WAMBO COAL PTY LIMITED

SOUTH BATES EXTENSION UNDERGROUND MINE

EXTRACTION PLAN
LONGWALLS 17 TO 20

APPENDIX I
REHABILITATION MANAGEMENT PLAN

Peabody

WAMBO COAL
MINING OPERATIONS PLAN
2018 – 2020

Prepared by Wambo Coal Pty Ltd
Document No. WCPL_MOP_2018-2020
March 2019

MOP Amendment A

Wambo Coal Pty Limited

Mining Operations Plan

Name of Mine:	Wambo Coal Pty Ltd
MOP Commencement Date:	1 January 2018
MOP Completion Date:	31 December 2020
Mining Authorisations (Lease / Licence No.):	CL397, CCL743, CL374, CL365, ML1402, ML1594, ML1572, MLA557.
Name of Authorisation/Title Holder(s):	Wambo Coal Pty Ltd
Name of Mine Operator (if different):	N/A

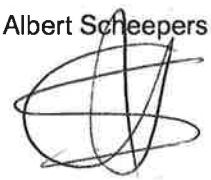
Name and Contact Details of Mine Manager (or equivalent):

Title	Albert Scheepers
Position:	General Manager
Contact:	Ph: (02) 6570 2208
	Email:ascheepers@peabodyenergy.com

Name and Contact Details of Environmental Representative:

Title:	Peter Jaeger
Position:	Environment & Community Manager
Contact:	Ph: (02) 6570 2206
	Email: pjaeger@peabodyenergy.com

Name of Representative(s) of the Authorisation Holder(s):

Name / Title:	Albert Scheepers - General Manager
Signature:	
Date:	14 March 2019

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Document Control

Document No.	WCPL_MOP_2018-2020
Title	Wambo Coal Mining Operations Plan (2018 – 2020) Amendment A
General Description	Mining Operations Plan (MOP)
Key Support Documents	South Bates (Wambo Seam) Underground Mine Modification (MOD15) South Wambo Underground Mine Modification (MOD12) SBU Extraction Plan LW11-16 South Bates Extension Modification Environmental Assessment (MOD17) SBUE Extraction Plan LW17 to LW20 United Wambo Open Cut Coal Mine Project Environmental Impact Statement and Associated Documents (MOD16) Wambo Coal Environmental Management System Development Consent – DA 305-7-2003

Revisions

Rev No	Date	Description	By	Checked
A	December 2017	Original Draft	WCPL	Steven Peart
Amend. A	March 2019	MOP Amendment A	WCPL	Peter Jaeger

The nominated Coordinator for this document is	Environment and Community Manager

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1.0 Introduction

This Mining Operations Plan (this MOP) for both the Open Cut and Underground Operations has been prepared by Wambo Coal Pty Ltd (WCPL) (the Mine), to satisfy conditions and the requirements of:

- ML 1402, ML 1572, ML 1594, CL 365, CL 374, CL 397 and CCL 743[1];
- DA 305-7-2003 & DA 177-8-2004; and
- ESG3: Mining Operations Plan Guidelines[2], September 2013 (here within referred to the *MOP Guidelines*).

The Mine is an open cut and underground coal mining operation located approximately 15 kilometres west of Singleton, near the village of Warkworth, New South Wales (**Figure 1**). The Mine is owned by WCPL, a subsidiary owned by Peabody Energy Australia Pty Ltd (Peabody-75%) and Sumiseki Materials Co Ltd (Sumiseki-25%). Open cut and underground mining, coal processing and other associated activities at the Mine are undertaken by WCPL. A recent aerial photograph of the Mine illustrating the existing and approved extent of open pits, underground mine plans and infrastructure is shown on **Figure 2**. Thermal coal products from the Mine are transported by rail to domestic customers for use in electricity generation and to port for export.

The Mine is bounded by the Wollombi Brook to the east, coal mining operations to the north and east, grazing land to the south and north-west and the Wollemi National Park to the west (**Plan 1A** and **Figure 1**). Land use in the vicinity of the Mine is a combination of coal mining operations, conservation areas, National Parks, agriculture and rural residential development.

The Department of Planning & Environment (DP&E) on the 4 May 2015 provided comment that an approved MOP will satisfy Condition 94C, Schedule 3 of DA 305-7-2003 for a preparation of a Rehabilitation Management Plan (RMP). Information on the requirements for an RMP and where the requirements are addressed in this MOP are provided in **Section 1.3**.

1.1 History of Operations

The Mine was originally granted development consent by Patrick Plains Shire Council in 1969. Subsequent development consents issued in 1972, 1974 and 1977 covered a range of early open cut and underground operations, while activities such as the construction of office buildings, bathhouses, the Homestead Underground Mine coal conveyor, Hales Crossing on Wollombi Brook, extensions to mining operations and modifications to road haulage rates were consented by Singleton Shire Council (SSC) between 1980 and 1991.

In July 1991, DA 108/91 was lodged with the SSC seeking approval for the expansion of open cut and underground mining activities at the WCPL and the consolidation of earlier development consents. Development consent for DA108/91 was granted in February 1992, approving the production of up to 3 million tonnes per annum (Mtpa) of saleable product coal over a 21 year period. Subsequent modifications to DA 108/91 have included the Wollemi Underground Mine box cut, coal transportation, tailings deposition, coal conveyor, underground borehole pumps, stockpile area and haul road for coal haulage. Subsequent to the grant of Development Consent DA 108/91 (SSC, 1992), open cut mining operations were conducted from 1993 until closure in March 1999. Open cut operations recommenced in August 2001 at a rate of 1 Mtpa of ROM coal.

[1] As at the time of preparing MOP Amendment A, grant of Mining Lease Application 557 is pending.

[2] ESG3: Mining Operations Plan Guidelines, September 2013 issued by the NSW Trade & Investment – Division of Resources and Energy. This obligation to prepare a MOP derives from Condition 2 of CL374, Condition 3 of CCL743, Condition 3 of ML1402, Condition 2 of ML1572 and Condition 2 of ML1594.

Figure 1 Locality Plan

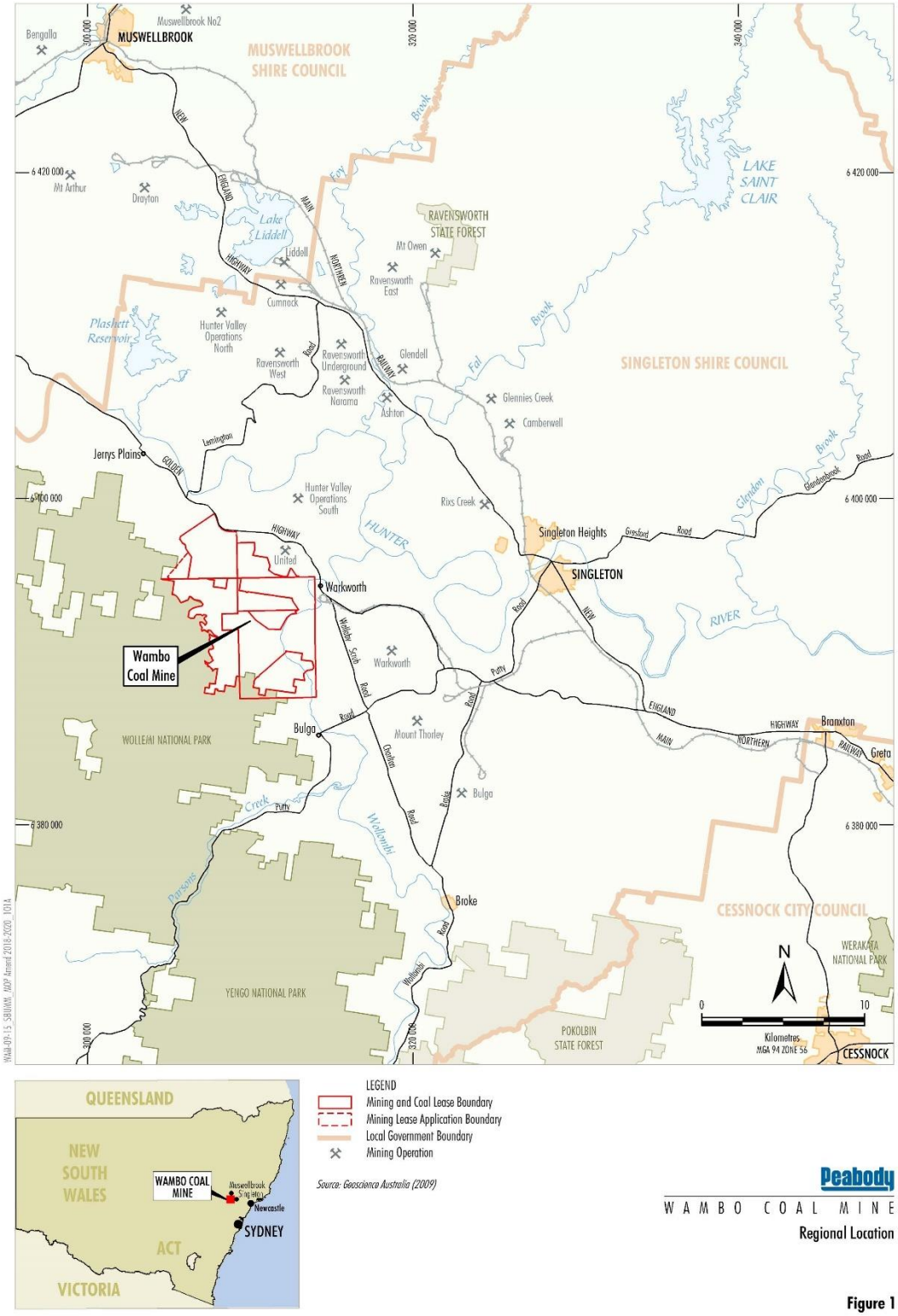
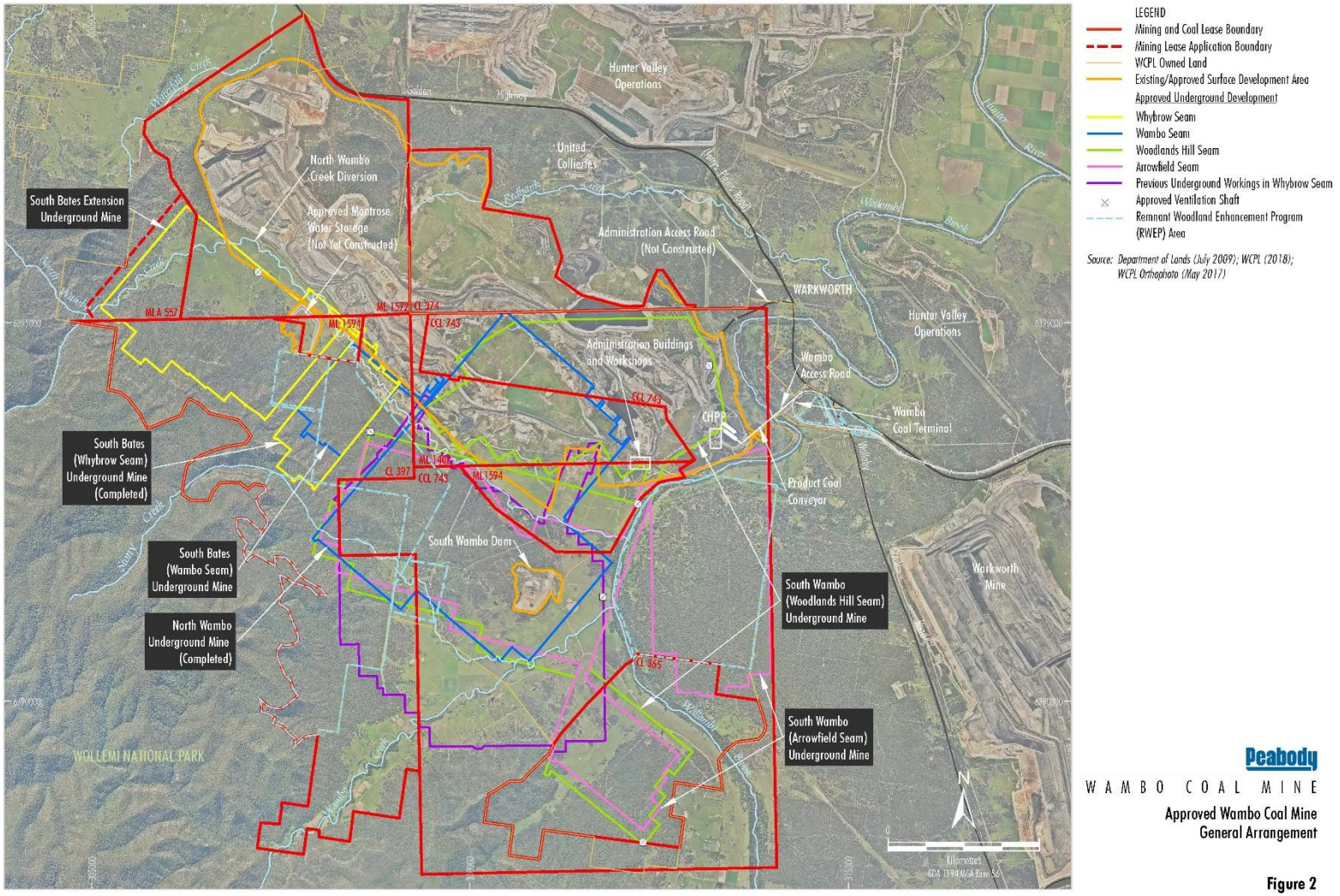


Figure 2 Wambo Coal Mine General Arrangement



Underground mining operations at the Homestead Underground Mine commenced in 1979 and ceased in 1999. The Wollemi Underground Mine commenced in 1997 and produced in the order of 3 million tonnes (Mt) of ROM coal during the 2001/2002 financial year, prior to the cessation of mining activities. The Wollemi Underground was placed on care and maintenance in October 2002. Following the cessation of underground operations in 2002, open cut operations were subsequently expanded to maintain an overall production rate at 4 Mtpa of ROM coal.

