Annual Rehabilitation Report - 2022

Mount Thorley Warkworth

DOCUMENT CONTROL

Version	Date	Revision Description	Author	Approver
1.0	01/05/2023	Original combined ARR and FP document prepared to satisfy new Standard Conditions on Mining Leases	Bill Baxter Environmental Specialist - Rehabilitation	Gary Mulhearn Environment & Community Manager
2.0	05/06/2023	Separate ARR document on Yancoal template.	Bill Baxter Environmental Specialist - Rehabilitation	Gary Mulhearn

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DEFINITIONS / ABBREVIATIONS

BBAM - BioBanking Assessment Method
BCD – NSW Biodiversity Conservation Department
CCC – Community consultative Committee
CCL – Consolidated Coal Lease
CL – Coal Lease
DPE – NSW Department of Planning and Environment
EEC – Endangered Ecological Community
EL – Exploration Licence
EPBC - Environment Protection and Biodiversity Conservation Act
EPA – NSW Environment and Protection Authority
EPL – Environment Protection Licence
MTO - Mount Thorley Operations
MTW - Mount Thorley Warkworth Coal Mine (combined operations)
RML - Radiation Management Licence
VENM - Virgin Excavated Natural Material
WBACHCA – Wollombi Brook Aboriginal Cultural Heritage Conservation Area
WML - Warkworth Mining Limited

Name of mine:	Mount Thorley Warkworth	
Annual Rehabilitation Report Period:	**START DATE:**	**END DATE:**
	1 January 2022	31 December 2022
Annual Rehabilitation Report revision dates and version numbers:	Revision 1 (version 2.0) 5th June 2023	
Mining leases	**No**	**Expiry**
	CL 219	23 September 2044
	ML 1752	17 March 2038
	CCL 753	17 February 2034
	ML 1412	11 January 2038
	ML 1590	26 February 2028
	ML 1751	17 March 2038
	ML 1828	25 February 2043
Name of Lease holder(s)	Mt Thorley Operations Pty Ltd Warkworth Mining Limited Mount Thorley Coal Loading Ltd	
Date of Submission	1 MAY 2023	

1.0 MINING DETAILS

1.1 PROJECT DESCRIPTION

Mount Thorley Warkworth (MTW) is a coal mine managed by Coal & Allied (NSW) Pty Ltd, a wholly owned subsidiary of Yancoal Australia Limited (Yancoal). MTW is situated approximately 14 km south-west of Singleton in the Upper Hunter Valley of New South Wales (NSW). MTW is an amalgamation of two open cut mines, Mount Thorley Operations (MTO) and Warkworth Mining Limited (WML). Currently operating, MTW extract coal from the Whittingham Coal Measures of the Hunter Coalfield. Resulting product is then transported by rail to the port of Newcastle where it is shipped to international customers.

Schedule 2 Condition 5 of both SSD-6364 and SSD-6465 outline the approved life of the mine. Commencement date for both the Warkworth continuation Project (SSD-6464) and Mount Thorley Continuation Project (SSD-6465) was 15 February 2016.

Mining operations for the project may take place until 2037

1.2 CURRENT DEVELOPMENT CONSENTS, LEASES, AND LICENCES

Environment Protection Licence (EPL): EPL 24, EPL 1976, EPL 1376.

Environment Protection and Biodiversity Conservation (EPBC) Act Approval: EPBC 2002/629, EPBC 2009/5081.

General Water Licences: WAL10543, WAL10544, WAL963, WAL19022, WAL18233, WAL18558, WAL40464, WAL40465, WAL43056, WAL43057, 20BL168821, 20BL171729, 20BL171841, 20BL171842, 20BL171843, 20BL171844, 20BL171845, 20BL171846, 20BL171847, 20BL171848, 20BL171849, 20BL171850, 20BL171891, 20BL171892, 20BL171893, 20BL171894, 20BL172272, 20BL172273, 20BL173065, 20BL173276, 20CA209904, 20FW213276.

Development Consents: SSD-6464, SSD-6465, DA 177/94.

