation objectives and completion criteria outlined in Section 4. The rehabilitation monitoring program objective is to track the progress of rehabilitation and document any changes and trends in relation to rehabilitation objectives and completion criteria.

If deficiencies are found at monitoring locations, then the TARPs outlined in Section 10 will be enacted. Actions in the TARPs will form part of the environmental works planning for the following period.

9. Rehabilitation research, modelling and trials

9.1 CURRENT REHABILITATION RESEARCH, MODELLING AND TRIALS

9.1.1 Studies identified in previous MOP

Cattle Grazing study

Areas rehabilitated as pasture have been assessed to better understand the capability of the rehabilitated pastures to support cattle. Assessment is undertaken within an annual monitoring program that will continue throughout the rehabilitation phases.

Monitoring and documentation of pastures provide an assessment of progress in achieving closure criteria for rehabilitated grazing land. Evaluation of pasture conditions will provide feedback for management of the land and provide early indicators to initiate changes in management if required. The grazing study also includes analytical testing of pasture quality and assessment on how the rehabilitated areas respond to drought.

The most recent reporting period identified that the chemical composition of rehabilitated pastures higher quality than analogue pastures in terms of nutritional value. The range of pasture species in the rehabilitated pastures can provide plant growth each season to take maximum advantage of seasonal rainfall. The success of rehabilitated pastures confirms progress toward completion criteria is achievable with current measures being implemented at the Colliery.

9.2 FUTURE REHABILITATION RESEARCH, MODELLING AND TRIALS

A Detailed Closure Plan will be prepared for the Colliery in late 2022. The scope of this plan will be to:

- Confirm and document closure objectives.
- Define the scope of closure project.
- Identify key roles and responsibilities.
- Develop RACI (Responsible, Accountable, Consulted, Informed) matrix.
- Establish resource requirements.
- Develop closure project organisational structure.
- Establish work breakdown structure.
- Establish key tasks and critical milestones.
- Identify logic between critical project tasks.
- Identify critical path and key constraints.
- Identify data gaps in elements that inform timing of closure.

- Establish Closure Execution Schedule.

Specialist studies currently being undertaken to inform the Detailed Closure Plan are:

- Contamination Assessment.
- Geochemical Assessment.
- Surface Water Assessment.
- Groundwater Assessment.
- Water dam Assessment.
- Geotechnical design and landform stability Assessment.
- Underground mines entry assessment.
- Mine subsidence assessment.
- Ecology Assessment and Rehabilitation.
- TSF closure design.

10. Intervention and adaptive management

The rehabilitation monitoring program is a key method to identify if maintenance or remedial activities are required to ensure that rehabilitated area achieve specific completion criteria.

Following the completion of rehabilitation activities at the Colliery a rehabilitation care and maintenance phase will be undertaken to monitor and identify required management actions in the event of impacts to rehabilitation, or where rehabilitation outcomes are not achieved in an acceptable timeframe. The following TARPs have been developed to identify risks, triggers and proposed mitigation measures. Where necessary, rehabilitation procedures will be amended accordingly with the aim of continually improving rehabilitation outcomes.

Table 10.1 Trigger Action Response Plans (TARPs)

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
Landform stability	Landform erosion	Rehabilitation monitoring	Lower limit: Rill or erosion line > 300 mm deep Upper limit: Lower limit actions no successful in preventing erosion.	Lower limit measures: Implement erosion control measures, such as emplacement of rolled erosion products or seeding with sterile pasture grass to stabilise soil Incorporation of rocky overburden material into spread growth medium to improve soil stability Maintenance earthworks and revegetation works will be undertaken in the areas where erosion has been noted Reinspection following rehabilitation work Upper limit measures: Re-designing and construction of appropriate drainage lines Assess the need for more regular maintenance in the impacted area	Environmental advisor

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
	Geotechnical failure of final landform	As constructed surveys Aerial survey Independent geotechnical reports	Lower limit: Small areas (less than 1 hectare) of slope failure, no immediate risk to personal safety Upper limit: Large areas (greater than 1 hectare) of slope failure, immediate risk to personal safety	Lower limit measures: Undertake a review of the landform design and if required undertake regrading and revegetation of the area Upper limit measures: Conduct a safety assessment and immediately implement findings Undertake a review of the landform design, including survey if required. Undertake regrading and revegetation of the area, if required	Mine planner
	U-Cut TSF capping failure	Visual inspections As constructed aerial surveys	Slope gradients greater than 18 degrees As constructed aerial surveys findings a capping depth of less than 2 metres Visual observations such as cracking, capillary breaks, slumping and erosion	Reprofile non-engineered cap to have a slope gradient of 18 degrees or less Identify which areas require additional material so the non-engineered cap is at least 2 metres deep Repair of cracks, capillary breaks, slumping or erosion	Mine planner

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
				Revegetation with pasture grasses	
	Subsidence	Visual inspection	Sinkholes or waste emplacement show signs of being uneven, or patterns of displacement appear excessive altering drainage patterns or presenting safety risks	Identify, investigate and report on sinkholes The standard management procedure for sinkholes is to flag off and isolate the sink holes from access, back fill the holes and monitor for further subsidence If excessive displacement is identified, then repair works will be carried out Once deemed stable, the area will then be rehabilitated, and periodic inspections will continue	Mine manager

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
Water Quality	Surface water quality impacts during or after final landform construction	Surface water monitoring	Site specific criteria for WM2 EC: > 1794 µS/cm pH: above or below 6.5 – 8.0 pH Turbidity: > 86.8 NTU Site specific criteria for WM5 EC: > 2730 µS/cm pH: above or below 5.4- 8.0 pH Turbidity: > 25 NTU Site specific criteria for WM13, WMA and WMB EC: > 905 µS/cm pH: above or below 6.5 – 8.0 pH Turbidity: > 25 NTU	Repeat water quality sampling immediately to confirm exceedance If during construction, inspect and repair temporary controls as required Identify, investigate, and report on impacts to surface water Implementation of other bespoke corrective actions based on the identified source/cause of the issue	Environmental Advisor

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
	Surface water quality for retained dams	Surface water monitoring	EC: above or below 125-2200 µS/cm pH: above or below 6.5 – 8.5 pH Total suspended solids: <55 mg/L	Repeat water quality sampling immediately to confirm exceedance If during construction, inspect and repair temporary controls as required Identify, investigate, and report on impacts to retained dams Implementation of other bespoke corrective actions based on the identified source/cause of the issue	Environmental Advisor
	Groundwater quality impacts during or after final landform construction	Ground water monitoring	Site specific trigger values developed via the process outlined in the Groundwater Assessment (GHD, 2022c)	Repeat water quality sampling to confirm Identify, investigate, and report on impacts to groundwater Implementation of other bespoke corrective actions based on the identified source/cause of the issue	Environmental Advisor
	Watercourse stability impacts	Watercourse stability monitoring	Excessive erosion or deposition	Document with photographic evidence	Environmental Advisor

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
		Erosion and sediment control inspections		If during construction, inspect and repair temporary controls as required Identify, investigate required repair work and report on impacts to surface water	
	U-Cut TSF seepage	Ground water monitoring	Site specific trigger values developed via the process outlined in the Groundwater Assessment (GHD, 2022c)	Identify, investigate, and report on impacts to groundwater Ongoing monitoring of runoff and seepage waters during operations to validate predictions Implementation of other bespoke corrective actions based on the identified source/cause of the issue	Environmental Advisor
Ecosystem development	Decrease in surface coverage in rehabilitated areas	Rehabilitation monitoring	Decrease in values recorded from the previous monitoring round for the groundcover/stability assessments undertaken as part of rehabilitation monitoring	Soil testing along transect Conduct remedial treatment such as soil amelioration, reseeding etc Review species mix and adjust to achieve the targeted ecosystem	Environmental Advisor