Following submission of the Wambo Development Project Environmental Impact Statement (the Project EIS) in July 2003, WCPL was granted development consent in February 2004 (DA 305-7-2003) which enables the expansion of the current open cut operations and development of additional underground mining operations. The approved development described in the Project EIS and subsequent modifications extends the mine life until 31 December 2039[3] and allows ROM coal production up to 14.7 million tonnes per annum (Mtpa). For a summary of all modifications please refer to **Section 1.3**.

The Project EIS also addressed a separate development application (DA) for a rail spur and loop, coal reclaim and rail loading facilities for the Wambo Coal Terminal. Consent for this development (DA 177-8-2004) was granted in December 2004. The Wambo Coal Terminal was commissioned in May 2006 and allows the transport of all product coal from the WCPL by rail to the Port of Newcastle.

A copy of DA305-7-2003 (as modified) is provided in **Appendix 2** and on the Peabody website (https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports).

All mining and associated activities are now undertaken by WCPL since the transition to an owner-operator operation was completed in April 2013. Approved run-of-mine (ROM) coal production at the Mine is 14.7 Mtpa. ROM coal is either washed at the Coal Handling and Preparation Plant (CHPP), or where in specification, by-passed to the product stockpile, and then loaded onto trains via the train loading infrastructure. All product and domestic coal is transported by rail, with product coal to the Port of Newcastle for export markets.

In accordance with Condition 5, Schedule 2 of the DA305-7-2003, mining operations may be undertaken on the site until 31 December 2039[3]. A summary of the approved Wambo Coal Mine is provided in **Table 1**. A summary of the approval history since the granting of DA305-7-2003 is provided in **Table 3** of this MOP.

1.1.1 MOP Amendment A

In accordance with the *ESG3: Mining Operations Plan (MOP) Guidelines* (the Guidelines), WCPL are seeking minor amendments of the approved MOP[4], here within referred to as MOP Amendment A. MOP Amendment A seeks to revise several mining, construction and rehabilitation plans, including but not limited to:

- Initial construction and development activities associated with the South Wambo Underground (SWU) Mine;
- Initial mining works in the SWU Mine (i.e. development of first workings in the Woodlands Hill Seam);
- Establishment of the boxcut for the Highwall Mining Project;
- Installation of a dewatering bore into the Arrowfield Seam;

[3] As approved by MOD 17.

[4] MOP approved on 1 February 2018.

- Refinements to the layout of the South Bates Underground Extension (SBUE) Mine, as a result of the identification of geological structures;
- Revisions to the open cut mining sequence to enable development of the United Wambo Open Cut Coal Mine Project (subject to approval);
- Updated disturbance and rehabilitation tables (Tables 10, 11, 12 and 30) and text to reflect minor amendments to actual schedules and rates; and
- Updated tailings disposal strategy to reflect amendments to actual schedules and rates.
- Subsidence remediation activities on private property 'Kharlibe'.

At the time of preparation of MOP Amendment A, the United Wambo Open Cut Coal Mine Project and associated Harmonisation Modification (MOD16) have not been determined by the Independent Planning Commission (IPC). If approval for MOD 16 is received, the MOP will be amended to incorporate the required changes.

MOP Amendment A also addresses comments in recent correspondence from the Resource Regulator and included in the 2017 Independent Environmental Audit (Hansen Bailey, 2017) including:

- The remediation plan for the North Wambo Creek Diversion (Table 9);
- Key management actions associated with hydrocarbon management;
- A revised procedure for Topsoil Management; and
- Remnant Woodland Enhancement Program (RWEP) - Area E.

As required by the Guidelines, updated information in MOP Amendment A is provided throughout in red text. Where appropriate, information superseded by MOP Amendment A will be shown as strikethrough ~~strikethrough~~.

1.1.2 Relationship with Previous MOP

WCPL previously operated under two separate Mining Operations Plans (MOPs) for the underground and open cut mining operations.

In late 2014 and early 2015, a revised MOP was developed in accordance with the *MOP Guidelines* to include all proposed open cut and underground mining and mining associated activities at the Wambo Coal Mine. The MOP was approved with a term of 5 years and an expiry date of 30 March 2020. This MOP was subsequently amended on six occasions.

Once approved, this MOP will supersede and replace the 2015-2020 MOP. This MOP has been prepared to incorporate the changes proposed as part of Modification 17 (MOD 17) to DA 305-7-2003. It also incorporates remediation activities on the Kharlibe property and some minor changes to scheduling of open cut mining activities.

In accordance with the definition as provided in the *MOP Guidelines*, Wambo Coal Mine is classified as a Level 1 Mine.

Table 1 Summary of the Approved Wambo Coal Mine

Component	Approved WCPL[1]
Life of Mine	• 35 years (until 31 December 2039).
Open Cut Mining	• Open cut mining at a rate of up to 8 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams.
	• An estimated total open cut ROM coal reserve of 98 million tonnes (Mt).

	• Open cut mining operations up to and including 2020.
Underground Mining	• Underground mining of up to 9.75 Mtpa of ROM coal from the Whybrow, Wambo, Woodlands Hill and Arrowfield Seams.
	• Underground ROM coal reserves are estimated at 161.3 Mt.
Subsidence commitments and management.	• The subsidence impact performance measures listed in Conditions 22 and 22A, Schedule 4 of the Development Consent (DA 305-7-2003).
ROM Coal Production Rate	• Up to 14.7 Mtpa of ROM coal.
Total ROM Coal Mined	• 259.3 Mt.
Waste Rock Management	• Waste rock deposited in open cut voids and in waste rock emplacements adjacent open cut operations.
Total Waste Rock	• 640 million bank cubic metres.
Coal Washing	• Coal Handling and Preparation Plant (CHPP) capable of processing approximately 1,800 tonnes per hour (tph).
Product Coal	• Production of up to 11.3 Mtpa of thermal coal predominantly for export.
Coal Handling and Preparation Plant Reject Management	• Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids in accordance with existing Wambo management practices.
Total CHPP Rejects	• Approximately 40.3 Mt of coarse rejects and approximately 24.5 Mt of tailings.
Water Supply	• Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River.
Surface Facilities	• Construction of surface facilities within the approved surface development area.
Mining Tenements	• Coal Lease (CL) 365, CL374, CL397, Consolidated Coal Lease 743, Mining Lease (ML) 1402, ML1572, ML1594, MLA577[2], Authorisation 444, Exploration Licence 7211.

Notes: [1] Development Consent DA 305-7-2003 (as modified), [2] Pending approval.

1.1.3 Scope & Objectives

The scope of this MOP applies to the Mine and includes, but is not limited to, all open cut and underground mining activities, mineral processing, material handling and mine rehabilitation areas. This MOP aims to provide an efficient approach to the management of the mining operation whilst maintaining compliance with its regulatory approvals. This MOP has also been prepared to address rehabilitation requirements, as identified by Condition 94, 94A, 94B and 94C of Schedule 4 of DA 305-7-2003.

Within the MOP term the general objectives for mining operations are as follows:

- Maximise resource recovery efficiency within the approved/existing open cut boundary, producing a total of approximately 11.38 Mt of ROM coal within the MOP term;
- The South Bates Underground (SBU) mine: Continue first workings development and longwall extraction in the Wambo Seam of the remaining approved longwall panels (i.e. LW15 and LW16) in accordance with DA305-7-2003, to produce approximately 2.3 Mt of ROM coal within the MOP term; ~~and~~
- The ~~South Bates Underground Extension (~~SBUE~~)~~ mine: Continue first workings development and commence longwall extraction in the Whybrow Seam of the first five approved longwall panels (i.e. LW17 to LW21) in accordance with DA305-7-2003, to produce approximately 8.71 Mt of ROM coal within the MOP term; and

- The SWU Mine: Commence construction activities and first workings development to enable longwall mining in the Woodlands Hill Seam to commence after the MOP term, in accordance with DA305-7-2003.

The MOP term will commence on the 1 January 2018 and expire on the 31 December 2020. During the MOP term, coal mining operations will be carried out to extract, process and transport product coal by rail. Rehabilitation of disturbed areas will be undertaken progressively as part of the mining operations. The proposed coal extraction mining areas for the open cut and underground operations within the term of this MOP (as amended) are presented in **Appendix 1**.

The approved ~~South Wambo Underground (~~SWU~~)~~ Mine involves the extraction of coal from longwall panels in the Woodlands Hill and Arrowfield Seams. Longwall mining of SWU is currently proposed to commence after the completion of this MOP term.

1.2 Structure of the MOP

The remainder of this MOP is structured as follows:

Section 1: Provides an **introduction** and details of the scope, objectives, consents, leases and licenses, mine geology, land ownership, consultation and existing environment.

Section 2: Describes the **proposed mining activity**, other activities, mine life, coal processing, waste disposal and material handling during the MOP term.

Section 3: Provides details of **the environmental issues management**, risk assessment and risk management during the MOP term.

Section 4: Details the **post mining land use**, regulatory requirements, post mining land use goals and rehabilitation objectives.

Section 5: Describes the **rehabilitation planning and management** activities, domain selection and rehabilitation phases.

Section 6: Provides the **performance indicators and completion criteria** for each phase of rehabilitation.

Section 7: Describes the **rehabilitation implementation** to include proposed rehabilitation activities over the MOP term.

Section 8: Outlines the **rehabilitation monitoring and research** trials to be implemented during the MOP term.

Section 9: Outlines WCPL **intervention and adaptive management** and contingency when threats to rehabilitation are identified.

Section 10: Describes the **reporting** framework and requirements for the Mine, and outlines the review and implementation of this MOP.

Section 11: The mining **plans** in A3 size are provided. The A0 mining plans are provided in **Appendix 1** (i.e. **Volume 2** & **Volume 3**).

Section 12: This section provides the **references** used throughout of this MOP.

Section 13: This section provides a list of key **abbreviations** used throughout of this MOP.

Appendix 1: **Plans**

Plan 1A – Project Locality

Plan 1B – Pre Mining Environment (Natural Environment)

Plan 1C – Pre Mining Environment (Built Features)

Plan 1C (2) – Mine Workings

Plan 2 – Mine Domains

Plan 3A – Sequence of Mining and Rehabilitation Activities (Year 1: 2018)

Plan 3B – Sequence of Mining and Rehabilitation Activities (Year 2: 2019)

Plan 3C – Sequence of Mining and Rehabilitation Activities (Year 3: 2020)

Plan 4 – Final Rehabilitation and Post Mining Land Use at End of Approval

Plan 5 – Final Rehabilitation and Post Mining Land Use Sections

Appendix 2: DA 305-7-2003

Appendix 3: Surface Disturbance Permit (SDP)

1.3 Current Consents, Authorisations and Licences

1.3.1 Development Consent

Mining and rail activities at the Mine operate under development consents granted by the NSW Minister for Planning (or delegate) and Singleton Shire Council (SSC).