Radiation Management License: RML 5061110, RML 5061122.

Prospecting and Coal Mining: CL 219, (Part) ML 1547 (Sublease), ML 1752, EL7712, EL 8824, CCL 753, ML 1412, ML1590, ML 1751, ML 1828.

Store Explosives License: XSTR100160.

Change to EPL 1976 (Mount Thorley) to allow mine water transfers from, and transfer mine water to Warkworth Coal Mine, Bulga Mine, Hunter Valley Operations Mine and Redbank Power Station. SSD-6464 Mod 2 approved to: allow water transfers into the Lemington Underground Mine workings; allow subdivision of a parcel of land to enable the transfer of land ownership within the Northern Biodiversity Area and facilitate security of the offset area; and allow construction of a workshop for Ultraclass haul

trucks. Conservation Agreements for Wollombi Brook Aboriginal Cultural Heritage Conservation Area (WBACHCA) signed off and approval from DP&E to allow continuation of mining west of Wallaby Scrub Road while Conservation agreement for WBACHCA is being registered.

1.3 LAND OWNERSHIP AND LAND USE

Lot/DP 4/1274662, 2/1241457, 1/1273145, 4/1241457, 5/1274662, 1/1274662 & 3/1241457 Crown Land Closed Roads purchased by Warkworth Mining Ltd; 6/1274662, 2/1274662 & 3/1274662 Crown Land Closed Roads purchased by Miller Pohang Coal Co. Pty Ltd.

2.0 COMPLAINTS

No complaints related to rehabilitation received in 2022.

3.0 STAKEHOLDER CONSULTATION

Table 1: Stakeholder Consultation 2022

Date	Stakeholder	Consultation Forms	Matters	Actions
August 2022	Department of Planning and Environment (DPE)	RMP Submission	Review MTW 2022 Rehabilitation Management Plan	To be reviewed and updated, if necessary, should comments be received.
	Biodiversity Conservation Department (BCD)			
	Singleton Council			
	Water NSW			
August 2022	Community Consultative Committee (CCC)	CCC Meeting	Final landform and Rehabilitation status presented in MTW 2022 Rehabilitation Management Plan and Forward Program	No actions required

4.0 SURFACE DISTURBANCE AND REHABILITATION ACTIVITIES

Surface disturbance activities included:

- North-out-of-Pit Dam construction, including the footprint of the dam (3.1ha) and the footprint of dumping areas for excavated material on the previously rehabilitated surface of Tailings Dam 1 (30.9ha)
- Progression of mining in North Pit and West Pit areas (59.2ha)
- Substation site adjacent to Watts Track (0.5ha)
- Rehabilitation disturbance in North Pit for a topsoil stockpile (1.4ha)
- Boral Shed apron (0.2ha)

The disturbance in this reporting period was 95.3ha. The disturbance ahead of mining conducted in 2022 was forecast in the Forward Program apart from approximately 2ha in North Pit.

Rehabilitation activities included:

- Rehabilitation of overburden emplacements in Centre Dump (CD) (27.4ha), Mount Thorley (19.0ha) and South Pit North (1.5ha).
- Topsoil was not used on rehabilitation areas in Mount Thorley. Mine spoil ameliorated with compost (100t/ha) and gypsum (5t/ha) was used as the growth medium.

The rehabilitation undertaken in this reporting period was 47.9ha. The bulk of the rehabilitation completed in the reporting period was in CD and Mount Thorley.

Progressive rehabilitation commitments are outlined in the Warkworth Continuation 2014 and Mt Thorley Operations 2014 EIS. These documents modelled a total of 1,103 ha of rehabilitation to be completed by end of 2017, and a further 504.8ha to be completed by the end of 2023. At the end of 2022, the cumulative rehabilitation total is 311.8ha behind the EIS forecast for the end of 2023.

Rehabilitation Planning Activities

The MTW final landform design was updated for submission of the Final Landform and Rehabilitation Plan in August 2022. The final landform of MTW has been designed using a geomorphological landform design approach based on alluvial analogues. The landform design work was undertaken using an external specialist consultant (WSP Australia) and an erosional risk analysis has been conducted to determine areas that require rock lining for erosion protection.