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
	Lack of plant species diversity	Rehabilitation monitoring	Monitoring of plant species present not progressing towards assemblages of analogue sites	Review species mix and, if required, adjust to achieve the targeted ecosystem, investigate if reseeding is required	Environmental Advisor
	Nutrient deficit	Rehabilitation monitoring	Soil testing results are not comparable to analogue sites	Review soil management procedures and amend as appropriate Implement soil testing and amend growing media by the addition of soil ameliorants as required for example lime, gypsum, mulch, biosolids	Environmental Advisor
	Pasture areas not suitable for grazing productively.	Rehabilitation monitoring and grazing rehabilitation monitoring)	Lower limit: Monitoring data indicates vegetation and biomass have decreased or are not tracking towards analogue sites, still within criteria Upper limit: Exceedance of the following criteria: Pasture Herbage:<800 kg DM/ha Pasture % Dead matter > 50% Crude protein of pasture < 2% Digestibility of pasture dry matter < 40%	Lower limit measure: Pasture species selection will be reviewed in context of pasture productivity Upper limit measure: Conduct remedial treatment such as soil amelioration or reseeding	Environmental Advisor

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
			Metabolisable energy of pasture < 6MJ/kg DM Potential stocking rates <2-4 DSE/ha		
	Weeds and predation	Weed and pest management Rehabilitation monitoring Visual observation	Weeds account for greater than 15% of total herbage mass Visual evidence of predation from pest species	A contract weeds sprayer/pest sprayer is employed in addition to mechanical support from a slasher when required Prior to topdressing, inspections for weeds will be undertaken. Soils will be treated if weeds are present to ensure that growth medium used in rehabilitation works is weed free Following seeding, rapid establishment of ground cover species will be encouraged to outcompete potential weeds	Environmental Advisor
	Drought	Rehabilitation monitoring	Monitoring and vegetation assessments highlight inadequate ground cover and species abundance compared to previous monitoring rounds	Re-seeding with a selection of drought tolerant species for revegetation Time seeding/plantings to take advantage of ideal weather conditions, such as if rain is forecast	Environmental Advisor

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
				Assess against analogue site to determine if impact rehabilitation specific Investigation into the possibility of utilising irrigation as part of the water management system to promote germination and establishment of vegetation	
Contamination	Contaminated waste management	Surface monitoring Groundwater monitoring Surface Water Monitoring Program as per Water Management Plan Validation testing	Data obtained from monitoring program indicates exceedance of EPL limits or criteria presented in the Water Management Plan Validation survey indicates contaminants still remain insitu	Implement remediation contingency measures as per the Remediation Action Plan	Environmental Advisor
	Unexpected, contaminated finds	Visual inspections	Visual appearance of contamination such as staining and hydrocarbon or chemical odour	Follow Unexpected Finds Procedure in Remediation Action Plan	Environmental Advisor

Aspect	Risk	Monitoring process	Trigger threshold	Action and mitigation measures	Person responsible
Hazards	Spontaneous combustion	Visual inspections	Visual indicators of spontaneous combustion, including surface cracking, visible smoke, and carbonaceous combustion odour	Undertake a review of cause and location of spontaneous combustion and identify suitable management and remedial actions including apply capping, or dig out affected area where possible and seal, remedial earthworks with inert material and revegetate	Mine manager
	Major storm event resulting in flooding, geotechnical instability, major erosion and/or widespread damage to rehabilitated areas	Inspections of erosion and sediment controls	Noticeable damage or impacts to the landscape particularly around the U-Cut TSF, final void or dams	Geotechnical inspection, implementation of resulting actions. Re-profiling and reseeding of scoured areas	Mine manager
	Bushfire	Visual inspection of vegetated areas. Consultation with RFS	Inspections identify excess fuel loads Fire breaks are overgrown and unmaintained	Reduce fuel loads and ensure access tracks are cleared. Inspect water sources are and ensure sufficient water is available	Mine manager

11. Review, Revision, and Implementation

The ongoing effectiveness of this plan will be assessed during the rehabilitation of the Colliery. Statutory triggers for reviewing and revising this RMP are provided in Table 11.1.

Table 11.1 Statutory Triggers for RMP Review and Revision

Condition	Review trigger requirement
PA 07_0087 Schedule 5 Condition 4	Within three months of: (a) the submission of an annual review under Condition 3 (b) the submission of an incident report under Condition 6; (c) the submission of an audit report under Condition 7, or (d) any modification of the conditions of this approval (unless the conditions require otherwise), the Proponent shall review, and if necessary, revise the strategies, plans, and programs required under this approval to the satisfaction of the Director-General
PA 05_0136 Schedule 6 Condition 5	Within 3 months of: (a) the submission of an annual review under Condition 4 (b) the submission of an incident report under Condition 7 (c) the submission of an audit report under Condition 9 (d) any modification to the conditions of this approval, (unless the conditions require otherwise), the Proponent shall review the strategies, plans, and programs required under this approval, to the satisfaction of the Director-General. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted for the approval of the Director General
Mining Amendment Regulation 2021 **Clause 11** **Schedule 8A**	The holder of a mining lease must amend the rehabilitation management plan for the mining lease as follows— (a) to substitute the proposed version of a rehabilitation outcome document with the version approved by the Secretary—within 30 days after the document is approved, (b) as a consequence of an amendment made under clause 14 to a rehabilitation outcome document—within 30 days after the amendment is made, (c) to reflect any changes to the risk control measures in the prepared plan that are identified in a rehabilitation risk assessment—as soon as practicable after the rehabilitation risk assessment is conducted, (d) whenever given a written direction to do so by the Secretary—in accordance with the direction

Continual improvement

Rehabilitation activities will be subject to regular review to ensure conformance with commitment made in this plan, and subordinate plans and strategies. Monitoring and maintenance will occur as per this plan and in accordance with the Environmental Assessments and the existing Bloomfield Environmental Management System. Any requirements outlined by this plan not already in the existing Environmental Management System will be added.

Document Management

Copies of this document are managed under the Group Document Management System. This document and other relevant documents are kept on site and are available to all employees.

Implementation

The Company Directors are responsible for the overall rehabilitation and environmental performance of Bloomfield Colliery. The Mine Manager has direct responsibility for the rehabilitation process. The Environmental Advisor provides direction and advice to ensure site environmental compliance is maintained. The Environmental Advisor is responsible for the implementation of the works as described in this RMP.

12. References

AECOM. 2018. Bloomfield Colliery - Life of Mine Extension, Modification 4.

Business Environment. 2008. Bloomfield Colliery Completion of Mining and Rehabilitation Part 3A Environmental Assessment Project Application 07_0087.

Business Environment. 2009. Bloomfield Colliery Completion of Mining and Rehabilitation Part 3A Environmental Assessment Project Application 07_0087 Response to Submissions.

Department of Environment and Climate Change. 2008. Managing Urban Stormwater: Soils and Construction Volume 2E: Mines and Quarries.

Department of Planning. 2006. Lower Hunter Regional Strategy.

EPA. 2014. Waste Classification Guidelines.

GHD. 2022a. Contamination Assessment Bloomfield Mine Closure.

GHD. 2022b. Bloomfield Mine Closure: Surface Water Assessment.

GHD. 2022c. Bloomfield Mine Closure: Groundwater Assessment.

Matthei. 1995. Soil Landscapes of the Newcastle 1:100 000 Sheet.

Landcom. 2004. Managing Urban Stormwater: Soils and Construction Volume 1.