WCPL operates current open cut and underground mining activities under DA 305-7-2003 (as modified) and within the approved boundaries as displayed in **Figure 2**. DA 305-7-2003 was granted under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) in February 2004. Activities under DA 305-7-2003 commenced in March 2004.

The construction of the rail spur, rail loop and train loadout area commenced under DA 177-8-2004 in January 2005.

In accordance with DA 305-7-2003, WCPL has development consent (**Figure 2**) to undertake open cut and underground longwall mining activities. The underground mining activities during the MOP period include:

- The SBU mine – longwall panels LW15 and LW16 within the Wambo Seam; and
- The SBUE mine – longwall panels LW17 to LW21 within the Whybrow Seam.

Table 2 provides a summary of the key approvals, leases and licences that the Mine operates under. WCPL has modified the DA305-7-2003 on fifteen occasions (**Table 3**). A copy of the modified DA 305-7-2003 is provided in **Appendix 2**.

Copies of the DA 305-7-2003, EPL 529 and mining leases are available on the Peabody website: https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports.

Table 2 Mine Approvals, Leases and Licences

Relevant Authority	Instrument	Approval/Licence No.	Expiry Date
DP&E	Development Consent	• DA 305-7-2003	31 December 2039
~~DRG~~ RR (formerly DRG)	Mining Lease (ML)	• Coal Lease 365 (Coal Mining Act (1973)) • Coal Lease 374 (Coal Mining Act (1973)) • Coal Lease 397 (Coal Mining Act (1973)) • Consolidated Coal Lease 743 (Coal Mining Act (1973)) • Mining Lease 1402 (Mining Act (1992)) • Mining Lease 1572 (Mining Act (1992)) • Mining Lease 1594 (Mining Act (1992))	Refer to **Table 5**
	Mining Lease Application (MLA)	• Mining Lease Application 557 (Mining Act (1992))	Refer to **Table 5**
	Exploration Licence	• Exploration Licence A444 • Exploration Licence EL7211	Refer to **Table 5**
	Mining Operations Plan (MOP)	• Wambo Coal Mine – Mining Operations Plan (as amended)	31 December 2020
EPA	Environment Protection Licence (EPL)	• EPL 529	Until the licence is surrendered, suspended or revoked. The licence is subject to review every 3 years.

Note: DP&E – Department of Planning and Environment. ~~DRG - Division of Resources and Geoscience~~ RR - Resources Regulator – NSW Department of Planning and Environment.

Table 3 Development Consents & Modifications

Approval Name	Number	Approval Authority	Date Granted	Expiry Date
WCPL Mining Operations				
Original consolidated consent for mine operations	DA 108/91	SSC	17/02/1992	21 years from issue of coal lease
Modification to include Wollemi Box Cut and mine	DA 108/91	SSC	16/10/1996	21 years from issue of coal lease
Modification to include Brambles Coal Transport System	DA 108/91	SSC	21/12/1998	21 years from issue of coal lease
Expansion of open cut and underground mining operations	DA 305-7-2003	DP&E	04/02/2004	31 December 2039
(MOD 1) Modification to allow DA No. 108/91 to remain active	DA 305-7-2003	DP&E	2004	31 December 2039
(MOD 2) Re-orientation of the Wambo seam underground mine longwall panels	DA 305-7-2003	DP&E	04/05/2005	31 December 2039
(MOD 3) Upgrade of open cut workshop and underground surface facilities	DA 305-7-2003	DP&E	10/01/2006	31 December 2039
(MOD 4) Extraction of the Wollemi remnants	DA 305-7-2003	DP&E	19/04/2006	31 December 2039

Approval Name	Number	Approval Authority	Date Granted	Expiry Date
(MOD 5) Construction of a temporary by-pass of North Wambo Creek	DA 305-7-2003	DP&E	20/10/2006	31 December 2039
(MOD 6) Construction of the North Wambo Creek Diversion, gas and dewatering wells	DA 305-7-2003	DP&E	25/01/2007	31 December 2039
(MOD 7) Construction of internal water storage dam – Chitter Dam	DA 305-7-2003	DP&E	22/06/2009	31 December 2039
(MOD 8) Construction of internal water storage dam – South Wambo Dam	DA 305-7-2003	DP&E	27/08/2009	31 December 2039
(MOD 9) Preparation of an Extraction Plan rather than a Subsidence Management Plan	DA 305-7-2003	DP&E	28/02/2011	31 December 2039
(MOD 11) Montrose Water Storage Dam	DA 305-7-2003	DP&E	18/01/2013	31 December 2039
(MOD 12) South Wambo Underground Mine Modification	DA 305-7-2003	DP&E	12/12/2016	31 December 2039
(MOD 13) Additional Longwalls LW9-10	DA 305-7-2003	DP&E	08/07/2013	31 December 2039
(MOD 14) Additional Longwall LW10a	DA 305-7-2003	DP&E	10/04/2015	31 December 2039
(MOD 15) South Bates (Wambo Seam) Underground Mine Modification	DA 305-7-2003	DP&E	10/11/2015	31 December 2039
(MOD 16) United Wambo Open Cut Mine	DA-305-7-2003	DP&E	Pending	Pending
(MOD 17) South Bates Underground Extension (Whybrow Seam)	DA-305-7-2003	DP&E	20/12/2017	31 December 2039
WCPL Rail Development				
Jerry's Plains Rail Line	DA 235/97	SSC	16/07/1998	Perpetuity
Modification to DA235/97 to correct residents list and allow the preparation of management plans in a staged manner	DA 235/97	SSC	01/05/2003	Perpetuity
Altered alignment of Jerry's Plains Rail Line	DA 235/97.3	SSC	03/12/2004	Perpetuity
WCPL rail and coal loading infrastructure	DA 306-7-2003	DP&E	01/06/2004	Superseded by DA 117-8-2004
WCPL rail and coal loading infrastructure (altered alignment of rail loop)	DA 117-8-2004	DP&E	16/12/2004	16/12/2025
(MOD 1) Upgrade of Wallaby Scrub Road / Golden Hwy Intersection	DA 117-8-2004	DP&E	15/12/2006	16/12/2025
(MOD 2) Establishment of a locomotive provisioning facility adjacent to the WCPL Rail Loadout Facility	DA 117-8-2004	DP&E	12/02/2012	16/12/2025
(MOD 3) Harmonisation with United Wambo Open Cut Mine	DA 117-8-2004	DP&E	Pending	Pending

Note: MOD10 was withdrawn by WCPL.

1.3.2 Rehabilitation Management Plan

During preparation of the previous MOP (2015-2020), the DRE (now ~~DRG~~ Resources Regulator [RR]) determined that an approved MOP will satisfy the requirements of Condition 94C, Schedule 3 of DA305-7-2003 (i.e. for preparation of a Rehabilitation Management Plan (RMP) to the satisfaction of the Executive Director of Mineral Resources).

In consultation with the DP&E, WCPL received acknowledgment on the 4 May 2015 the MOP would satisfy the requirements of the RMP, subject to the MOP being approved by the Executive Director Mineral Resources. **Table 4** provides the conditions as they related to Condition 94C, Schedule 3 of DA305-7-2003 and where they are addressed in this MOP.

Table 4 Rehabilitation Management Plan Requirements

Condition 94C, Schedule 3 of DA305-7-2003	MOP Section
94C. The Applicant must prepare and implement a Rehabilitation Management Plan for the Wambo Mining Complex to the satisfaction of DRG. This plan must:	
(a) be prepared in consultation with the Department, CLWD, OEH, Council and the CCC;	Section 1.5
(b) be submitted to DRG by the end of June 2013;	
(c) be prepared in accordance with any relevant DRG guideline;	Section 1.0
(d) describe how the rehabilitation of the site would be integrated with the implementation the biodiversity offset strategy;	Section 3.3.7 and Section 5.3
(e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);	Section 6.0 and Section 9.0
(f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landform, and final land use;	This document
(g) include a detailed tailings management strategy that includes timing for rehabilitation of all tailings storage facilities, in order that final land form and land use objectives can be achieved in a timely manner;	Section 2.3.2.7
(h) include a plan that describes proposed grazing carrying capacity across the post mining landscape;	Section 8.4
(i) include interim rehabilitation where necessary to minimise the area exposed for dust generation;	Section 2.3.9
(j) include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and	Section 8.2
(k) build to the maximum extent practicable on the other management plans required under this consent.	Section 8.1 and Section 8.2

1.3.3 Mining Leases & Exploration Licences

The Open Cut, SBU mine and SBUE mine are located within a combination of coal and mining leases including ML 1402, ML 1572, ML 1594, MLA 557 (refer to Notes below Table 5), CL 365, CL 374, CL 397 and CCL 743 (Plan 1C). Mining lease conditions as they relate to rehabilitation are tabularised (**Table 20**) in **Section 4.1**. The date of grant and duration of key approvals and licences issued by government agencies relevant to the WCPL underground operations are provided in **Table 5** below.

Table 5 Mining Leases and Authorisations

Lease Reference	Area (ha)	Date Granted	Expiry Date
Coal Lease 365 (Coal Mining Act 1973)	530	19/09/1990	19/09/2032

Lease Reference	Area (ha)	Date Granted	Expiry Date
Coal Lease 374 (Coal Mining Act 1973)	382	06/12/1991	21/03/2026
Coal Lease 397 (Coal Mining Act 1973)	1,480	04/06/1992	4/06/2034
Consolidated Coal Lease 743 (Coal Mining Act 1973)	3,000	09/03/1990	14/08/2022
Mining Lease 1402 (Mining Act 1992)	352	23/09/1996	14/08/2022
Mining Lease 1572 (Mining Act 1992)	1,012	21/12/2005	21/12/2026
Mining Lease 1594 (Mining Act 1992)	263	01/05/2007	30/04/2028
Mining Lease Application 557 (Mining Act 1992)#	0	Pending	Pending
Exploration Licence A444^*	3,060	04/10/2007	16/05/2016
Exploration Licence EL7211	967	29/09/2008	29/09/2019

Notes: United has a strata title lease to the Arrowfield seam in the northern 1.5 km of CCL743 and CL397.
Mining Lease 1402 covered surface rights to enable development of the Wollemi Mine.
#MLA557 was submitted to the Resources Regulator on 14 May 2018 and the grant of this lease is currently pending.
^A444 is an Authority to Prospect granted under *Coal Mining Act 1973*.
*Licence Renewal Application was submitted to the DRE on 16 May 2016 and is currently under review.

1.3.4 Environment Protection Licence

The Mine operates under Environmental Protection Licence 529 (EPL 529), issued by the NSW Environment Protection Authority (EPA), under the authority of the *Protection of the Environment Operations Act 1997*. EPL 529 covers WCPL activities at the Mine and rail spur.

1.3.5 Extraction Plan Approvals

An Extraction Plan (EP) was approved on the 9 February 2016 to allow for longwall extraction of panels LW11 to LW13 within the Whybrow Seam at the SBU mine. This EP was revised to incorporate longwall panels LW14 to LW16 in the Wambo Seam (for a combined EP for LW11 to LW16). The EP for SBU LW11 to LW16 (*Extraction Plan - South Bates Underground Mine Longwalls 11 to 16)* was conditionally approved by the DP&E on the 16 May 2017. The approval considered the reduced lengths of LW13 to LW16 would result in similar or less subsidence related impacts to those approved as part of the approved layout and therefore can be generally in accordance with the Development Consent DA305-7-2003 as modified.

~~An EP is required to be prepared and approved prior to the commencement of any secondary extraction at SBUE. This will occur during this MOP term.~~

An EP for LW17 to LW20 within the Whybrow Seam at the SBUE mine (*Extraction Plan – South Bates Underground Extension Mine Longwalls 17 to 20*) was prepared and submitted to DP&E on 27 April 2018. Subsequent to the submission of the EP for LW17 to LW20, WCPL identified geological structures that required changes to the main headings and the finishing ends of LW18, LW19 and LW20. On 7 September 2018, the DP&E approved the EP for LW17 to LW20 for the extraction of Longwall 17 only. An updated EP for LW18 to LW20 will be prepared and submitted to the DP&E for approval during the MOP term.

1.3.6 EPBC Approvals

WCPL was granted approval (EPBC 2003/1138) under the *Environment Protection and Biodiversity Conservation Act, 1999* (EPBC Act) for the expansion of the mine on the 23 November 2004. In accordance with the approval WCPL prepared a Flora and Fauna Management Plan (FFMP) (**Section 3.3.7**) to address the conditions set out in *EPBC 2003/1138*. The FFMP was revised in March 2016 and subsequently renamed as the Biodiversity Management Plan (BMP).