The landform design work included the sizing and positioning of a temporary stockpile of capping material for the Loders Pit TSF. The Loders Pit TSF will be used for tailings deposition through to the closure of MTW. Sufficient material will be needed to be stockpiled adjacent to this facility during the operational phase of the mine to facilitate capping at closure. Further studies will be undertaken to reduce the amount of capping material required to be stockpiled by potentially reducing the footprint of the TSF.

Surface soils from 8.6ha of stripping area ahead of mining in North Pit were assessed and classified in accordance with the NSW EPA requirements for classifying excavated materials as Virgin Excavated Natural Material (VENM). The stripped soil is proposed for off-site re-use in revegetation activities at MTW's Northern Biodiversity Area.

Subsidence Repair Undertaken

As MTW is an open cut operation, subsidence has been regarded as a negligible risk. Regardless, mine subsidence was examined and risk-ranked in the RMP Risk Assessment. No subsidence incidents have been recorded at MTW. As such this RMP does not introduce measures and methods to address subsidence impacts to rehabilitation during the active phase of mining.

Rehabilitation Management and Maintenance Activities

The following weed management activities were conducted across rehabilitation areas at MTW:

- Boom spraying of various exotic grasses and broadleaf weeds (16.3ha);
- Weed wiping of *Acacia saligna* shrubs and various exotic grasses (28.0ha);
- Selective spraying (backpack) of various exotic grasses and broadleaf weeds (78.6ha);

- Selective spraying (Quikspray) of various exotic grasses and broadleaf weeds (0.8ha); and
- Manual removal (Cut and Paint) of *Acacia saligna* shrubs (45.2ha)

Two 1080 ground baiting programmes utilising meat baits and ejector baits were undertaken during autumn and spring to target wild dogs and foxes. The program consisted of approximately 60 bait sites across MTW, including rehabilitation areas.

A feral pig trapping programme was carried out across MTW in winter that resulted in 12 feral pigs being controlled.

Rehabilitation Actions

Rehabilitation risk assessment updated in June 2022 as part of development of Rehabilitation Management Plan. Recommendation in Targeted Assessment Program – Landform Establishment (May 2021); Targeted Assessment Program – Soils and Material Management (June 2020); and Resources Regulator Compliance Audit – May 2022.

Work commenced with assistance from an external consultant on a formalised quality assurance program for rehabilitation activities. Recommendation in Targeted Assessment Program – Landform Establishment (May 2021); and Targeted Assessment Program – Soils and Material Management (June 2020).

Design of temporary capping material stockpile for Loders Pit TSF undertaken as part of final landform design work. Further investigations to be undertaken during 2023 reduce the amount of capping material required for the closure of the Loders Pit TSF. Recommendation from Targeted Assessment Program – Landform Establishment (May 2021).

Scoping meetings undertaken with two external consultancy firms for the assessment of the long-term stability of the final landform using Landform Evolution Models. Recommendation from Targeted Assessment Program – Landform Establishment (May 2021).

Importation of rock for use on rock-lined drains in Geofluv landform areas Targeted Assessment Program – Landform Establishment (May 2021).