Landloch. 2021. Rehabilitation and Closure Study – Material Characterisation and Landform Erodibility Part A - Preliminary Screening Program. Report prepared for Bloomfield Colliery.

Landloch. 2022. Rehabilitation and Closure Study – Material Characterisation and Landform Erodibility Part B - - Erodibility Testing and Landform Evolution Modelling Program.

NSW Resources Regulator. 2021. Form and Way: Rehabilitation Management Plans for Large Min.

Appendix 1 - Land Ownership

Lot No.	DP No.	Landowner
1	42349	Ashtonfields Pty Ltd
1	58967	Ashtonfields Pty Ltd
1	69246	Ashtonfields Pty Ltd
1	136865	Ashtonfields Pty Ltd
12	241097	Ashtonfields Pty Ltd
13	241097	Ashtonfields Pty Ltd
14	241097	Ashtonfields Pty Ltd
15	241097	Ashtonfields Pty Ltd
1	456999	Ashtonfields Pty Ltd
2	456999	Ashtonfields Pty Ltd
1	722209	Ashtonfields Pty Ltd
1	722210	Ashtonfields Pty Ltd
10	755237	Ashtonfields Pty Ltd
18	755237	Ashtonfields Pty Ltd
19	755237	Ashtonfields Pty Ltd
20	755237	Ashtonfields Pty Ltd
23	755237	Ashtonfields Pty Ltd
29	755237	Ashtonfields Pty Ltd
31	755237	Ashtonfields Pty Ltd
37	755237	Ashtonfields Pty Ltd
38	755237	Ashtonfields Pty Ltd
39	755237	Ashtonfields Pty Ltd
223	755237	Ashtonfields Pty Ltd
36	755260	Ashtonfields Pty Ltd
35	755260	Ashtonfields Pty Ltd
34	755260	Ashtonfields Pty Ltd
48	755260	Ashtonfields Pty Ltd
30	755260	Ashtonfields Pty Ltd
29	755260	Ashtonfields Pty Ltd
28	755260	Ashtonfields Pty Ltd
27	755260	Ashtonfields Pty Ltd
26	755260	Ashtonfields Pty Ltd
43	755260	Ashtonfields Pty Ltd
25	755260	Ashtonfields Pty Ltd
24	755260	Ashtonfields Pty Ltd
23	755260	Ashtonfields Pty Ltd
22	755260	Ashtonfields Pty Ltd
45	755260	Ashtonfields Pty Ltd
46	755260	Ashtonfields Pty Ltd
1	1045719	Ashtonfields Pty Ltd
3	1045720	Ashtonfields Pty Ltd

Lot No.	DP No.	Landowner
4	1045720	**Ashtonfields Pty Ltd**
2	1045720	**Ashtonfields Pty Ltd**
1	1045720	**Ashtonfields Pty Ltd**
1	1045722	**Ashtonfields Pty Ltd**
2	1045722	**Ashtonfields Pty Ltd**
1	1045723	**Ashtonfields Pty Ltd**
11	755237	**Ashtonfields Pty Ltd**
44	755260	**Ashtonfields Pty Ltd**
35	755237	**Bloomfield Group**
36	755237	**Bloomfield Group**
10	241097	**Hunter Water**
4	241097	**Hunter Water**
5	241097	**Hunter Water**
6	241097	**Hunter Water**
1	241097	**Hunter Water**
2	241097	**Hunter Water**
3	241097	**Hunter Water**
7	241097	**Hunter Water**
8	241097	**Hunter Water**
9	241097	**Hunter Water**
1	617909	**Hunter Water**
1	724270	**Hunter Water**
1	814743	**Hunter Water**
102	1130948	**Hunter Water**
101	1130948	**Hunter Water**
100	1130948	**Hunter Water**
104	1131098	**Hunter Water**
105	1131098	**Hunter Water**
106	1131104	**Hunter Water**
107	1131109	**Hunter Water**
103	1131280	**Hunter Water**
120	1154927	**Hunter Water**
1217	1157771	**Hunter Water**
30	1113350	**Rathvale Pty Ltd**

Appendix 2 - Regulatory Requirements for Rehabilitation

<table>
<tr><th>Statutory Approval</th><th>Condition/ Section</th><th>Requirement (including timing)</th><th>Area Applies to</th><th>RMP section addressed</th></tr>
<tr><td rowspan="2">PA 07_0087 Bloomfield Coal Project</td><td>Schedule 2
Condition 5</td><td>Mining operations may take place at the Colliery until 31 December 2030.

Note: Under this Approval, the Proponent is required to rehabilitate the site to the satisfaction of the Secretary and DRG. Consequently, this approval will continue to apply in all other respects other than the right to conduct mining operations until the site has been rehabilitated to a satisfactory standard.</td><td>PA 07_0087 Approval area</td><td>Section 6.1</td></tr>
<tr><td>Schedule 3

Condition 25</td><td>The Proponent must rehabilitate the site to the satisfaction of DRG and the Secretary. This rehabilitation must be generally consistent with the proposed rehabilitation activities described in the documents listed in condition 2 of Schedule 2 and comply with the objectives in Table 5.

Table 5: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>All areas of the site affected by the project</td><td>• Safe, stable and non-polluting
• Fit for the intended post-mining land use/s</td></tr>
<tr><td>Areas proposed for native ecosystem re-establishment</td><td>• Restore self-sustaining native woodland ecosystems characteristic of vegetation communities found in the local area.
• Establish areas of self-sustaining:
– riparian habitat, within any diverted and/or re-established creek lines and retained water features;</td></tr>
</table>
</td><td>ML 1738</td><td>Section 4, Appendix 5 - Completion Criteria</td></tr>
</table>

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed

Feature	*Objective*
	– potential habitat for threatened flora and fauna species; and – wildlife corridors, as far as is reasonable and feasible.
Areas proposed for agricultural land	• Establish/restore grassland areas to support sustainable agricultural activities • Achieve the nominated land capability classification
Other land affected by the development	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native plant species (unless DRG agrees otherwise)
Final Landform	• Stable and sustainable for the intended post-mining land use/s • Integrated with surrounding natural landforms • Incorporate micro-relief and drainage lines that are consistent with surrounding topography, to the greatest extent practicable • Maximise surface water drainage to the natural environment (excluding final void catchment)
Final voids	• Designed as long term groundwater sinks to maximise ground water flows across back filled pits to the final void • Minimise to the greatest extent practicable: – the size and depth of final voids; – the drainage catchment of final voids; – any high wall instability risk; and – the risk of flood interaction

<table>
<tr><th>Statutory Approval</th><th>Condition/ Section</th><th>Requirement (including timing)</th><th>Area Applies to</th><th>RMP section addressed</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><td>Creek restoration works</td><td>• Engineered to be hydraulically and geomorphologically stable
• Incorporate erosion control measures based on vegetation and engineering revetments
• Incorporate structures for aquatic habitat
• Revegetate with suitable native species</td></tr>
<tr><td>Surface infrastructure of the development</td><td>• To be decommissioned and removed, unless DRG agrees otherwise</td></tr>
<tr><td>Rehabilitation materials</td><td>• Materials from areas disturbed under this consent (including topsoils, substrates and seeds) are to be recovered, managed and used as rehabilitation resources, to the greatest extent practicable</td></tr>
<tr><td>Water quality</td><td>• Water retained on the site is fit for the intended post-mining land use/s
• Water discharged from the site is suitable for receiving waters and fit for aquatic ecology and riparian vegetation</td></tr>
<tr><td>Community</td><td>• Ensure public safety
• Minimise adverse socio-economic effects associated with mine closure</td></tr>
</table>
Note: The rehabilitation objectives detailed in 5 apply to the entire site, including all landforms constructed under either this approval or previous consents. However, they do not require any additional earthmoving works to be undertaken for landforms that have been approved and constructed prior to Modification 4 or under previous consents.
</td><td></td><td></td></tr>
<tr><td></td><td>Schedule 3
Condition 25A</td><td>The Proponent must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable steps must be taken to minimise the total area exposed at any time. Interim stabilisation and temporary vegetation strategies must be employed when areas prone to dust generation, soil erosion and weed incursion cannot be permanently rehabilitated.</td><td>ML 1738</td><td>Section 6.1, Section 6.2.1 to 6.2.6</td></tr>
</table>