The BMP was issued to the DP&E on the 28 October 2016 after extensive consultation with NSW Office of Environment and Heritage (OEH) and the Department of the Environment and Energy (DoEE). On the 17 November 2016 the DoEE approved the BMP. On the 1 November 2016 the OEH endorsed the BMP. Although the BMP did not receive final approval by the DP&E until 11 October 2017, key elements of the BMP applicable to this MOP including completion criteria, biodiversity management and monitoring programs have been implemented since late 2016. A copy of the BMP is available at https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports.

Separate approval (EPBC 2016/7636) under the EPBC Act was granted on 30 April 2017 for portions of the SWU that were not covered by EPBC 2003/1138. Approval for SBUE was also required under the EPBC Act (EPBC 2016/7816).

1.3.7 Water Licences

WCPL currently holds water licences for a number of test and dewatering bores located within and outside the mining lease. **Table 6** details the current water licenses held by WCPL.

Table 6 Water Access Licences (Water Management Act 2000)

Licence Number	Description	Expiry Date	Entitlement	Category
Hunter Regulated River Water Source				
WAL 718 (20SL060212)	Hunter River Pump	Perpetuity	1000 unit shares (high security)	Regulated River (high security)
WAL 8599 (20SL061206)	Hunter River Pump	Perpetuity	6 unit shares (high security)	Regulated River (high security)
WAL 8600 (20SL061206)	Hunter River Pump	Perpetuity	868 unit shares (general security)	Regulated River (general security)
WAL 8604 (20BL061206)	Hunter River Pump	Perpetuity	240 unit shares (supplementary water)	Supplementary Water
Hunter Regulated River Water Source – Shared with United Colliery				
WAL 929 (20SL050661)	Other Pump	Perpetuity	3 Megalitres	Domestic and Stock
WAL 1369 (20SL060416)	80 mm CP	Perpetuity	15 Units (supplementary water)	Regulated River (Supplementary)
WAL15459 (20SL204246)	80 mm CP	Perpetuity	21 Units (General Security)	Regulated River (General Security)
Hunter Unregulated and Alluvial Water Sources (Lower Wollombi Brook Water Source)				
WAL18437 (20SL033872)	Wollombi Brook Pump	Perpetuity	350 unit shares	Unregulated River
WAL 23897	Well No. 2	Perpetuity	70 unit shares	Aquifer

Licence Number	Description	Expiry Date	Entitlement	Category
(20BL167737)				
North Coast Fractured and Porous Rock Groundwater Sources (Sydney Basin - North Coast Groundwater Source)[2]				
WAL 39735 (20BL168643)[1]	Dewatering Bore	Perpetuity	40 unit shares	Aquifer
WAL 39738 (20BL132753)[1]	Old Well No. 1	Perpetuity	243 unit shares	Aquifer
WAL 39803 (20BL166910)[1] (20BL173032)[1] (20BL173033)[1] (20BL173034)[1] (20BL173035)[1]	Dewatering (Bore No. 1)	Perpetuity	450 unit shares	Aquifer
WAL41494 (20BL168017)[1] (20BL172061)[#1] (20BL173040)[1]	Dewatering (Bore No. 2 and 2a)	Perpetuity	750 unit shares	Aquifer
WAL41532 (20BL172156)[1]	Dewatering	Perpetuity	98 unit shares	Aquifer
WAL41528 (20BL167738)[#1]	Dewatering Bore	11/09/15	57 ML/year	NA
WAL41520 (20BL173844)[1]	Dewatering Bore	04/09/2019	9 unit shares	NA
20BL168997	Piezometer	Perpetuity	Groundwater monitoring	NA
20BL168998	Piezometer	Perpetuity	Groundwater monitoring	NA
20BL168999	Piezometer	Perpetuity	Groundwater monitoring	NA
20BL169000	Piezometer	Perpetuity	Groundwater monitoring	NA
20BL170638	Piezometer	Perpetuity	Groundwater monitoring	NA
20BL172237	Monitoring Bore (GW14, GW18, GW21)	Perpetuity	Groundwater monitoring	NA
20BL172238	Monitoring Bore (GW12)	Perpetuity	Groundwater monitoring	NA
20BL172240	Monitoring Bore (GW15)	Perpetuity	Groundwater monitoring	NA
20BL172242	Monitoring Bore (GW16, GW17)	Perpetuity	Groundwater monitoring	NA
20BL172244	Monitoring Bore (GW20)	Perpetuity	Groundwater monitoring	NA
20BL172255	Monitoring Bore (GW22)	Perpetuity	Groundwater monitoring	NA
20BL172256	Monitoring Bore (GW13)	Perpetuity	Groundwater monitoring	NA
20BL172257	Monitoring Bore (GW19)	Perpetuity	Groundwater monitoring	NA
20BL172332	Piezometer	Perpetuity	Groundwater monitoring	NA
20BL173032	Monitoring		Groundwater monitoring	NA
20BL173290	Monitoring Bore	Perpetuity	Groundwater monitoring	NA

Licence Number	Description	Expiry Date	Entitlement	Category
20BL173291	Monitoring Bore	Perpetuity	Groundwater monitoring	NA
20BL173292	Monitoring Bore	Perpetuity	Groundwater monitoring	NA
20BL173293	Monitoring Bore	Perpetuity	Groundwater monitoring	NA
20BL173946	Monitoring	Perpetuity		NA
20BL173999	Monitoring Bores	Perpetuity	Groundwater monitoring	NA
20BL009818	Bore	Perpetuity	Stock	NA
20BL009819	Bore	Perpetuity	Stock	NA
20BL009820	Bore	Perpetuity	Stock	NA
20BL009821	Bore	Perpetuity	Stock	NA
20BL143779	Bore	Perpetuity	Stock/Domestic	NA

WAL = water access licence, ML/year = megalitres per year.

Renewal lodged prior to expiry.

1. In mid-2015, WCPL applied to the Department of Primary Industries – Water (DPI-Water) to combine all of its groundwater licences that contained an extraction entitlement into a single licence. The purpose of this licence was to streamline mining activities and simplify the reporting of extraction against licensed entitlements. As such, WCPL was licensed to extract a total of 1,647 ML from all groundwater sources under the *Water Act 1912*. This combined licence was confirmed to be active by DPI-Water in correspondence received on the 18 February 2016, the status of its' conversion to licences under the *Water Management Act 2000* is yet to be advised by DPI-Water.

2 In December 2019, Water NSW approved an application to consolidate WAL 39738, 39803, 41494, 39735, 41520 and 41528.

1.4 Land Ownership and Land Use

1.4.1 Land Ownership

WCPL owns a significant area of land[5], including all of the land within the area consented to be disturbed by open cut mining and all of the land that overlies the SBU mine and SBUE mine. WCPL land ownership is shown on **Plan 1C.**

In accordance with DA 305-7-2003, WCPL has de-gazetted and closed off Pinegrove Road which is located in the north western extent of the current approved open cut limit. Pinegrove Road was required to be closed for mining in the Montrose East and Montrose West Pits. WCPL owns all of the land serviced by Pinegrove Road. **Table 7** identifies the schedule of land ownership.

1.4.2 Land Use

Other land use includes previously cleared grazing land and patches of remnant native woodland. Land use in the vicinity of WCPL is characterised by a combination of coal mining operations, agricultural land uses and rural residential development (evident in the local villages of Bulga, Jerrys Plains and, to a lesser extent, Warkworth). WCPL controlled lands that are not subject to mine operations are utilised for the agistment of stock (primarily cattle) and provide a buffer to neighbouring coal operations and private landholders and the adjoining Wollemi National Park.

An aerial photograph of the WCPLs and surrounds is provided on **Figure 2**. Significant areas of land which overlie SBU mine and SBUE mine have been previously disturbed by historical agricultural uses. Underground access to the SBU and SBUE mine are from highwall entries in the existing open cut. The open cut mining operations is bounded by the United Colliery and the Golden Highway to the north and Wollombi Brook to the east.

[5] Lot 170, DP 823775 is Crown Reserve. The mine plan has been designed to avoid the portion of Crown Reserve to the north of the Montrose East mining area.

Table 7 Schedule of Land Ownership

Schedule of Land Ownership	
WCPL Freehold	
Lot 79 DP753792	Lot 181 DP823775
Lot 57 DP753817	Lot 177 DP823775
Lot 160 DP753817	Lot 118 DP753792
Lot 18 DP753817	Lot 95 DP753792
Lot 71 DP753817	Lot 2 DP709722
Lot 161 DP753817	Por 131 DP753792
Lot 49 DP753792	Lot 2 DP616303
Lot 50 DP753792	Lot 1 DP720705
Lot 51 DP753792	Lot 2 DP720705
Lot 52 DP753792	Lot 3 DP720705
Lot 58 DP753792	Lot 4 DP720705
Lot 66 DP753792	Lot 45 DP753792
Lot 67 DP753792	Lot 46 DP753792
Lot 62 DP753792	Lot 4 DP542226
Lot 63 DP753792	Lot 5 DP542226
Lot 64 DP753792	Lot 1 DP241316
Lot C DP33149	Lot 7 DP3030
Lot 22 DP753817	Lot 23 DP3030
Lot A DP33149	Lot 92 DP755267
Lot 79 DP753821	Lot 109 DP753792
Lot 19 DP3030	Lot 110 DP753792
Lot 129 DP755267	Lot 111 DP753792
Lot 22 DP755267	Lot 112 DP753792
Lot 1 DP616303	Lot 103 DP753792
Lot 100 DP753792	Lot 104 DP753792
Lot 101 DP753792	Lot 82 DP548749
Lot 38 DP753792	Lot 83 DP548749
Lot 39 DP753792	Lot 1 DP110084
Lot 60 DP753792	Lot 2 DP110084
Lot 61 DP753792	Lot B DP33149
Lot 1 DP709722	Lot 113 DP753817
Lot 55 DP753792	Lot 2 DP617852
Pine Grove Road (WCPL Owned)	
Road bounded by Lots 7,19 & 23 DP 3030, Lots 22 & 129 DP755267, Lot 83 DP548749 and Lot 1 DP110084	
Crown Land	
Lots 170, 175 DP 823775	Lot 208 DP 753817
Lot 76 DP753821	Lot 78 DP753821
Travelling Stock and Camping Reserve No. 5294	
Lot 175 DP 823775	
Council Roads	

Schedule of Land Ownership	
Wambo Mine Road	Road within Lot 1 DP 616303
Crown Roads	
Bounded by Lots 92 & 129 DP 755267	Bounded by Lots 4 & 5 DP 542226, Lots 2 &3 DP720705 and Lot 2 DP 616303
Bounded by Lots 38, 55, 61, 100, 101, 149 DP 753792, Lot 2 DP617852 and Lot 1 DP 616303	Within Lot 2 DP617852
Bounded by Lots 175, 177, 181 DP 823775	Bounded by Lot 177 DP 823775, 60, 62-64, 95, 118 DP 753792, Lot 2 DP617852
Bounded by Lots 170, 177 DP 823775, 49-51, 58, 118 DP 753792	Bounded by Lots 170 DP 823775, 49, 50, 52, 79 DP 753792, 18, 160, 161 DP753817
Bounded by Lots A & B DP 33149, 22, 66, 67, 71 DP 753817	Adjoining to the East and North Lot 79 DP753821
Wollombi Brook	
Bounded by Lots 22 DP 755267, Lot 83 DP 548749, Lot 1 DP 110084, Lot 1 DP 241316, Lot 7 DP 3030	
Private Land within Mining Leases	
Lot 3 DP735566	Lot 92 DP586792
Lots 1, 54, 17, 20, 19, 6, 7, 23, 18 DP595702	Lot 91 DP586792
Lot 312 DP579424	Lot 23 DP858472
Lot 311 DP579424	Lot 2 DP595702
Lot 1 DP178612	Lot 1 DP 735566

Notes: Council controlled roads have been identified using geographical names where possible. Council and Crown roads and sections of Wollombi Brook with no real property identifier have their location described relative to adjoining lots.

1.5 Stakeholder Consultation

With the exception of some remediation of previous subsidence, all of the Mine's activities for this MOP are entirely contained within WCPL owned land. There are several private properties and portions of Crown Land within WCPL mining leases (**Table 7** and **Plan 1C**). Consultation with Crown Lands and private landholders are provided in **Section 1.5.1** and **Section 1.5.2**. Consultation regarding proposed remediation activities has occurred with the one affected landholder.