Rehabilitation Areas That Have Achieved the Final Land Use

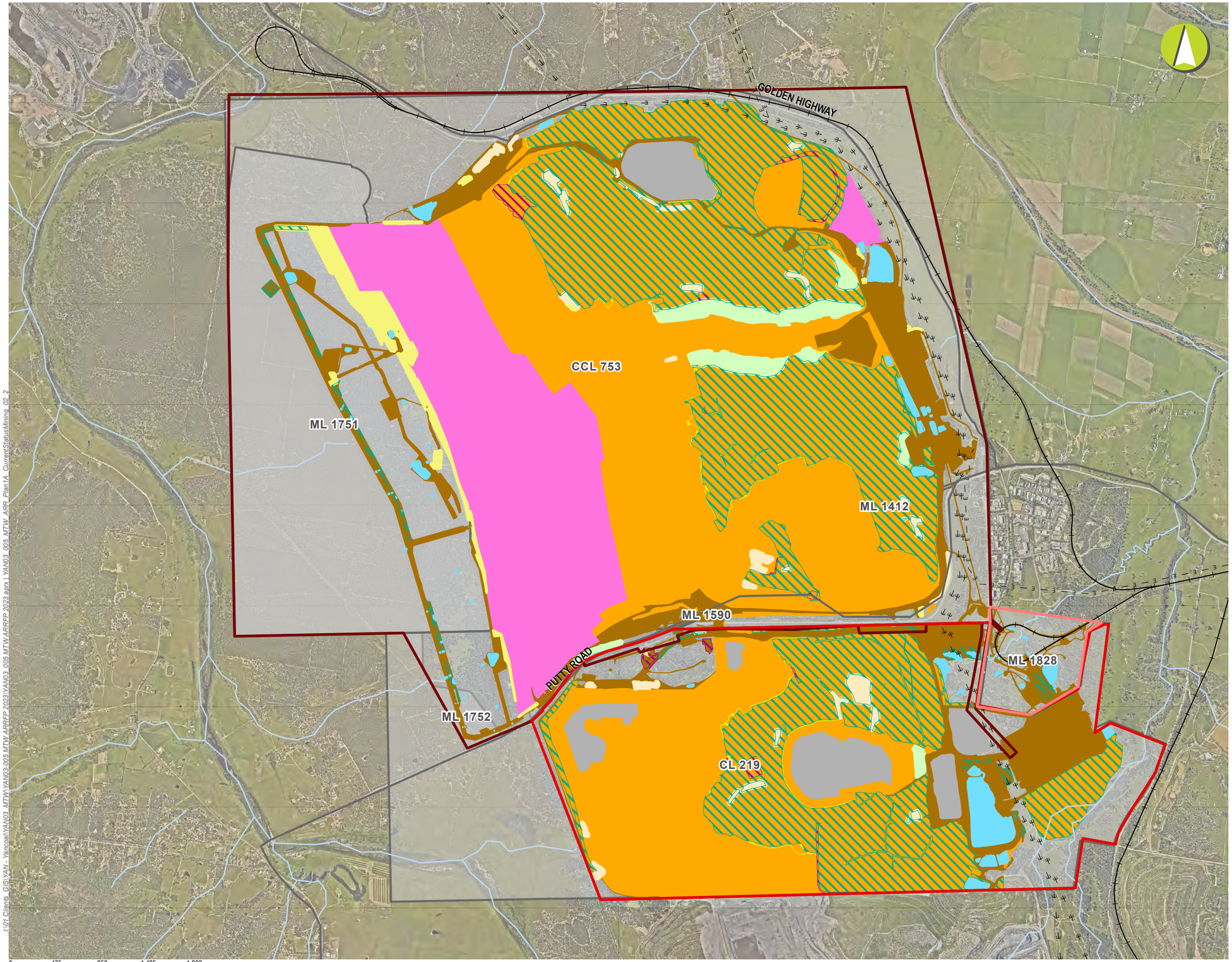
No areas achieved final land use during the 2022 reporting period.

Key Production Milestones

Table 2: Key Production Milestones

Material	Unit	Year 1 (1 Jul 2022 to 30 Jun 2023)	This report (1 Jan 2022 to 31 Dec 2022)
Stripped topsoil	m3	113,400	85,821
Rock / Overburden	m3	114,200,000	76,771,000
Ore	Mt	22.1	12.41
Reject Material (Includes coarse rejects, tailings and any other wastes resulting from beneficiation)	Mt	5.5	4.39
Product	Mt	12.5	8.08

Figure 1: Plan 1A - Current Status of Mining and Rehabilitation



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MT THORLEY WARKWORTH

LEGEND

Project Approval Number
- SSD 6464 - Warkworth
- SSD 6465 - Mount Thorley
- ML 1828 - Mount Thorley Coal Loader
- Railway
- Major Road
- Electricity Transmission Line
- Waterways