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed
		Note: It is accepted that some parts of the Colliery that are progressively rehabilitated may be subject to further disturbance at some later stage of the development.		
	Schedule 3 Condition 26	The Proponent must rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. All reasonable steps must be taken to minimise the total area exposed at any time. Interim stabilisation and temporary vegetation strategies must be employed when areas prone to dust generation, soil erosion and weed incursion cannot be permanently rehabilitated. Note: It is accepted that some parts of the Colliery that are progressively rehabilitated may be subject to further disturbance at some later stage of the development.	ML 1738	Section 6.2.1 to 6.2.6
	Schedule 3 Condition 27	The Rehabilitation Management Plan must include: (a) the rehabilitation objectives for the site: (b) a description of the short-, medium-, and long-term measures that would be implemented to: • rehabilitate the site; and • manage the remnant vegetation and habitat at the Colliery. (c) performance and completion criteria for the rehabilitation of the Colliery. (d) a detailed description of the measures that would be implemented over the next 3 years, including the procedures to be implemented for: • minimising and rehabilitating disturbed areas. • protecting vegetation and soil outside the disturbance areas. • undertaking pre-clearance surveys. • managing impacts on fauna.	PA 07_0087 Approval area	Section 4; Section 6.1; Section 6.2.1 to 6.2.6; Section 8.1 to 8.3; Section 10; Section 11 and Appendix 5 - Completion Criteria

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed
		• landscaping the site to minimise visual impacts. • conserving and reusing topsoil. • collecting and propagating seed for rehabilitation works. • salvaging and reusing material from the site for habitat enhancement. • controlling weeds and feral pests. • controlling access; and • bushfire management. (e) a program to monitor the effectiveness of these measures, and progress against the performance and completion criteria. (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 (g) details of who would be responsible for monitoring, reviewing, and implementing the plan.		
	Schedule 3 Condition 28	The Final Void Management Plan must: (a) justify the final location and future use of the final void. (b) incorporate design criteria and specifications for the final void based on verified groundwater modelling predictions and a re-assessment of post-mining groundwater equilibration; and (c) describe what actions and measures would be implemented to: • minimise any potential adverse impacts associated with the final void; and • manage and monitor the potential impacts of the final void.	Final void	Section 6.2.3 Bloomfield Final Void Management Plan

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed
	Schedule 3 Condition 29	The Mine Closure Plan must: (a) be prepared in consultation with DRG and Council. (b) define the objectives and criteria for mine closure (c) investigate options for the future use of the Colliery in a manner consistent with the Lower Hunter Regional Strategy (Department of Planning, 2006) and/or other extant regional planning strategies. (d) investigate ways to minimise the adverse socio-economic effects associated with mine closure, including reduction in local employment levels. (e) describe the measures that would be implemented to minimise or manage the ongoing environmental effects of the project; and (f) describe how the performance of these measures would be monitored over time.	PA 07_0087 Approval area	Not relevant to this RMP Scope of Mine Closure Plan and Demolition Strategy discussed in Section 9.2
	Appendix 3 Comment 4.1	All site rehabilitation, including monitoring and maintenance will be undertaken in accordance with procedures documented in the EA and the existing Bloomfield Rehabilitation Management System.	ML 1738	Section 7, Section 11
	Appendix 3 Comment 4.2	Any additional rehabilitation requirements and plans for this Project will be included in the existing Bloomfield Rehabilitation Management System.	ML 1738	Section 11
	Appendix 3 Comment 4.3	Land that has been mined will be rehabilitated to a safe and stable form with a land capability similar to that existing prior to mining, and with a landform compatible with the surrounding landscape.	ML 1738	Section 2.3
	Appendix 3 Comment 5.2	Rehabilitation of the final void forms part of the Abel Project Approval. However, rehabilitation of the tailings filled void at the completion of the Abel Project will remain the responsibility of Bloomfield as outlined in the Draft Bloomfield Closure and Rehabilitation Strategy (Abel).	ML 1738 ML 1653	Section 6.1

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed
	Appendix 3 Comment 18.1	Visual impacts of the Bloomfield Mine will be mitigated by the following strategies: Rehabilitation of the southern boundary of the Project Area adjacent to John Renshaw Drive will be given priority during the early stages of mining. Mobile directional lighting in active mine areas will be directed away from neighbouring properties and roadways; and Complaints regarding lighting will be investigated by Bloomfield during the relevant shift.	ML 1738	Not applicable to this RMP
	Appendix 3 Comment 18.2	Tree areas will be incorporated into rehabilitation to assist the visual blending of overburden dumps with the surrounding landscape.	ML 1738	Section 5.1
	Appendix 3 Comment 20.3	Rehabilitation of the final void forms part of the Abel Project Approval. However, rehabilitation of the tailings filled void at the completion of the Abel Project will remain the responsibility of Bloomfield as outlined in the Draft Bloomfield Closure and Rehabilitation Strategy (Abel).	ML 1738 ML 1653	Section 5.1 and Section 6.1
PA 05_0136 Abel Coal Project	Schedule 2 Condition 5	The Proponent may carry out mining operations on site until the end of December 2030. Note: Under this approval, the Proponent is required to rehabilitate the site and perform additional undertakings to the satisfaction of either the Director-General or the Executive Director, Mineral Resources. Consequently, this approval will continue to apply in all other respects other than the right to conduct mining operations until the rehabilitation of the Colliery and these additional undertakings have been carried out satisfactorily.	ML 1738 ML 1653	Section 6.1
	Schedule 4 Condition 27	The Proponent shall rehabilitate the site to the satisfaction of the Executive Director Mineral Resources. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EA and comply with the objectives in Table 12.	ML 1738 ML 1653	Section 4, Appendix 5 - Completion Criteria

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed

Table 12: Rehabilitation Objectives

Feature	Objective
• Mine site (as a whole).	• Safe, stable & non-polluting; and • Final land use compatible with surrounding land uses.
• Surface infrastructure.	• To be decommissioned and removed, unless the Executive Director Mineral Resources agrees otherwise.
• Portals and ventilation shafts.	• To be decommissioned and made safe and stable; and • Retain habitat for threatened species (eg bats), where practicable.
• Watercourses within project area.	• Hydraulically and geomorphologically stable.
• Cliffs.	• No additional risk to public safety compared to prior to mining.
• Other land affected by the project.	• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of: – local native plant species (unless the Executive Director Mineral Resources agrees otherwise); and – a landform consistent with the surrounding environment .
• Built features damaged by mining operations.	• Repair to pre-mining condition or equivalent unless: – the owner agrees otherwise; or – the damage is fully restored, repaired or compensated under the *Mine Subsidence Compensation Act 1961*
• Community.	• Ensure public safety; and • Minimise the adverse socio-economic effects associated with mine closure

Notes:

- *These rehabilitation objectives apply to all subsidence impacts and environmental consequences caused by mining taking place after the date of this approval; and to all surface infrastructure sites and other disturbance which forms part of the project, whether constructed prior to or following the date of this approval.*
- *Rehabilitation of subsidence impacts and environmental consequences caused by mining which took place prior to the date of this approval may be subject to the requirements of other approvals (eg under a mining lease or a Subsidence Management Plan approval).*

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed
	Schedule 4 Condition 28	The Proponent shall carry out the rehabilitation of the Colliery progressively, that is, as soon as reasonably practicable following disturbance.	ML 1738	Section 6.1
	Schedule 4 Condition 29	The Proponent shall prepare and implement a Rehabilitation Management Plan for the project, in consultation with OEH, NOW, Cessnock City Council, Maitland City Council and Newcastle City Council, and the CCC, and to the satisfaction of the Director-General and the Executive Director Mineral Resources. This plan must: (a) be submitted to the Director-General and the Executive Director Mineral Resources for approval within 9 months of the date of approval of MOD 3. (b) be prepared in accordance with any relevant DRE guideline and be consistent with the rehabilitation objectives in the EA, EA (MOD 3) and in Table 11. (c) describe how the performance of the rehabilitation would be monitored and assessed against the objectives in Table 11. (d) describe the process whereby additional measures would be identified and implemented to ensure the rehabilitation objectives are achieved. (e) provide for detailed mine closure planning, including measures to minimise socio-economic effects due to mine closure, to be conducted prior to the site being placed on care and maintenance; and (f) be integrated with the other management plans required under this approval. Note: The Rehabilitation Management Plan should address all land impacted by the project and should be suitably integrated with the approved Rehabilitation Management Plans for the Donaldson Open-Cut Mine and the Bloomfield Colliery.	ML 1738	Not applicable to the Colliery, this will be produced by Yancoal for the Abel Underground Mine

Statutory Approval	Condition/ Section	Requirement (including timing)	Area Applies to	RMP section addressed
	Appendix 5 Comment 12	The Company commits to rehabilitating the Abel Underground Mine area and Abel pit top in accordance with DP&I and DRE guidelines. This includes ongoing rehabilitation in response to mine subsidence as well as rehabilitation of pit top areas after completion of mining. The Company will provide a Mine Closure Plan as part of the MOP required under the relevant condition of the mining lease for the Abel Underground Mine. This Mine Closure Plan will be produced in consultation with DP&I, DRE and other stakeholders as required.	ML 1738 ML 1653	Not applicable to Bloomfield
ML 1738	Condition 2	Any disturbance as a result of activities under this mining lease must be rehabilitated to the satisfaction of the Minister.	ML1738	Section 4 and Appendix 5
CCL 761	Condition 2	Any disturbance as a result of activities under this lease must be rehabilitated to the satisfaction of the Director-General.	CCL761	Section 4 and Appendix 5 - Completion Criteria
AMA 1001	Schedule A Condition 1	The leaseholder must rehabilitate the land described in Schedule C that is or may be affected by the carrying out of the ancillary mining activities	AMA1001	Section 4, Section 6.1 and Appendix 5 - Completion Criteria

Appendix 3 - Regulatory Agency Consultation

Key stakeholders such as Ashtonfields Pty Ltd and NSW Resources Regulator will be consulted to refine the rehabilitation objectives and rehabilitation completion criteria. Evidence and outcomes of consultation will be provided in forward versions of the RMP.

Appendix 4 - Risk Assessment – Bowtie Diagram

Risk ID	Phase of Rehabilitation	Risks/Causes	Prevention Controls	Control Effectiveness
1	General	Insufficient provision for closure and rehabilitation	Department of Planning and Environment (DPE) Rehabilitation Cost Estimation (RCE)	Satisfactory
			Detailed mine closure planning	Proposed/Future
			Progressive rehabilitation	Good
2	General	Changing regulatory expectations and requirements of completion criteria	Rehabilitation Management Plan (RMP)	Satisfactory
			Detailed mine closure planning	Proposed/Future
			Partial/early relinquishment	Satisfactory
3	General	Loss of site knowledge and history of the site	Historical records	Satisfactory
			Detailed mine closure planning	Proposed/Future
4	General	Interface with stakeholders	Stakeholder engagement strategy	Good
			Engagement with Yancoal	Good
5	General	Interface with third party assets (e.g. Ausgrid easement, Hesslow block, Telstra fibre optic cable, Orica compound, Hunter water)	Stakeholder engagement strategy	Good
			Access agreements	Satisfactory
6	General	Offsite water discharge outside licence agreement	Detailed mine closure planning	Proposed/Future
			Water Management Plan (WMP)	Satisfactory
			Storage dams	Good
			Environmental Protection Licence (EPL)	Good
			Rehabilitation monitoring program	Good
7	Active mining	Change in coal quality / price extends / shortens mine life	Detailed mine closure planning	Proposed/Future
8	Decommissioning	Dam closure, removal & decommissioning (tailings)	Tailings Storage Facility (TSF) closure strategy	Proposed/Future
			Detailed mine closure planning	Proposed/Future
9	Decommissioning	Pumping infrastructure to support intended final land use (e.g. tailings, UG dewatering)	Studies (further) – surface and ground water mine closure	Proposed/Future
			Detailed mine closure planning	Proposed/Future
			Rehabilitation monitoring program	Good
			Groundwater sampling	Good
10	Decommissioning	Poor understanding / planning of decommissioning closure activities and approvals	Procurement - specialist contractors (as required)	Proposed/Future
			Detailed mine closure planning	Proposed/Future
			Rehabilitation Management Plan (RMP)	Satisfactory
11	Decommissioning	Contamination resulting from associated activities	Contamination land assessment	Good
			Contamination Remediation Action Plan (RAP)	Proposed/Future
			Environmental Management Strategy and Pollution Incident Response Management Plan	Good
12	Decommissioning	Hazards associated with retained infrastructure (incl. power transmission lines, water infrastructure, roads, power infrastructure, rail loop)	Transfer ownership – third party assets	Proposed/Future
			Maintenance & inspection program – infrastructure	Good
			Development consent (post mining)	Proposed/Future
			Land owner acceptance & agreement	Proposed/Future
13	Decommissioning	Exposure or access to mine openings	Risk assessment, design and sealing of mine openings	Proposed/Future
			Historical records	Satisfactory
14	Decommissioning	Impacts to European heritage	Historical Heritage Conservation Management Plan	Good
			TARPs – Blasting	Good
15	Decommissioning	Impacts to Aboriginal heritage	Aboriginal Cultural Heritage Management Plan	Satisfactory
16	Landform establishment	Re-work for sites that have revegetated	Land Disturbance Management Procedure	Good
			Detailed mine closure planning	Proposed/Future
17	Landform establishment	Changes to visual amenity to neighbours and/or transport corridors	Stakeholder engagement strategy	Good
			Final landform design (update/refinement)	Proposed/Future
			Dust management	Good
			Rehabilitation – ground cover (achieved)	Proposed/Future
18	Landform establishment	Geo-chemical properties impacting final land use	Identification of leaching sources (Acid Mine Drainage, saline drainage, neutral mine drainage, Heavy Metals & Spontaneous Combustion)	Proposed/Future
			Geochem Remediation plan	Proposed/Future
			Detailed mine closure planning	Proposed/Future
			Soil testing & amelioration	Good
19	Landform establishment	Spontaneous combustion of landforms	Dust management	Good
			Final landform design (update/refinement)	Proposed/Future
			Spontaneous Combustion Principal Mining Hazard Management Plan	Good
			Monitoring – spontaneous combustion	Satisfactory
			Rehabilitation – ground cover (achieved)	Proposed/Future
20	Landform establishment	Subsidence from UG workings	Risk assessment, design and sealing of mine openings	Proposed/Future
			Risk assessment – subsidence from UG workings	Proposed/Future
			Historical records	Satisfactory
21	Landform establishment	Erosion and failure of landform, drainage and water management/storage structures	Landform evolution modelling	Proposed/Future
			Water Management Plan (WMP)	Satisfactory
			Detailed mine closure planning	Proposed/Future
			Rehabilitation – ground cover (achieved)	Proposed/Future
			Post mining land use – grazing	Good
			Rehabilitation monitoring program	Good
22	Growth medium development	Identification of sufficient, suitable material for topsoil	Landform evolution modelling	Proposed/Future
			Final landform design (update/refinement)	Proposed/Future
			Growth medium - material balance	Satisfactory
			Soil testing & amelioration	Good
23	Ecosystem and land use establishment	Weed infestation	Weed management program	Satisfactory
			Rehabilitation monitoring program	Good
24	Ecosystem and land use development	Changes to surface water flows	Detailed mine closure planning	Proposed/Future
			Stakeholder engagement strategy	Good
			Final landform design (update/refinement)	Proposed/Future
25	Ecosystem and land use development	Natural events impact performance of rehabilitation (e.g. drought, bushfires)	Landform evolution modelling	Proposed/Future
			Storage dams	Good
			Final landform design (update/refinement)	Proposed/Future
26	Ecosystem and land use development	Lack of infrastructure to support final land use (e.g. fencing, watering facilities)	Final landform design (update/refinement)	Proposed/Future
			Stakeholder engagement strategy	Good
27	Rehabilitation completion (sign-off)	Instability of void in final landform	Final landform design (update/refinement)	Proposed/Future
			Landform evolution modelling	Proposed/Future
28	Rehabilitation completion (sign-off)	Subsidence / settlement cracking of final landform	Rehabilitation monitoring program	Good
29	Rehabilitation completion (sign-off)	Impacts to aquifers and groundwater (e.g. Wallis creek)	Groundwater sampling	Good
			Water Management Plan (WMP)	Satisfactory
			Detailed mine closure planning	Proposed/Future