Consultation in relation to the Project EIS was undertaken in 2002, 2003 and 2004 with regulatory authorities, non-government organisations, relevant Aboriginal groups and the local community. This included community meetings in Jerrys Plains and at WCPL. In addition, consultation for consecutive modifications of DA305-7-2003 has been undertaken. Consultation with the local community, Aboriginal stakeholders, United Collieries, key state government agencies and Singleton Shire Council (SSC) is ongoing, including as part of the recent MOD 17 consultation conducted in 2016 and 2017.

Consultation with United Collieries regarding the MOP commenced in May 2015 and is ongoing. WCPL and United Collieries have entered into a Joint Venture (JV) with adjoining mining tenements. Ongoing consultation with United Collieries will continue to be undertaken regarding the JV and future operations, as required, during the MOP term.

The Project EIS and environmental assessments that accompany the various modifications are provided on the DP&E and Peabody's webpage for the Mine.

Consultation with the property owner occurred throughout the development of the Subsidence Remediation Plan for 'Kharlibe'.

1.5.1 Government Consultation

A meeting was held with DRG (now RR) on 13 November 2017 and 1 December 2017 to discuss proposed amendments to the 2015-2020 MOP in advance of the approval of MOD 17. The outcome of this consultation was that a new MOP would be prepared.

Under Condition 94C, Schedule 4 of DA 305-7-2003, the Rehabilitation Management Plan (RMP) component of the MOP is required to be prepared in consultation with DP&E, Crown Lands and Water Division (CLWD), OEH, SSC and the CCC.

These stakeholders are regularly consulted as part of ongoing operations. Consultation specific to rehabilitation will continue to occur with these stakeholders ~~within 3 months of the approval of MOD 17~~. Any changes to the MOP required as a result of this consultation will ~~form a~~ be included in a future MOP amendment.

MOP 2018-2020 was conditionally approved by the RR 1 February 2018. WCPL met with the RR 7 December 2018 to discuss proposed amendments for MOP 2018-2020 (Amendment A).

1.5.2 Community Consultation

Ongoing community consultation in regards to the MOP was completed in accordance with the WCPL Environmental Management Strategy (EMS) via the CCC. The CCC was formed back in September 2005. Minutes from the CCC are placed on the WCPL webpage. The website is maintained in accordance with DA 305-7-2003 requirements. The website provides the wider community with access to the sites monitoring results, details of current activities, proposed blast times, policies, environmental management plans and monitoring programs and any other information in relation to the site operation that may be considered of interest to the community.

WCPL also conducts regular open information sessions which are held in the local village of Jerrys Plains to allow community members access to key WCPL personnel to discuss all aspects of the Mine's operations.

The Peabody website address for WCPL is: https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports

Table 7 identifies the various private landholders within WCPL mining leases. A copy of the MOP, if requested, will be provided to each land holder. WCPL provided information regarding the new MOP during the latest CCC meeting held on 11 December 2017.

The Annual Review (formally known as the Annual Environmental Management Report or AEMR) also provides information about the preparation of the new MOP and the status of the operation.

1.6 Rehabilitation and Mine Closure

1.6.1 Conceptual Mine Closure Plan

WCPL and United Collieries have entered into a JV over adjoining tenements in relation to the United Wambo Open Cut Coal Mine Project. The United Wambo Open Cut Coal Mine Project (MOD 16) seeks to combine the existing open cut operations at the Mine with a proposed new open cut coal mine at the United Collieries. WCPL's CHPP and underground operations do not form part of the JV, and will continue to be owned and operated by WCPL under DA 305-7-2003.

The United Wambo Open Cut Coal Mine Project will affect the final landform and extend the life of open cut operations beyond the term of this MOP. The CHPP and underground operations are not planned for closure under DA 305-7-2003 until 2039.

Noting the above, WCPL are revising the Conceptual Mine Closure Plan (CMCP) to undertake life of mine closure planning for mining operations. A revised CMCP is planned for submission to the ~~DRG~~ RR and other relevant stakeholders ~~by the end of 2018~~ within six months of determination of the United Wambo Open Cut Coal Mine Project (MOD16). The CMCP will incorporate a review of the constraints and opportunities to identify potential sustainable land-use options, in consultation with relevant stakeholders in order to obtain feedback of any issues that need to be considered as part of the final land use analysis.

In addition, the CMCP will provide detailed decommissioning works for infrastructure, in general:

- Infrastructure with no ongoing beneficial use would be removed from the site at the completion of the project. Foundation slabs of certain buildings may be retained for suitable end-use goals in agreement with the relevant authorities and stakeholders. Alternatively, they would be excavated for disposal or buried in a void in an approved manner.
- Process reagents and fuels unused at the completion of mining would be returned to the supplier in accordance with the relevant safety and handling procedures. Foundation soils would be chemically tested, contour ripped and chemically ameliorated, as required (in accordance with EPA requirements). Stockpiled soils would then be applied as necessary and stabilised. Revegetation would be undertaken with suitable endemic tree species or pastures, consistent with the Project revegetation strategy (see **Section 3.3.7**).
- Roads that have no specific post-mining use would be ripped, topsoiled and revegetated. Some access roads may be retained post-mining to enable access and for use in bushfire and other land management activities.
- Water management structures and sediment control structures would either be retained as wetland habitat/water features or decommissioned and rehabilitated. The design, capacity and final location of these post mining water management structures will be refined and detailed in revised water management plans as the Mine progresses towards mine closure. Some access roads may be retained post-mining to enable access and for use in bushfire and other land management activities.

Rehabilitation monitoring results would be used to confirm rehabilitation areas are on a trajectory towards a self-sustaining ecosystem and towards meeting the rehabilitation completion criteria. Monitoring results would also be used to determine the requirement for maintenance and/or contingency measures (e.g. supplementary plantings) to improve rehabilitation performance. Contingency measures are described further in **Section 9.2**.

At mine closure, the need for maintenance/intervention would be no greater than that required for the surrounding lands whether it be for grazed lands or for existing remnant vegetation areas such as the Remnant Woodland Enhancement Program (RWEP) areas.

Upon the cessation of mining operations, it would be expected that tenure of the mining leases would be maintained by WCPL until such time as lease relinquishment criteria (including rehabilitation completion criteria) were satisfied. Lease relinquishment criteria would be developed in consultation with relevant authorities and stakeholders.

It is anticipated that lease relinquishment criteria would include, but not necessarily be limited to the following:

- Land tenure;
- Landform stability and public safety;
- Water quality;
- Trajectory towards self-sustaining ecosystems; and

- Fulfilment of mining lease and other statutory approval conditions.

Rehabilitation performance would be considered to be satisfactory when the assessment process indicates a trajectory towards self-sustaining ecosystems across the rehabilitation areas. Once this rehabilitation status has been achieved, monitoring and maintenance programs may be ceased in consultation with the relevant regulatory authorities and key stakeholders at which stage a mining lease relinquishment process would be commenced.

The final determination of the success of rehabilitation prior to relinquishment would be made by the relevant authorities.

The strategies and planning set out in the MOP, with respect to mine closure, reflect the current stages of mine development and will be reviewed in consultation with all relevant government and community stakeholders during the life of the mine as strategies and planning mature and develop further. This will allow the MOP to be used as a dynamic document that can be continually improved over the life of the mine. The MOP will be reviewed and updated accordingly during the MOP term.

1.6.2 Final Void Management Plan

A draft Final Void Management Plan (FVMP), a requirement of Condition 39, Schedule 4 of DA 305-7-2003, was submitted in June 2016.

The FVMP, a component management plan of the CMCP, is currently under review. Changes to the location and nature of final voids are being proposed as part of the United Wambo Open Cut Coal Mine Project (MOD16).

Any revised FVMP will include a detailed description of the design and long-term management of the final voids. Final void management issues that will be addressed by the FVMP include;

- Assessment of the predicted hydrological behaviour (long-term water quantity/quality);
- Groundwater/surface water management (inflows/outflows);
- Long-term geotechnical stability of the voids;
- Public safety, including the construction of bunds;
- Access requirements; and
- Water quality monitoring requirements.

1.6.3 Rehabilitation Management Plan

Condition 94C, Schedule 4 of DA307-7-2003 requires the Rehabilitation Management Plan (RMP) to describe measures that would be implemented to ensure compliance with relevant conditions of ~~the~~ DA305-7-2003 and address all aspects of rehabilitation including mine closure, final landform and final use. As previously discussed, DP&E has acknowledged the MOP can satisfy the requirements of the RMP, subject to the MOP being approved by the Executive Director Mineral Resources. **Table 20** outlines where the rehabilitation regulatory requirements are addressed in this MOP regarding mine closure.

2.0 Proposed Mining Activities

2.1 Project Description

A range of open cut and underground mine operations have been conducted at the Mine since mining operations commenced in 1969. Mining under ~~the~~ DA 305-7-2003 commenced in 2004 and currently both open cut and underground operations are conducted. The Mine has approval in accordance with DA305-7-2003 to carry out mining operations until 31 December 2039.

The approved ~~run-of-mine (~~ROM~~)~~ coal production rate is 14.7 ~~million tonnes per annum (~~Mtpa~~)~~ and product coal is transported from WCPL by rail. The approved Open Cut, Underground and associated infrastructure area at the Mine (**Figure 2**) comprise an area of approximately 1,990 ha. A summary of the approved Wambo Coal Mine is provided in **Table 1**.

The mining sequence and rate of mining would continue to be subject to review on the basis of market conditions and customer demand, coal quality or unforeseen changes to mining conditions. An indicative mining sequence for both the Open Cut and Underground operations during the MOP term are provided in **Plans 3A – 3C**. However, the mining sequence within the approved open cut extents will continue to be subject to periodic revision over the life of the mine. Any variation of the mining sequence as described in this MOP would require WCPL to amend the MOP as required by the *MOP Guidelines* and in consultation with the ~~DRG~~ RR.

Open Cut mining operations at the Mine involve the extraction of coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams (**Figure 3**). The Open Cut is bounded by the United Colliery and the Golden Highway to the north, Wollombi Brook to the east (**Figure 2**) and by uneconomic strip ratios to the south and west. The open cut mining fleet includes excavators, dozers, front end loaders, haul trucks, water trucks, service trucks, graders and drills.

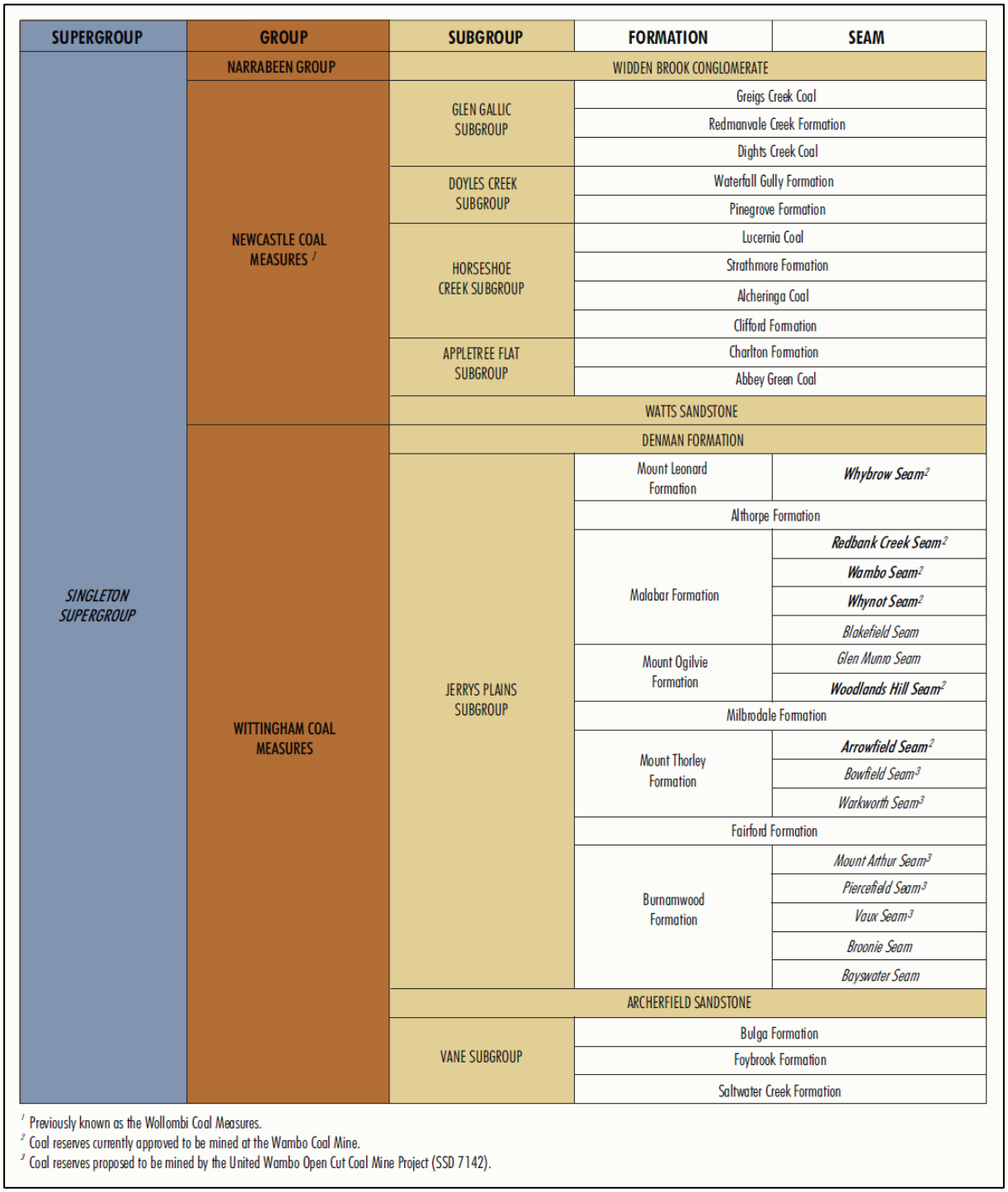
The Open Cut mining operation uses a combination of truck and excavator mining and dozer bulk pushing of blasted overburden into the previous strip void, followed by the removal of coal and interburden, operating 24 hours per day, seven days per week (**Section 2.3.3**).