Current Authorisations
- Relevant Minerals Title

Mining Domain Type
- Domain 1: Infrastructure Area
- Domain 2: Tailings Storage Facility
- Domain 3: Water Management Area
- Domain 4: Overburden Emplacement Area
- Domain 5: Active Mining Area (Open cut void)
- Domain 8a: Other - Topsoil Stockpile
- Domain 8b: Other - Topsoil Stripped
- Domain 8c: Other - Temporary Rehabilitation

Rehabilitation Phase
- Landform Establishment
- Growth Media Development
- Ecosystem and Land Use Establishment

Source: Project Approval Boundary, rehabilitation, disturbance, watercourses and Current Authorisations from Yancoal (2022). Aerial imagery from Yancoal (2022).

Mount Thorley Warkworth Complex

Current Status Mining and Rehabilitation
PLAN 1A

Mine name	Mount Thorley Warkworth Complex
Plan name	Mount Thorley Warkworth ARR
Year of anticipated relinquishment	To be determined closer to closure
Data theme submission ID No.	4775 and 4824
Spatial Reference	GDA2020 MGA Zone 56
Plan date (date created)	1/05/2023

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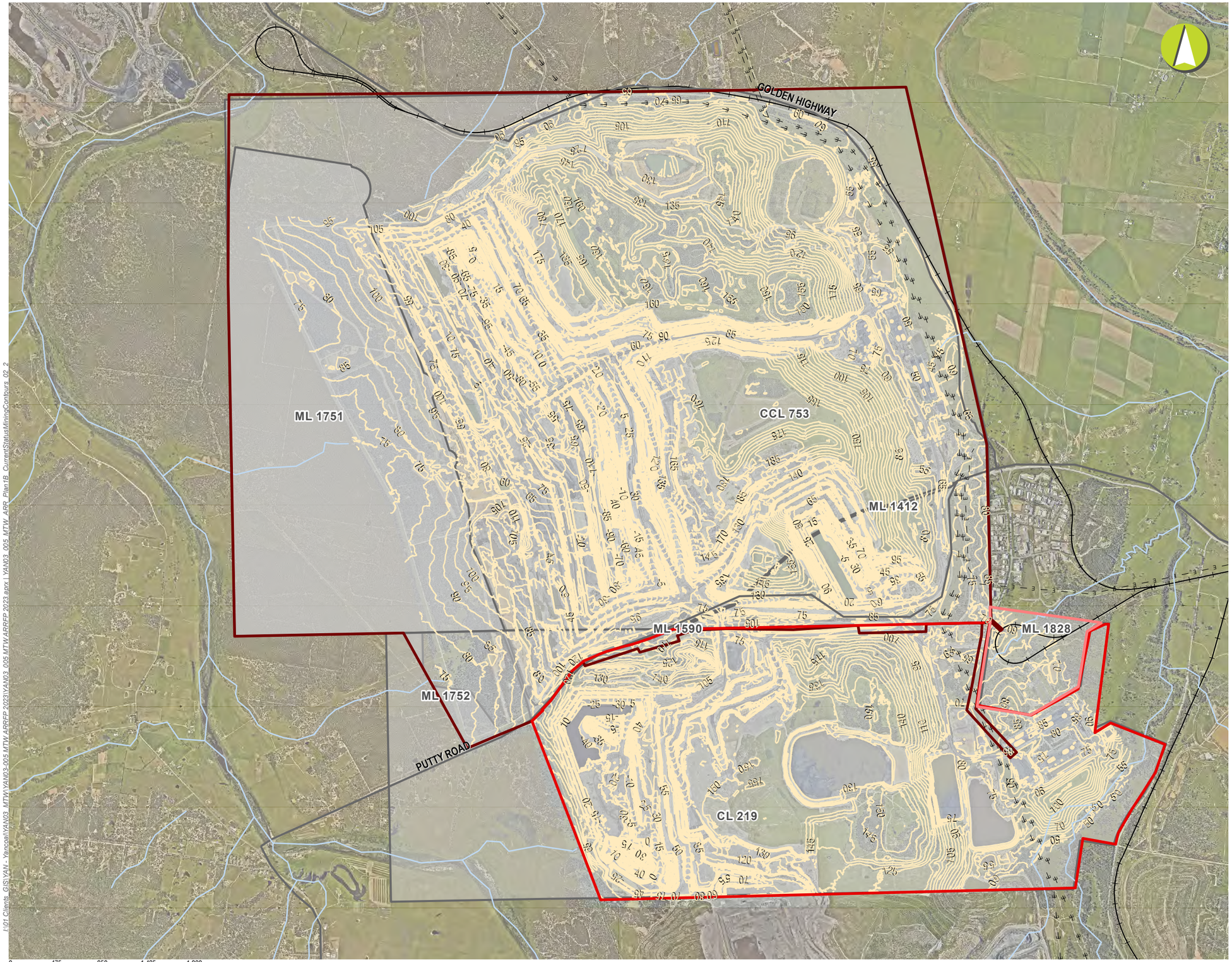
Figure 2: Plan 1B - Current Landform Contours