Bloomfield Colliery Rehabilitation
Failure to relinquish site and successfully rehabilitate

Impact ID	Impact/ Consequence	Mitigating controls	Control effectiveness	Risk: Consequence	Risk: Likelihood	Risk: Risk
A	Financial & schedule impacts	Detailed mine closure planning	Proposed/Future	2. Major	C. Possible	High
		Contingency planning - rehabilitation and closure	Proposed/Future			
		Progressive rehabilitation	Good			
		Partial/early relinquishment	Satisfactory			
B	Regulatory impacts	Rehabilitation Management Plan (RMP)	Satisfactory	4. Minor	C. Possible	Low
		Stakeholder engagement strategy	Good			
C	Environmental Impacts	Rehabilitation monitoring program	Good	2. Major	C. Possible	High
		Environmental Management Strategy and Pollution Incident Response Management Plan	Good			
		Monitoring – spontaneous combustion	Satisfactory			
D	Social licence impacts	Stakeholder engagement strategy	Good	4. Minor	D. Remote	Low
		Detailed mine closure planning	Proposed/Future			
		Rehabilitation Management Plan (RMP)	Satisfactory			
E	Final land user impacts	Stakeholder engagement strategy	Good	3. Moderate	D. Remote	Low
		Lease Agreements	Good			
F	Contract impacts	Post mining contracts	Proposed/Future	4. Minor	D. Remote	Low
G	Public safety impacts	Post mining land use – grazing	Good	4. Minor	D. Remote	Low
		Final landform design (update/refinement)	Proposed/Future			
		Final landform security	Proposed/Future			

Control ID	Controls	Control Effectiveness	RMP Section Addressed
1	Department of Planning and Environment (DPE) Rehabilitation Cost Estimation (RCE)	Satisfactory	Forward Program (not RMP)
2	Detailed mine closure planning	Proposed / Future	Section 9.2 Future rehabilitation research, modelling and trials
3	Progressive rehabilitation	Good	Section 6 Rehabilitation Implementation
4	Rehabilitation Management Plan (RMP)	Satisfactory	This document
5	Partial/early relinquishment	Satisfactory	Section 6 Rehabilitation Implementation
6	Historical records	Satisfactory	Section 9.2 Future rehabilitation research, modelling and trials
7	Stakeholder engagement strategy	Good	Section 2.2 Final Land Use Options Assessment and Section 4.2 Rehabilitation Objectives and Rehabilitation Completion Criteria - Stakeholder Consultation
8	Engagement with Yancoal	Good	
9	Access agreements	Satisfactory	N/A
10	Water Management Plan (WMP)	Satisfactory	Website (not RMP) https://www.bloomcoll.com.au/
11	Storage dams	Good	Water Management Plan on website (not RMP) https://www.bloomcoll.com.au/
12	Environmental Protection Licence (EPL)	Good	Section 6 Rehabilitation Implementation
13	Rehabilitation monitoring program	Good	Section 9 Rehabilitation research, modelling and trials
14	Tailings Storage Facility (TSF) closure strategy	Proposed / Future	Section 9.2 Future rehabilitation research, modelling and trials
15	Studies (further) – surface and ground water mine closure	Proposed / Future	Section 9.2 Future rehabilitation research, modelling and trials
16	Contamination land assessment	Good	Section 6.2.2. Decommissioning (d) Management of carbonaceous and contaminated materials and Section 9.2 Future rehabilitation research, modelling and trials
17	Contamination Remediation Action Plan (RAP)	Proposed / Future	
18	Environmental Management Strategy and Pollution Incident Response Management Plan	Good	Website (not RMP) https://www.bloomcoll.com.au/
19	Transfer ownership – third party assets	Proposed / Future	Future control
20	Maintenance & inspection program – infrastructure	Good	Computerised Maintenance Management System (CMMS) - Pulse (not RMP)
21	Development consent (post mining)	Proposed / Future	Future control
22	Land owner acceptance & agreement	Proposed / Future	Future control
23	Risk assessment, design and sealing of mine openings	Proposed / Future	Section 6.2.2. Decommissioning (e) Hazardous material management and Appendix 5 (Completion Criteria)
24	Historical Heritage Conservation Management Plan	Good	Section 6.2.1 Active Mining Phase (m) Management of potential cultural and heritage issues
25	TARPs – Blasting	Good	Website (not RMP) https://www.bloomcoll.com.au/
26	Aboriginal Cultural Heritage Management Plan	Satisfactory	Section 6.2.1 Active Mining Phase (m) Management of potential cultural and heritage issues
27	Land Disturbance Management Procedure	Good	Website (not RMP) https://www.bloomcoll.com.au/
28	Dust management	Good	Section 6.2 Phases of Rehabilitation and General Methodologies
29	Rehabilitation – ground cover (achieved)	Proposed / Future	Section 6.2.4 Growth Medium Development and Appendix 5 Completion Criteria
30	Identification of leaching sources (Acid Mine Drainage, saline drainage, neutral mine drainage, Heavy Metals & Spontaneous Combustion)	Proposed / Future	Section 6.2 Phases of Rehabilitation and General Methodologies and Section 9.2 Future Rehabilitation Research, Modelling and Trials
31	Geochem Remediation plan	Proposed / Future	
32	Soil testing & amelioration	Good	Section 6.2.1. Active Mining Phase (a) soils and materials and Section 6.2.4 Growth medium development
33	Growth medium - material balance	Satisfactory	
34	Final landform design (update/refinement)	Proposed / Future	Section 6.2.3. Landform establishment
35	Spontaneous Combustion Principal Mining Hazard Management Plan	Good	Section 6.2.1. Active Mining Phase (g) Materials prone to spontaneous combustion
36	Monitoring – spontaneous combustion	Satisfactory	
37	Identification of historical known mine openings	Proposed / Future	Section 6.2.2. Decommissioning (e) Hazardous material management and Appendix 5 (Completion Criteria)
38	Risk assessment – subsidence from UG workings	Proposed / Future	Section 6.2.1 Active Mining Phase (l) Mine subsidence
39	Landform evolution modelling	Proposed / Future	Section 6.2.1. Active Mining Phase (a) soils and materials and Section 9.2 Future rehabilitation research, modelling and trials
40	Post mining land use – grazing	Good	
41	Weed management program	Satisfactory	Section 6.2 Phases of Rehabilitation and General Methodologies and Section 10 Intervention and adaptive management
42	Groundwater sampling	Good	Section 10 Intervention and adaptive management and Appendix 5 Completion Criteria
43	Contingency planning - rehabilitation and closure	Proposed / Future	Section 6.2.2 Decommissioning and Section 10 Intervention and adaptive management
44	Lease Agreements	Good	Appendix 5 Completion Criteria
45	Post mining contracts	Proposed / Future	Future control
46	Final landform security	Proposed / Future	Section 6.2.2. Decommissioning (a) Site security
47	Procurement - specialist contractors (as required)	Proposed / Future	Future control