Coal and interburden are mined in a similar manner to the overburden where dozers are used to rip and push the coal/interburden, followed by truck loading using excavators. Some interburden and coal blasting is also required, depending on the thickness and hardness of the material. Overburden and interburden that is not bulk pushed with dozers is hauled into the previous strip void using haul trucks.

The following underground mines at WCPL are approved (**Figure 2**):

- North Wambo Underground Mine (Wambo Seam) (mining completed);
- ~~South Bates Underground~~ SBU Mine (Whybrow and Wambo Seams) (covered by this MOP, extraction in the Whybrow Seam completed);
- ~~South Bates Extension Underground~~ SBUE Mine (Whybrow Seam) (covered by this MOP); and
- ~~South Wambo Underground~~ SWU Mine (Woodlands Hill and Arrowfield Seams) (development covered by this MOP, extraction proposed following the completion of this MOP term).

Figure 3 Stratigraphy of the Wambo Coal Mine Area



SUPERGROUP	GROUP	SUBGROUP	FORMATION	SEAM
SINGLETON SUPERGROUP	NARRABEEN GROUP	WIDDEN BROOK CONGLOMERATE		
	NEWCASTLE COAL MEASURES [1]	GLEN GALLIC SUBGROUP	Greigs Creek Coal	
			Redmanvale Creek Formation	
			Dights Creek Coal	
		DOYLES CREEK SUBGROUP	Waterfall Gully Formation	
			Pinegrove Formation	
		HORSESHOE CREEK SUBGROUP	Lucernia Coal	
			Strathmore Formation	
			Alcheringa Coal	
			Clifford Formation	
		APPLETREE FLAT SUBGROUP	Charlton Formation	
			Abbey Green Coal	
		WATTS SANDSTONE		
	WITTINGHAM COAL MEASURES	DENMAN FORMATION		
		JERRYS PLAINS SUBGROUP	Mount Leonard Formation	***Whybrow Seam*** [2]
			Althorpe Formation	
			Malabar Formation	***Redbank Creek Seam*** [2]
				Wambo Seam [2]
				Whynot Seam [2]
				Blakefield Seam
			Mount Ogilvie Formation	*Glen Munro Seam*
				Woodlands Hill Seam [2]
			Milbrodale Formation	
			Mount Thorley Formation	***Arrowfield Seam*** [2]
				Bowfield Seam [3]
				Warkworth Seam [3]
			Fairford Formation	
			Burnamwood Formation	*Mount Arthur Seam* [3]
				Piercefield Seam [3]
				Vaux Seam [3]
				Broonie Seam
				Bayswater Seam
		ARCHERFIELD SANDSTONE		
		VANE SUBGROUP	Bulga Formation	
			Foybrook Formation	
			Saltwater Creek Formation	

[1] Previously known as the Wollombi Coal Measures.
[2] Coal reserves currently approved to be mined at the Wambo Coal Mine.
[3] Coal reserves proposed to be mined by the United Wambo Open Cut Coal Mine Project (SSD 7142).

The NWU mine longwall panels LW1 - 5 have been developed off main headings driven from the existing Bates North highwall. Access to NWU mine longwall panels LW6 to LW10 (and LW10a) is from the Homestead In-Pit open cut highwall. ROM coal is conveyed to a 70,000 tonne (t) capacity stockpile adjacent to the open cut highwall where it is loaded into haul trucks and hauled to the ROM bin or the ROM coal stockpile.

The SBU and SBUE mines are accessible off main headings driven from the Bates South highwall. ROM coal is conveyed to a stockpile where it is loaded into haul trucks and hauled to the ROM bin or the ROM coal stockpile.

The Glen Munro Pit will be deepened to facilitate access to the SWU Mine. SWU main headings will be driven from the Glen Munro Pit highwall.

Underground mining equipment includes continuous miners, longwall mining equipment, electric shuttle cars, load haul dump machines and personnel transporters.

ROM coal ~~will~~ is either ~~be~~ washed at the CHPP or, where required, by-passed to the product stockpile and then loaded onto train carriages via the rail load facility. Coal rejects produced though the washing process are transported via the operational mining fleet and positioned within the overburden waste dumps, while tailings are deposited via pipelines to tailing storage facilities located in open cut voids.

Onsite maintenance and servicing of heavy mining equipment is also undertaken at the Heavy Vehicle Workshop and in the field as required.

2.2 Asset Register

WCPL have developed an asset register of major infrastructure within the Mine's Primary Domains (**Plan 2** and **Figure 8**). Details regarding the Mine's domains are provided in **Section 5.1** and **Table 21**.

Table 8 summarises the major infrastructure assets within each Primary Domain that includes the domain area, a description of the major infrastructure and general infrastructure construction details including areas, lengths and volumes.

Table 8 Major Infrastructure within Primary Domains

Primary Domains	Domain Area (ha)	Open Cut		Underground	
		Major Infrastructure Assets	Area/ Length	Major Infrastructure Assets	Area/ Length
Mine Infrastructure Areas (Domain 1)	252.1	Rail loop	14300m		
		Small buildings (Main Workshop Area)	152.3m^2	Small Buildings (Main Workshop Area)	2085.63m^2
		Industrial Buildings (Main Workshop Area)	1345.2m^2	Industrial Buildings (Main Workshop Area)	457m^2
		Overhead powerlines	7000m	Overhead powerlines	16000m
		Concrete pads, footings and bitumen (car park) for dumping in a void on the site (Main Workshop Area)	4110m^2		
		Concrete pads, footings and bitumen (car park) (Admin)	10909.9m^2	Concrete pads, footings and bitumen (car park) (Admin)	30664m^2
		Small buildings (Admin)	745.2m^2	Small buildings (Admin)	2014m^2
		Industrial Buildings (Admin)	1205.66m^2	Industrial Buildings (Admin)	300.88m^2
		Small buildings Tanks (Sewerage)	450m^2	Small buildings Tanks (Sewerage)	559m^2
		Roadways	25000m^3	Roadways	10706m^3

Primary Domains	Domain Area (ha)	Open Cut		Underground	
		Major Infrastructure Assets	Area/ Length	Major Infrastructure Assets	Area/ Length
Water Management (Domain 2)	34.8			Dewatering Bores	2500m^2
				Mine Water Dams	563827.3m^2
				Clean Water Dams	25843.5m^2
Tailings Emplacement Areas (Domain 3)	56.2	North East Tailings Dam	26.1 ha		
		Hunter Pit Tailings Dam	14.3 ha		
North Wambo Creek Diversion (Domain 7)	90	Creek Diversion	4.25km		
Coal Handling Preparation Plant (Domain 10)	28.6	Coal Handling Prep. Plant	4074.3m^2		
		Conveyors & gantries (includes overland conveyors)	2344.3m	Conveyors & gantries (includes overland conveyors)	2030m
		Concrete Pads and Footings	7318.7m^2		
		Large Tanks	2307.38m^2		
		Small Buildings	921.9m^2		
		Industrial buildings	566.4m^2		
		Carbonaceous material (spillage or otherwise) within footprint of the CHPP, ROM & Product stockpiles, conveyors and workshops	31033m^3		

2.3 Activities over the MOP Term

2.3.1 Exploration

WCPL will undertake exploration and prospecting activities within DA305-7-2003 approved mining authorisations during the MOP term. These authorisations consist of:

- CL365
- CCL743
- ML1594
- ML1402
- CL397
- ML1572
- CL374
- MLA557 (pending approval)

Exploration and ancillary prospecting activities will be undertaken to further define coal reserves, coal quality and gas content of the Whybrow, Redbank Creek, Wambo, Whynot, Woodlands Hill, Arrowfield and Bowfield coal seams.

Exploration and ancillary prospecting activities outside of DA305-7-2003 but within mining titles may also be undertaken during the term of the MOP.

Prior to any exploration and ancillary prospecting disturbance commencing a WCPL Surface Disturbance Permit (SDP) is approved and issued. The SDP identifies environmental, heritage and regulatory constraints requiring further management. The SDP is included as **Appendix 3** for reference.

All assessments of disturbance occurring due to exploration activities will consider *ESG5: Assessment Requirement for Exploration Activities* (DRG, 2017).

Disturbance relating to exploration is always minimised but may consist of slashing and removal of flora from access tracks and drill pad areas. Earth works may comprise the levelling of drill pads where a slope is present and installation of in ground sumps where above ground sumps are not feasible. All disturbance activities and site specific controls are detailed in the SDP.

Small scale earth moving machinery, water carts and track/tyred drill rigs will be utilised during site commissioning, operation and decommissioning. Where large scale equipment is proposed to be utilised for disturbance activities the potential environmental impacts will be assessed as part of the SDP assessment process.

Decommissioning and sealing of boreholes and site rehabilitation will be consistent with the *Exploration Codes of Practice - Rehabilitation* and *Exploration Code of Practice: Environmental Management* (DRG, 2017). Decommissioning of exploration sites consists of the disposal of all waste from site, sealing of borehole to surface and removal of drill casing from one meter below surface. Drill sites are stabilised, decompacted, topsoil replaced and seed applied as necessary to facilitate the sites return to former land use.

WCPL operate under an approved Groundwater Monitoring Program (GWMP). WCPL may expand its existing groundwater monitoring network by utilising specific exploration boreholes. The requirement to convert any exploration hole over to a groundwater monitoring bore will be subject to further determination from WCPL's groundwater specialist and consultation with DPI-Water in regards to licensing.

An exploration report will be provided to the ~~DRG~~ RR annually as part of the Annual Review process.

2.3.2 Construction

The majority of the existing Mine facilities have been constructed, including the office administration complex, bathhouse and employee carpark, ROM pads, underground portal areas, coal handling preparation plant (CHPP), products stockpiles, coal conveyors, rail spur, rail loop and rail loading infrastructure (**Figure 2**). For the term of this MOP, all existing approved infrastructure will be utilised including:

- Main administration/bathhouse building and associated car parking areas;
- Electrical supply;
- Water management system;
- Bates South In-pit portal entries;
- Underground support facilities in the In-pit area, including workshop, Control Room, Crib Room, ablution building and hardstand area;
- In-pit conveyor to underground ROM stockpile;
- In-pit ventilation fans;
- Open cut haul roads;

- Open cut workshop;
- Coal handling and preparation plant;
- Coal loadout and rail line infrastructure; and
- Hunter Pit tailings emplacement area.