LEGEND

Project Approval Number

- SSD 6464 - Warkworth
- SSD 6465 - Mount Thorley
- ML 1828 - Mount Thorley Coal Loader
- Current Landform Contours (5m)
- Railway
- Major Road
- Electricity Transmission Line
- Major Waterways

Current Authorisations

- Relevant Minerals Title

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Source: Project Approval Boundary, contours, watercourses and Current Authorisations from Yancoal (2022).
Roads, electricity transmission lines and railways from LPI (2021).
Aerial imagery from Yancoal (2022).

Mount Thorley Warkworth Complex

Current Landform Contours
PLAN 1B

Mine name	Mount Thorley Warkworth Complex
Plan name	Mount Thorley Warkworth ARR
Year of anticipated relinquishment	To be determined closer to closure
Data theme submission ID No.	4779
Spatial Reference	GDA2020 MGA Zone 56
Plan date (date created)	1/05/2023

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Disturbance and Rehabilitation Statistics

Table 3: Current Disturbance and Rehabilitation Progression

	Annual Reporting Period	Year 1 (at 30 Jun 23)	This report (at 31 Dec 22)
A	Total disturbance footprint – surface disturbance	4,181.13	4,067.75
B	Total active disturbance (Ha)	2,819.48	2,735.23
C	Rehabilitation – land preparation (Ha)	33.80	34.68
D	Ecosystem and land use establishment (Ha)	1,307.35	1,297.84
E	Ecosystem and land use development (Ha)	0	0
F	Rehabilitation completion (Ha)	0	0

Table 4: Rehabilitation key Performance Indicators (KPI's)

	Annual Reporting Period	Year 1 (1 Jul 22 to 30 Jun 23)	This report (1 Jan 22 to 31 Dec 22)
G	Total active disturbance during reporting period (Ha)	113.38	95.29
H	Area of land proposed for active rehabilitation during reporting period (Ha)	49.88	47.93
I	Established rehabilitation (Ha)	0	0
J	Annual rehabilitation to disturbance ratio	0.44	0.50
K	Ecosystem and land use development (Ha) % Rehabilitation land to total mine footprint	0	0

Table 5: Progressive Achievement of Established Rehabilitation

	Annual Reporting Period	Year 1 (at 30 Jun 23)	This report (at 31 Dec 22)
L	Established rehabilitation for agricultural final land uses (%)	0	0
M	Established rehabilitation for native ecosystem final land uses (%)	0	0
N	Established rehabilitation for other/ non-vegetated final land uses (%)	0	0

4.1 VARIATION TO THE REHABILITATION SCHEDULE

Identify the components of the most recent forward program that were not achieved.

Note that the reporting period (January 2022 to December 2022) does not align with the forecast period for the current Forward Program (July 2022 to June 2023). The Forward Program being submitted will align disturbance and rehabilitation forecasts with the calendar year reporting period.

The rehabilitation forecast in the current Forward Program (July 2022 to June 2023) was 65.5ha and the amount of rehabilitation undertaken in the 2022 calendar year was 47.9ha.