Appendix 5 - Completion Criteria

Final Land Use Domain	Mining Domain	Rehabilitation Objectives	Indicator	Rehabilitation Completion Criteria	Justification/ Validation Method
Final Void	Active Mining Area	Final landform is safe, stable and non-polluting.	Visual – indicators of erosion and land instability. Measured - survey of Final landform to specifically monitor material loss via erosion.	High risk landforms have been constructed in accordance with geotechnical landform design.	An engineering assessment undertaken by a suitably qualified person concludes that high risk landforms have been constructed in accordance with landform design. Aerial survey.
			Visual – indicators that surface water drains and management structures are stable.	Water management structures have been constructed in accordance with hydrological design.	Before and after photos, as constructed surveys.
		Management of waste materials	Quality assurance records for the placement and burial in accordance with EPL.	Used tyres covered by at least 20 m of inert material.	Quality assurance records.
Water Management Area	Water Management Area	Removal of infrastructure: All infrastructure that is not to be used as part of the final land use is removed.	Removal of all water management infrastructure (including pumps, pipes and power supply).	Infrastructure removed.	Statement provided and before/ after photos.
			Services disconnected and removed.	Infrastructure removed.	Statement provided and before/ after photos.
			Diversion drains, sediment ponds, banks and sediment removed.	Infrastructure removed.	Statement provided and before/ after photos.
		Surface Water: Runoff water quality from the mine site is suitable for receiving waters, aquatic ecology and riparian vegetation.	Water quality parameters selected from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 and or the EPL.	Water quality discharge meets the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 and or the EPL.	Water quality monitoring reports. EPL relinquished by EPA Independent hydrological assessment report.
Water Storage Area	Water Management Area	Removal of infrastructure:	Removal of all water management infrastructure (including pumps, pipes and power).	Infrastructure removed.	Statement provided and before/ after photos.
		Surface Water: Runoff water quality from mine site is suitable for receiving waters, aquatic ecology and riparian vegetation.	Water quality parameters selected from Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 and or Environment Protection Licence.	Water quality discharge meets the Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000 and or the EPL.	Water quality monitoring reports. Environment Protection Licence relinquished by Environment Protection Authority. Independent hydrological assessment report. Depending on the nature, scale and risks associated with a specific site.
		Water Approvals: Structures that take or divert water such as final voids, dams, levees etc. are appropriate.	Final landform and retained water storages considers advice from relevant Government Agency whether sufficient licence shares are available in the water source to account for water stored in voids and dams in the proposed final landform.	Water approvals / licences are granted by relevant NSW Government Agency.	Confirmation from relevant Government Agency that relevant water approvals / licences are able to be granted.
Agricultural – Grazing **(pasture and trees over pasture)**	Tailings Storage Facility; Overburden Emplacement Area; Active Mining; Ancillary Infrastructure - Topsoil Stockpile Areas; Water Management; Underground Mining Areas (SMP)	Removal of Infrastructure: All infrastructure that is not to be used as part of the final land use is removed.	Removal of all services (power, water, communications).	Infrastructure removed.	Statement provided, utility service disconnection record and before/ after photos.
			Removal of all buildings, footings, hardstands etc. not agreed for retention.	Buildings and structures removed. Formal acceptance from the subsequent landowner that buildings has been left in a condition that is suitable for the intended final land use in accordance with formal agreement.	Statement provided and before/ after photos. Formal acceptance from landowner. Identified on an appropriate legal instrument associated with the land title.
			Removal of bitumen sealed roads not required for final land use or lease agreement.	Infrastructure removed.	Statement provided and before/ after photos.
			Surveying and sealing of all underground mine entries in accordance with departmental guidelines and relevant standards, as required based on risk assessment.	Sealing completed and verified by suitably qualified engineer.	Engineering report/ statement, plug and abandonment log, photos, as-constructed drawings, records of fill materials and concrete plugs, filling methods etc.

		Retention of infrastructure: Infrastructure to be retained is approved for retention by the landowner.	Potential hazards (e.g. electrical, mechanical) have been effectively isolated and secured.	Hazards isolated and secured.	Statement provided by suitably qualified engineer.
			All road infrastructure required left in place in maintained condition. Damage to access tracks has been repaired and stabilised.	Repairs complete.	As constructed final landform plan, photos etc.
			If any underground pipelines or other infrastructure are to remain in situ, they do not pose a hazard for the intended final land use.	The location of the infrastructure has been marked on a plan and registered with the relevant local Council (Maitland or Cessnock depending on location) and Dial Before You Dig. Formal acceptance from the subsequent landowner that underground infrastructure has been left in a condition that is suitable for the intended final land use in accordance with formal agreement.	Surveyed and marked on the as-constructed final landform plan. Copy of notification to local Council and Dial Before You Dig. Formal acceptance from landowner. Identified on an appropriate legal instrument associated with the land title.
		Land Contamination: There is no residual soil contamination on site that is incompatible with the final land use or that poses a threat of environmental harm.	Soil testing for contaminants of concern as listed by Health Investigation Level of the National Environment Protection (Assessment of Site Contamination) Measure (1999) applicable to land use type.	Contamination will be appropriately remediated so that appropriate guidelines are met e.g. Health Investigation Level of the National Environment protection (Assessment of Site Contamination) Measure (1999).	Validation Report prepared by a suitably qualified person in accordance with NSW EPA Guidelines.
			Waste material and/ or visible contamination areas on site surface.	There are no visible signs of contamination following the removal of plant, equipment and materials. All rubbish/ waste materials removed from site.	Statement provided and before/ after photos.
		Management of waste and process materials: Tailings storage facility will be appropriately contained so that it is compatible for final land use.	Visual –capping material placement, type across emplacement Visual – indication of capping performance on final landform Visual – seepage and other indicators of groundwater issues Measured - survey of emplacement capping to verify construction and to monitor settlement. Quality assurance records for the construction of the emplacement material including (where relevant) capping material, liner system, seepage control etc, integrated with the drainage features on the adjacent landscape. Measured- surface and groundwater levels to verify water balance modelling and capping function.	Visual – verification that capping, type and placement are consistent with design. Visual – no signs of compromised capping performance. Visual – no areas of unexpected seepage Survey verifies that capping placement consistent with design and settlement and/or material loss is within predicted limits and will not compromise final landform drainage via differential settlement. Quality assurance records verify capping constructed and in accordance with design specifications relevant to site risks and target final land use. For example capping depth – at least 2 metres. Groundwater and surface monitoring verify capping function e.g. ‘store and release’ and design performance permeability/seepage. Groundwater and surface water monitoring verify adequate containment of waste materials and seepage/leachate is not contributing to land/groundwater contamination.	Photos, rehabilitation monitoring reports, as-constructed surveys, quality assurance records for construction, erosion surveys, independent geotechnical reports (where required), groundwater/surface water monitoring reports. The structural integrity of the infrastructure and capping has been inspected by a suitably qualified engineer and determined to be suitable and safe as part of the intended final land use and water material adequately contained.
		Management of unsuitable material	Quality assurance records for the placement of potential spontaneous combustion material.	Quality assurance records verify placement during constructed and in accordance with design specifications relevant to site risks and target final land use. For example, potential spontaneous combustion material is placed in thin layers, and is rapidly buried with inert cover of at least 5 metres depth.	Quality assurance records for construction.
		Landform Stability: The final landform is stable for the long-term and does not present a risk of environmental harm downstream/downslope of the site or a safety risk to the public/stock/native fauna.	Visual - indicators of rill erosion and land instability. Visual – indicators that surface water drains and management structures are stable Measured – erosion rates from representative unmined and rehabilitated profiles. Measured – survey of rehabilitated landform to verify	Visual- minimal erosion that would not require moderate to significant ongoing management and maintenance works. Visual – no signs of land instability such as mass movement. Visual - no areas of active gully erosion.	Before and after photos, rehabilitation monitoring reports, as constructed surveys, landform evolution modelling reports, aerial survey.