Construction activities currently planned, within the MOP term (i.e. outside of the normal development activities associated with mining including progressive development of water management infrastructure and light vehicle access tracks) will include:

- Construction at the South Bates Underground Extension Mine;
- Construction at the South Wambo Underground Mine;
- Establishment of the boxcut for the Highwall Mining Project;
- Recommissioning South Wambo Dam;
- Establishing an additional HRSTS discharge point on South Wambo Dam (once recommissioned);
- Water management structures;
- Homestead and In-Pit Tailings Dam;
- North East Tailings Dam capping;
- Montrose Water Storage Dam[6];
- Maintenance of the North Wambo Creek Diversion;
- Montrose Tree Screening Project;
- South Dam Remediation;
- Gas Drainage System (SBU and SBUE); ~~and~~
- Subsidence remediation; and
- Installation of a dewatering bore to the Arrowfield Seam.

2.3.2.1 South Bates Underground Extension Mine

~~Proposed new infrastructure for the term MOP will be primarily associated with the SBUE mine.~~ The majority of the infrastructure and construction activities for the South Bates Underground Extension Mine will occur within the Bates South open cut area (see **Plan 3A – 3C**) during 2018 and will include, but not be limited to:

- Bench and pad preparation and drainage;
- Portal entries from the Bates South highwall, highwall meshing, adits, spiling & support;
- Electrical supply substation;
- Ventilation shaft and fan relocation;
- Compressors and associated shed (including concrete foundations);
- Conveyor and ROM pad installation construction;

[6] The Montrose Water Storage Dam was approved under MOD11. The construction of the dam during the MOP period remains subject to further feasibility studies and at this stage is planned for 2023 (beyond the terms of this MOP).

- Extend fibre and power; and
- Setup communications (PABX & UG phone system).

2.3.2.2 South Wambo Underground Mine

Construction of new infrastructure and relocation of existing infrastructure associated with the development of the SWU Mine during the MOP term will include, but not be limited to:

- development of the existing box cut including stabilisation and excavation;
- construction of a new MIAs and associated bulk earthworks;
- construction of an extended ROM coal facility;
- relocation of existing services (including power and water);
- installation of water management structures including levees, dams, drains, pumps and pipelines;
- installation, upgrade and realignment of internal access roads;
- installation of dewatering bores, gas management infrastructure, service boreholes and associated infrastructure;
- installation of electrical infrastructure including substation, buried power and fibre optic cables, telecommunication lines, power lines, switch room and back-up generator;
- stabilisation and meshing of highwalls, and development and installation of highwall portals;
- construction of conveyor systems;
- installation of services to be utilised in the underground operations including power, clean water, compressed air, pump out lines, monitoring lines and devices;
- installation of ventilation fan at the portal and at the main shaft locations;
- installation of compressor stations;
- installation of raw water tanks;
- construction and installation of storage areas for emulsion, diesel fuel, ballast and gravels;
- construction of a ventilation shaft including fan, generator, switch room, associated infrastructure and water management and flood control infrastructure, where required; and
- initial underground mining works including development of first workings in the Woodlands Hill Seam.

2.3.2.3 Water Management Structures

WCPL operate under an Erosion and Sediment Control Plan (ESCP). A number of water management structures, including diversion drains, sediment dams, sediment fencing, draining lines and other associated structures may be required throughout the life of the mine. Monitoring and maintenance of all water management structures is outlined in the ESCP (**Section 3.3.5**).

Consultation with the ~~DRG~~ RR regarding additional water management structures, if required during the MOP term, will be completed to determine if revisions to the MOP Plans are necessary.

2.3.2.4 Homestead Pit Tailings Dam

WCPL will also commence works to establish new tailings facilities in the former open cut voids of the old Homestead In-Pit areas in ~~Q1~~ Q3 2018. Previously, the Homestead area provide portal access to the NWU mine. Sealing the mine entries in the Homestead Pit was completed in March 2016.

2.3.2.5 North East Tailings Dam Capping

A Section 101 of the *Coal Mines Health and Safety Act 2002* was issued to WCPL on the 10 September 2009 for the discontinuance and decommissioning of the North East Tailings Dam (NETD). The capping and monitoring process as detailed in the Section 101 Application was carried out until early 2012 due to slower than expected progress and safety concerns accessing the NETD. The capping project was subsequently placed in a care and maintenance phase whilst alternate capping strategies were investigated.

WCPL is re-evaluating the design and capping options (including displacement capping methodologies) to identify new strategies or technological advancements that could be used to improve the success and decrease the time to cap NETD. A number of options are currently being considered by WCPL; however these options to date are unproven in the coal industry (and Australia) and are being evaluated for viability as well as options for a traditional capping strategy.

WCPL anticipate undertaking further trials, subject to a detailed peer review for adequacy, in regards to alternate methods of capping the NETD during the MOP term. Further information regarding the method proposed for capping under consideration for the NETD will be provided in subsequent MOP amendments and reported in the Annual Review. WCPL anticipate submitting a *High Risk Activity Notification* in Q1 ~~2018~~ 2019 to commence capping of the NETD, in consultation with ~~DRG's~~ RR's Mine Safety Officer.

WCPL submitted the *Wambo Coal North East Tailings Dam Rehabilitation Strategy - November 2016* (NETDRS) to the DRE for approval on the 22 November 2016. The NETDRS was submitted in response to a condition from the MOP Amendment C approval. In March 2017 the DRE provided confirmation that NETDRS could not be approved, as the final landform was not consistent with the current development consent conditions for maximum emplacement heights. As a result, WCPL was required by the DRE to resubmit the NETDRS by the 31 May 2017.

As an alternate capping method, WCPL commenced a trial using secondary flocculation[7] back in July 2016 with a flocculation plant located on the crest of the Hunter Pit Tailings Dam (HPTD) embankment. The trial consisted of a cell within the HPTD. The undrained shear strength data for secondary flocculated tailings in the trial cell as measured on site with a hand shear vane on 2 March 2017 ranged from 30kPa up to about 350kPa (Fitton, 2017).

With the success of the HPTD trial, WCPL are developing a capping design viability study using intermittent disposal methodology of layering 200mm of secondary flocculated tailings at a time. Each 200mm layer of flocculated material deposited will be allowed to dry, to finally form a layered crust approximately 3m thick as part of the capping final design.

As recommended by WCPL's tailings consultant (Fitton 2017), Cone Penetration Testing (CPT) will be undertaken to understand the geotechnical characteristics of the tailings over the full depth of the facility, over a multiple location testing regime in both NETD and the HPTD facilities. This testing will enable a final capping design to be prepared that contains far fewer critical assumptions.

The following is a summary of key project milestones proposed by WCPL regarding the above mentioned method to cap both NETD and HPTD, they include:

- CPT testing of NETD to commence in Q1 2019 and HPTD to commence in Q3 2019 ~~Q1 2018~~;
- Finalise capping design for NETD and HPTD in ~~Q4 2018~~ Q4 2019;

[7] Secondary flocculation is the process of adding more flocculant to the tailings slurry at (or near to) the end of the pipe to the tailings storage facility. It is sometimes referred to as "pipe-head flocculation", "Inline floccution" or "Enhanced Tailings Disposal (BASF)". This further addition of flocculant causes more agglomeration of tailings particles, and more release of water from the slurry. The main benefit from this process is that greater densities and shear strengths are achieved in the deposited tailings.

- Capping Works - commence intermittent disposal of double flocculated tailings in NETD in Q2 2019 and HPTD in Q1 2020 ~~Q2 2018~~; and
- Capping Works – completion of intermittent disposal of double flocculated tailings in NETD and HPTD will occur outside of the MOP Term.

A detailed summary of the progression of the CPT testing, capping design and outcomes from the intermittent disposal of double flocculated tailings in NETD and HPTD will be provided in the Annual Review.

2.3.2.6 Ancillary Infrastructure

During the MOP term, WCPL may need to construct or remove ancillary infrastructure including water management features (e.g. bores, pipelines, pumps, drains, bunds, sediment dams and light vehicle roads), environmental and operational monitoring equipment, electricity supply, communication towers and in-pit facilities. Consultation with the ~~DRG~~ RR will be undertaken accordingly to determine if a MOP amendment is required in regards to additional ancillary activities not described above.

2.3.2.7 Maintenance of the North Wambo Creek Diversion

During the MOP term general erosion and rehabilitation maintenance works will continue, as required, along sections of the North Wambo Creek Diversion (NWCD) (Domain 7).

Specific rehabilitation maintenance works have been identified in sections of Stage 2 and Stage 3 of the diversion.

~~In 2018,~~ Wambo Coal, in consultation with the NSW Soil Conservation Service will prepare and commence implementation of a detailed 5 Year NCWD Rehabilitation and Maintenance Plan. The Plan will be developed in consultation with ~~DRG~~ RR.

Rehabilitation maintenance works will be undertaken annually throughout the MOP term, including:

- Weed management (particular focus on Galenia *puescens*) to control this noxious weed;
- Repair areas of erosion;
- Re-seeding with selected native pasture and tree species;
- Revegetation trials with native grass species in selective areas of the diversion to assist in controlling weeds; and
- Collection of native grass seeds within pasture areas on adjacent WCPL owned pasture lands.

With mining of LW11 to LW16 complete, rehabilitation works for the NWCD, including rehabilitation of subsidence effects, can be planned for areas overlying, and downstream of, LW16. Development of a detailed rehabilitation plan for NWCD upstream of LW16 is not considered practical at this time due to the number of current and future underground mining activities that may affect processes and condition of the watercourse. Some of those activities may also impact areas overlying, and downstream of, LW16, and their influence will be considered as part of the proposed rehabilitation actions for that section of the diversion.

In late 2018, WCPL commissioned Alluvium to prepare a detailed five (5) Year NWCD Rehabilitation and Maintenance Plan, which will be developed in consultation with a stakeholder panel. Table 9 provides an outline of the rehabilitation and maintenance works proposed.

Table 9 Outline of NWCD Rehabilitation and Maintenance Plan

2018	2019	2020
Continue inspections.	Commence implementation of NCWD Rehabilitation and Maintenance Plan.	Continue implementation of NCWD Rehabilitation and Maintenance Plan.
Annual Diversion and Subsidence Monitoring.	Annual Diversion and Subsidence Monitoring.	Technical panel review of actions implemented, monitoring results and update of rehabilitation plan as required.
Subsidence remediation measures (if required) as outlined in the approved Extraction Plan - South Bates Underground Mine Longwalls 11 to 16.	Subsidence remediation measures (if required) as outlined in the approved Extraction Plan - South Bates Underground Mine Longwalls 11 to 16.	Annual Diversion and Subsidence Monitoring.
Rehabilitation maintenance works, including: • Weed management (particular focus on Galenia puescens); • Repair areas of erosion; • Re-seeding with selected native pasture and tree species; • Revegetation trials with native grass species in selective areas of the diversion to assist in controlling weeds; and • Collection of native grass seeds within pasture areas on adjacent WCPL owned pasture lands.		
Prepare and commence implementation of a detailed five (5) Year NCWD Rehabilitation and Maintenance Plan.		

2.3.2.8 Montrose Tree Screening Project

WCPL have implemented the Montrose Tree Screening project along a section in the north western portion of the WCPL owned Montrose Property, adjacent to Golden Highway. Maintenance ~~and re-establishment~~ of the tree screen will continue. The tree and shrub species to be planted are consistent with the woodland corridor species as identified in **Table 17**.

2.3.2.9 Subsidence Remediation

WCPL monitor and record the various subsidence related surface impacts from its underground operations on WCPL owned land. A record of surface related impacts and the results of the subsidence remediation are provided in the Annual Review.

Subsidence remediation works during the MOP term will include remediation of impacts (mainly surface cracking) within areas of existing pasture (Domain C) and native vegetation (Domain B), repairs to internal access tracks (where required) and repairs to the North Wambo Creek Diversion as a result of mining activities by SBU and SBUE (Domain 7).