The disturbance forecast in the current Forward Program (July 2022 to June 2023) was 113.4ha and the amount of disturbance undertaken in the 2022 calendar year was 95.3ha.

Allowing for the misalignment in reporting period and Forecast period the location and quantity of rehabilitation and disturbance was consistent with the Forward Program projections.

Key factors that have delayed the progressive rehabilitation.

None required.

Outline actions to minimise disturbance and undertake progressive rehabilitation.

Dump scheduling has been undertaken by Medium Term Planning team to identify the timing of dump releases for the Forward Program period. Carryover of dump release and bulk shaped areas is planned each year to provide rehabilitation crews with consistent work through the year.

5.0 REHABILITATION MONITORING AND RESEARCH FINDINGS

5.1 REHABILITATION MONITORING

Aerial Drone survey was conducted across 500ha of rehabilitated land at MTW during 2022. This mapping is used in conjunction with land-based monitoring to provide information across broad areas of rehabilitation for parameters including presence and density of weeds, erosion features, vegetation structure and fauna.

Land based monitoring was also conducted during the reporting period across six Grey Box Ironbark Woodland reference sites, 31 previously established Woodland – EEC rehabilitation sites and six newly established Woodland – EEC rehabilitation sites. The 2022 Ecological Monitoring Report (Emergent Ecology/Mosaic Ecology 2023) detailed the following:

Monitoring methods incorporated and addressed the requirements specified in MTW Rehabilitation Management Plan (2022). This included a combination of plot-based monitoring in accordance with the NSW BioBanking Assessment Method (BBAM) (to assess native vegetation). BBAM vegetation sampling was conducted at each of the 43 flora monitoring sites and involved measuring the following components:

- Native Plant species richness: a total number of species recorded in a 20m x 20m plot. The plot was systematically traversed, and the number of indigenous vascular plant species were counted.

- Native over-storey: percent foliage cover at 10 points along a 50m transect. Native over-storey is the tallest woody stratum present (including emergent) that is 1m and higher and includes all species native to New South Wales;

- Native mid-storey cover: percent foliage cover within the 20m x 20m plot. The mid-storey contains all vegetation between the over-storey stratum and 1m in height and includes all species native to New South Wales;

- Native ground cover: percent foliage cover within the 20m x 20m plot for grasses, shrubs and other (such as herbs and forbs). The ground stratum contains all native vegetation below 1m in height and includes all species native to New South Wales;

- Exotic plant cover: percent foliage cover within the 20m x 20m plot;

- No. of trees with hollows: total no. of hollow trees within the 50m x 20m plot;

- Total length of fallen logs: total length of logs at least 10cm diameter and at least 0.5m long within a 50m x 20m plot; and

Regeneration: measured as the proportion of over-storey species present at the sites that are regenerating (i.e., with diameter at breast height (DBH) < 5cm) within the entire zone.

5.2 STATUS OF PERFORMANCE AGAINST REHABILITATION OBJECTIVES AND REHABILITATION COMPLETION CRITERIA

Monitoring methods incorporated and addressed the requirements specified in MTW Rehabilitation Management Plan (2022). This included: a combination of plot-based monitoring in accordance with the NSW BioBanking Assessment Method (BBAM) (to assess native vegetation) together with walkover inspections of rehabilitation areas to detect potential issues occurring at the broader scale; Landscape Functional Analysis; soil assessment (chemical/nutrition and microbial); and native canopy development.

Are all rehabilitation areas in the Landform Establishment phase or higher represented in the monitoring program

Yes

Include an appraisal of whether rehabilitation is moving towards achieving the approved final landform

Recent ecological monitoring reports indicate that recent rehabilitation at the Northern area at MTW is progressing towards the target vegetation communities, with no evidence of disease or die-back recorded. Species richness was recorded as moderate to low in the Central rehabilitation area, with MTW to increase rehabilitation efforts in this area to achieve the target vegetation communities required.