		Landform that is consistent with surrounding natural landform.	final landform construction in accordance with the Final Landform and Rehabilitation Plan provided to NSW Resources Regulator Measured – survey of rehabilitated landform to monitor settlement/ and or erosion maximum slope gradients 18 degrees or less. Drainage design to utilize existing sediment controls structures. Areas deep ripped to reduce compaction. Track banks and batter trims to achieve landform matching surrounding landforms. Unnecessary culverts removed. Natural drainage paths reinstated utilizing appropriate sediment	Visual - no evidence of tunnel erosion. Visual – no evidence of active scour likely to compromise surface water management structure. Survey verifies final landform complies with final landform construction in accordance with Final Landform and Rehabilitation Plan provided to NSW Resources Regulator. Survey verifies that settlement and/or material loss is within predicted limits and will not compromise final landform drainage via differential settlement. Erosion rate monitoring verifies that erosion levels are within the range of target analogue sites representative of final land use.	
				Surface water management drains and creeks have been reprofiled in accordance with hydrological design.	Surveyed and marked on the as constructed plans.
				Landforms with steep slopes have been constructed in accordance with geotechnical design.	An engineering assessment undertaken by a suitably qualified person concludes the landforms have been constructed in accordance with landform design.
		Surface water: Runoff water quality from mine site is suitable receiving waters, aquatic ecology and riparian vegetation.	Water quality parameters selected in accordance with Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000.	Water quality discharged from rehabilitated mining operation meets parameters selected in accordance ANZECC guidelines for specific environment.	Surface water and aquatic ecology monitoring program.
		Water Approvals: Structures that take or divert water such as final voids, dams, levees etc. or groundwater take are appropriately licensed.	Reconciliation of the water structures/ works against existing and potential entitlements.	Water supply works approvals and water access licenses or relevant exemptions are granted by relevant NSW government agencies.	Confirmation from relevant Government Agency that relevant water approvals / licences are able to be granted.
			Sufficient water take entitlement is held for potential groundwater take.	Entitlements have been obtained greater than potential groundwater take volume.	Confirmation from relevant Government Agency that relevant entitlements have been granted.
		Groundwater Quality: Groundwater quality is similar to ANZECC guidelines for specific environment.	Water quality parameters selected in accordance with Australian and New Zealand guidelines for fresh and marine water quality 2000.	Water quality meet specifications selected in accordance with ANZECC guidelines for specific environment.	Groundwater monitoring program.
		Seepage Quality: Surface water base flow (seepage water) quality at receptor has an acceptable level of aquatic ecology impact in consultation with EPA.	Water quality parameters agreed with relevant agencies.	Water quality meets the agreed parameters.	Surface water and aquatic ecology monitoring program.
		Agricultural Revegetation: Revegetation is sustainable for the long-term and only requires maintenance that is consistent with the intended final land use. Land use capability is capable of supporting the target agricultural land use.	Soil testing of topsoil (0-10 cm depth) – Includes: soil pH, EC, major nutrient levels (N,P,K,S,Ca,Mg,Na,Cl), trace elements (Zn, Cu, Mn, Fe), soil salinity and sodicity and organic carbon.	Land and Soil Capability classification Class 4 and 5 met for pasture and trees over pasture areas. The re-established topsoil is capable of supporting the targeted pasture regime on a sustained basis. Pasture establishment is consistent with the range of species utilised within the region by DPI. Pasture/ grass establishment is in good health and provides adequate cover in pasture and trees over pasture areas.	Cattle grazing monitoring reports.
			Health and productivity data including pasture herbage mass, pasture % dead matter, crude protein of pasture, digestibility of pasture dry matter, metabolizable energy of pasture and potential stocking rates.	Appropriate and reliable access to water for livestock. Appropriate animal refuge areas for livestock (e.g. wooded/treed areas) during extreme weather conditions.	Cattle grazing monitoring reports.

			Resilience demonstrated by the effects of drought and fire on composition, structure and other function attributes of pasture and cropping lands.	Ground cover Plant species consistent with species in Table 6.6 of RMP. Existence of long term perennial pastures/ short term annuals. Resilience to drought and fire. Pasture: Pasture Herbage:>800 kg DM/ha Pasture % Dead matter < 50% Crude protein of pasture > 2% Digestibility of pasture dry matter > 40% Metabolisable energy of pasture > 6MJ/kg DM Potential stocking rates 2-4 DSE/ha Trees over pasture: Maximum of 700 tree stems per ha Pasture Herbage Pasture % Dead matter Crude protein of pasture Digestibility of pasture dry matter Metabolisable energy of pasture Potential stocking rates	
				GIS studies confirm trees have been established generally in accordance with approved conceptual final landform.	Aerial survey.
			Threats to rehabilitation.	Vertebrate pest species – presence and damage is recorded and controlled.	Rehabilitation monitoring reports.
Infrastructure **(includes built infrastructure proposed to be retained for future use)**	Infrastructure Area	Retention of infrastructure: Where not required in the Ashtonfield Agreement, all buildings, fixed plant and powerlines will be demolished and removed from the site.	Where applicable, necessary approvals are in place (e.g. development consent under the EPA Act 1979) where buildings and infrastructure are to be retained as part of final land use.	Permits and approval documents issued.	Copy of any relevant approvals.
			Road infrastructure to remain is repaired and in a maintained condition.	Repairs complete.	As-constructed final landform plan and photos.
			The structural integrity of the infrastructure is suitable and safe for use as part of the intended final land use.	The structural integrity of the infrastructure has been inspected by a suitably qualified engineer and determined to be suitable and safe as part of the intended final land use.	Engineering report/statement, photos, risk assessment verifying modes of failure are adequately addressed to minimise risks to public safety or the environment.
			Infrastructure is in a condition (e.g. structural, electrical, other hazards) that is suitable for the intended final land use.	Formal acceptance from the subsequent landowner that infrastructure is in a condition that is suitable for the intended final land use in accordance with formal agreement.	Formal acceptance from landowner.