Most of the Southern area provided moderate to high native species richness with one site exceeding the benchmark value providing evidence of good potential resilience through a diversity of native species and good native ground cover. One site provided the lowest native species richness score, due to the area being established within 12 months. This site is likely to improve over time with appropriate weed control. The canopy cover was low at all sites which is expected in early-stage rehabilitation.

A total of 229 plant species were recorded across all monitoring sites in 2022, including 175 native species and 54 weed species. The most speciose family was Poaceae (grasses) with 53 species recorded, followed

by Fabaceae (including subf. Faboideae (peaflowers) and subf. Mimosoideae (wattles)) with 33 species and Asteraceae with 31 species.

Please select the best description of the appraisal

There are performance issues preventing rehabilitation moving towards achieving the final land use as soon as reasonably practicable.

Summaries the findings of the Rehabilitation Monitoring Program,

A total of 43 flora monitoring sites were assessed between the Northern, Central and Southern Rehabilitation Areas. The rehabilitation sites in the northern area generally provided evidence of good resilience through high diversity of native species and good native ground cover in many of the areas surveyed. This is a good indicator of the ability of the sites monitored in 2022 to progress towards the target vegetation community.

The central area provided moderate native ground cover (grasses, shrubs and other) for most sites. This shows good potential resilience following control of invasive grass species.

All sites provided poor native canopy cover; however, tree species were recorded between two and seven species at each plot. This indicates that a canopy is likely to establish over time at most sites. The mid-layer (shrubs) are developing in the southern area with seven sites achieving a higher shrub cover than the average of the reference sites. The shrub layer cover is likely to improve over time with appropriate weed control.

Based on collected monitoring results and observations, management recommendations have been suggested to improve the condition of rehabilitation areas and ensure they are trending towards the defined final land use objectives.

Identify any performance issues

The rehabilitation monitoring report (2022) outlines the following:

- Appropriate weed management of invasive grassland species and appropriate cover in shrub and canopy layer will allow site to progress towards target vegetation community;
- High Threat Exotic (HTE) weed species pose a significant threat to the development of the target vegetation community.
- Thinning should be undertaken surrounding NPN202001 due to the dense cover of spotted gum.
- Create a fallen timber corridor through the rehabilitation areas, this will provide refuge and potential habitat for mammals, reptiles, and frogs across the rehabilitation area.
- Review the seed mix used to ensure that appropriate species and rates are being applied to new rehabilitation area.

5.3 OUTCOMES OF REHABILITATION RESEARCH AND TRIALS

Table 6: List of Active Rehabilitation Research and Trials

No.	Project/Trial Name	Objective of Trial Project	Methodology	Expected Date of Completion
1	Bursaria spinosa Germination trial	Germination testing: 1) if freezing pre-treatment of seed improves germination rates; and 2) if germination rates in MTW topsoil's and spoils are comparable to seed raising mix.	Subject seed to freezing temps pre-treatment and run a germination trial with the following treatments: Provenance 1(Hunter Valley) control/seed raising mix; Prov. 1 freeze treatment/seed raising mix; Prov. 1 freeze treatment/typical MTW topsoil; Prov. 1 freeze treatment/typical MTW spoil/ameliorant. Provenance 2(Coonabarabran) control/seed raising mix; Prov. 2 freeze treatment/seed raising mix; Prov 2 freeze treatment/typical MTW topsoil; Prov. 2 freeze treatment/typical MTW spoil/ameliorant.	30/11/2023
2	Compost Type Trial (Spoil/Compost Application)	Rehabilitation trials to test if different types of compost result in improved native vegetation establishment in spoil/compost applications	Application of 3 types of compost: Remondis (coarse), Remondis (with fines), Bettergrow (with Biosolids) to a rehabilitation area with mine spoil as growth medium. Trial areas seeded with diverse native seed mix and monitored to detect differences in native vegetation establishment.	30/06/2024

Table 7: List of Inactive Rehabilitation Research and Trials

No.	Project/Trial Name	Objective of Trial Project	Methodology	Expected Date of Completion
Nil	Nil	Nil.	Nil	N/A