~~WCPL will also undertake subsidence remediation works at an adjacent property (Kharlibe) within CL397 and CCL743 that was undermined by the Homestead Underground Mine (**Plan 2**).~~

In February 2018, a Section 240 Notice was issued to WCPL by the RR to prepare a Subsidence Remediation Plan (SRP) for impacted areas of the neighbouring "*Kharlibe*" property. The property was undermined between 1991 and 2000 as part of the Homestead Underground Mine, within CL397 and CCL743 (**Plan 2**). The final SRP was provided to the RR in February 2019 for review and approval. Upon agreement to access "Khalibe" from the landowner, WCPL will conduct the recommended subsidence remediation and monitoring works. The Wambo Annual Review will provide an overview of the works conducted under the SRP each year. The SRP is provided in Appendix 4

~~To assist with addressing the rehabilitation obligations under the *Mining Act, 1992*, WCPL proposes the following:~~

- ~~WCPL will prepare a draft subsidence remediation plan that outlines rehabilitation objectives, timing of remediation activities and quantitative criteria to assess rehabilitation.~~
- ~~WCPL will provide the draft subsidence remediation plan to the landholder in the first half of 2018 and will provide a 4 week period for the landholder to provide comment.~~
- ~~Within 2 months of receiving feedback from the landholder, WCPL will incorporate all reasonable and feasible requests and will submit the draft subsidence remediation plan to the DRG.~~
- ~~It is understood that the DRG will seek written feedback from the landholder on the draft subsidence remediation plan;~~
- ~~It is understood that the DRG will commission an independent expert to peer review both the draft remediation plan and the written feedback from the landholder to inform the preparation of a final remediation plan.~~

  ~~Once signed off by the DRG, the final remediation plan will be included in this MOP.~~

2.3.2.10 Montrose Water Storage Dam

On the 18 January 2013, MOD 11 was approved by the DP&E. This modification comprised the construction and operation of the Montrose Water Storage Dam and associated supporting infrastructure. The Montrose Water Storage Dam would be a "turkey's nest" style dam located to the south-west of the approved open cut limit (**Figure 2**) and would have a nominal capacity of approximately 1,500 million litres (ML).

At this stage, commencement of construction of this dam is anticipated in 2023 (beyond the terms of this MOP). If construction of the dam is brought forward, WCPL will consult with the ~~DRG~~ RR regarding a MOP amendment.

2.3.2.11 Gas Drainage System (SBU and SBUE)

In 2016, WCPL commenced installation of a gas drainage system for the SBU (Wambo) to provide for pre-mining gas drainage and goaf gas discharge to reduce the gas content in the coal seam to levels suitable for longwall operations. A similar gas drainage system may be installed for the SBUE.

2.3.3 Open Cut Mining Operations

2.3.3.1 Open Cut Mining Equipment Fleet

Open cut mining during the MOP term is to be carried out primarily with dozers, loaders, hydraulic excavators and trucks. The equipment is sized to provide maximum flexibility and minimise coal losses. The estimated number of each equipment type to be used during the MOP term is presented in **Table 10**; however this may vary during the term of the MOP based on production requirements.

Table 10 Open Cut Mining Fleet

Mining Equipment Description	Make and Model	Number of Fleet
Excavators (overburden/coal)	Komastu PC5500	5
	Hitachi EX2500	1
Haul Trucks (overburden/coal)	Komastu 930	11
	CAT 793	~~16~~ 20
	CAT 789	4
Dozers (open cut pit/product stockpile)	Cat D10	9
	Cat D11	3
Front End Loaders	Le Tourneau L1350	1
	CAT 992D	1
	CAT 980	2
Graders	CAT 16M	2
	CAT 24M	1
Water Trucks	CAT 777F	4
Drill Rigs	Drilltech D40K	1
	Ezidrill 15M-SP	1
	Drilltech D75K	1
Tyre Handler	Omega 16-12	1

2.3.3.2 Open Cut Mining Sequence

The Open Cut mine has been divided into a number of 'Pits'. The main pit is called the Montrose Pit. Montrose Pit has been divided into Montrose West Pit and Montrose East Pit. Each Pit is generally divided into strips (approximately 100m wide) and blocks which are orientated to suit the sequence of mining, which is influenced by seam dip, seam structures and strip ratio.

~~Mining in the South Bates Extended Pit (Roses Pit) will be completed during 2018 with the subsequent void becoming a mine water storage facility.~~

Mining in Montrose West Pit for 2018 is focussed on removal of material to the south of the ridgeline and steadily progressing in a northerly direction towards the Montrose East Pit. The majority of the waste rock from this pit will be used to backfill the Montrose West void.

~~Montrose East Pit will also be further developed in 2018, to allow mining of lower ratio reserves. Waste rock dumps will be developed out of pit to screen mining operations, and later used to fill the advancing void.~~

Two minor areas subject to a dozer push operation will be targeted in 2018 and 2019 in Montrose West and in Homestead East.

Establishment of the boxcut for the Highwall Mining Project (an extension of the South Bates Extended Pit [Roses Pit]) will be undertaken during 2019.

The indicative mining schedule and sequence of open cut mining operations will be undertaken during the MOP term is illustrated in **Plans 3A – 3C** and identified Table 11.

Table 11 Mining Schedule and Disturbance during MOP Term

Open Cut Planned Disturbance (ha) & Mining Schedule	2018 Area (ha)	2019 Area (ha)	2020 Area (ha)	Summary 2018-2020 Area (ha)
Montrose Pit	~~79.3~~ 35.5	~~17.84~~ 24.3	~~23.5~~ 52.3	~~120.64~~ 112.1
Glen Munro Pit (South Wambo)		~~3.4~~ 13.4		~~3.4~~ 13.4
Highwall Mining Project		44.4		44.4
~~South Bates Extension~~	~~2.8~~			~~2.8~~
Total	**~~82.1~~ 35.5**	**~~21.24~~ 82.1**	**~~23.5~~ 52.3**	**~~126.84~~ 169.9**

2.3.3.3 Vegetation Clearing & Topsoil Removal

Prior to the commencement of mining areas in the open cut, pre-strip operations will be conducted to remove vegetation and topsoil. Approximately 126.84 ha of vegetation would be progressively cleared over the MOP term (Table 11).

Further topsoil removal and vegetation clearance procedures are provided in **Section 3.3.5**. The proposed disturbance areas during the MOP term, necessary for mining and construction related activities are provided on **Plans 3A – 3C**. The mitigation measures relevant to vegetation clearance activities include the following:

- Completion of SDP's;
- Wherever practicable, existing native vegetation will be retained and vegetation clearance avoided;
- Archaeological clearance in accordance with Heritage Management Plan (HMP) will be obtained from WCPL archaeologist prior to releasing the area for work;
- Sediment controls implemented are consistent with the ESCP;
- Follow the Vegetation Clearance Protocol (VCP), to minimise the impact of the Mine vegetation clearance activities on flora and fauna. As a component of the protocol, pre clearance surveys will be completed (where necessary) to identify habitat trees and threatened fauna species. The proposed clearance areas will be demarcated;
- Where available, topsoil resources will be identified, stripped and stockpiled for later use in rehabilitation in accordance with the Topsoil Stripping Permit; and
- Where vegetation clearance is undertaken, timber will be mulched and either used as a soil conditioner or timber salvaged for habitat creation on rehabilitation areas where practicable.

Due to the known variability and distribution of the soils at WCPL, the concept of soil complex units is used to identify the soil types, and provide guidance on appropriate stripping depth. Expected topsoil volumes stripped (**Table 12**) during the MOP term are provided in **Sectio**.

Surface Disturbance Permit Procedure

WCPL has implemented a Surface Disturbance Permit (SDP) procedure and checklist (**Appendix 3**). The SDP requires the approval of the Environment and Community Manager (or delegate) prior to any land disturbance and clearing activities taking place. The SDP aims to identify any environmental issues such as cultural heritage sites, flora and fauna communities, threatened species, surface drainage and the identification of any seed or timber resources that can be salvaged. The SDP procedure is completed prior to any surface disturbance being permitted on:

- WCPL owned land;

- United Collieries' owned land covered by WCPL's mining lease; and
- Privately owned land where the disturbance is subject to agreement with the landowner. An Exploration Site Permit (ESP) may substitute the standard SDP if the disturbance is related to exploration activities.

Surface disturbance at WCPL includes, but is not limited to:

- Felling of trees on undisturbed, disturbed or rehabilitated land;
- Grading of new access roads and maintenance of existing access roads where the footprint of disturbance is greater than the original;
- Pushing up or removing topsoil on any land whether undisturbed, disturbed or rehabilitated;
- Dumping over any undisturbed, disturbed or rehabilitated land; and
- Construction of any earthworks across undisturbed, disturbed or rehabilitated land.

The following requirements (but not limited to the below), may be addressed (dependent on activity) by the SDP, prior to the Environment and Community Manager (or delegate) granting approval:

- A plan with proposed area for disturbance delineated;
- Pre-clearance surveys completed for both ecological and heritage assessments;
- An erosion and sediment control plan;
- Topsoil management measures;
- Noise management measures;
- Dust management measures; and
- Light management measures.

Salvage and Re-use of Materials

Where practicable, clearing operations required for the open cut will be managed to re-use the cleared timber. Timber resources that can be salvaged will be identified as part of the SDP procedure.

Cleared timber suitable for fence posts and habitat for fauna will be set aside and salvaged where possible. Habitat features such as logs and hollows collected during a clearance campaign may be utilised in rehabilitated and RWEP areas to augment habitat features for fauna.

2.3.3.4 Drilling and Blasting

The majority of overburden material cannot be ripped or excavated by mobile plant; therefore blasting techniques using ammonium nitrate based explosives loaded into blast holes, drilled with rotary drills will be undertaken. Blasting activities will also be required for the purposes of excavation blasting to develop drift access to coal seams for underground mining.

WCPL have developed a Blast Management Plan[8] (BMgtP) to outline blast management and mitigation strategies, procedures, controls and monitoring programs that are to be implemented at the Mine. The BMgtP was prepared to satisfy:

- Development consent DA 305-7-2003, Schedule 4, Consent Conditions 11,12,13,13A, 14,15,16,17,18,19, 20, 20A, 63, 64, 65, 66, 67 & 68;
- Development consent DA 305-7-2003, Schedule 6, Consent Conditions 3 & 4;

[8] Condition 20, Schedule 4 of DA305-7-2003.

- Development Consent DA 177-8-2004, Schedule 4, Consent Conditions 8, 9 & 10;
- Environment Protection Licence No.529 (EPL 529) Condition L5; and
- *Australian Standards (AS) 2187.2:2006 Explosives – Storage and Use – Use of Explosives*.

The approved blasting hours for the Mine are between 9.00 am and 5.00 pm Monday to Saturday inclusive.

No blasting is allowed on Sundays, Public Holidays, or at any other time without the written approval of the Secretary of the DP&E.

A maximum of three blasts events per day (unless an additional blast is required following a blast misfire), and fifteen blasts per week for all operations at the Mine.

WCPL must develop a Traffic Management Plan[9] for blasting within 500 metres of a public road that has been prepared in consultation with the Roads and Maritime Service (RMS) and Singleton Shire Council (SSC).

Exceedance of the overpressure limit of 115 dB at the nearest sensitive receiver should be limited to a maximum of 5 percent (%) of the total number of blasts (over a period of 12 months), and should not exceed 120 dB at any time.

Exceedance of the ground vibration limit of 5 mm/sec at the nearest sensitive receiver should also be limited to 5% of the total number of blasts, and should not exceed 10mm/sec at any time. For more details about blasting and blasting management measures refer to **Section 3.4.9**.

2.3.4 Rock/Overburden Emplacement

The open cut operations are expected to produce approximately 640Mbcm of waste rock (or overburden material) during the life of the Mine (WCPL, 2003). Only a limited amount of waste rock will be produced from the underground operations. The overburden and interburden waste rock materials comprise mudstones, siltstones, sandstone, shale and conglomerates (WCPL, 2003).

Waste rock material is progressively placed back in-pit once the coal has been mined. A combination of temporary and permanent out-of-pit waste rock emplacements are located adjacent to the open cut mining operations (**Plans 3A – 3C**). Mine waste rock emplacements behind the advancing open cut are progressively constructed to form the final landform. Some of the waste rock is also utilised to construct internal walls for the tailings emplacements and for capping.

The coarse reject material is selectively handled and co-disposed of with waste rock in open cut voids or would be used as bulk fill in the covering and rehabilitation of tailings materials (WCPL, 2003). Coarse reject material is dispersed throughout the overburden within the mine waste rock emplacements to manage its geochemical characteristics.

Rehabilitation of mine waste rock emplacements would be progressive and would be undertaken as soon as practicable. Landform reshaping consists of re-contouring overburden dumps to the designed shape for final rehabilitation.

Reshaping results in a stable landform incorporating slopes and drainage which blend in with the surrounding natural topography. Slope stability is integral to rehabilitation design and the objective during rehabilitation planning is to design all slopes to a gradient of 10° or less (1V:5.7H). Slopes steeper than 10° may be necessary in some locations to ensure rehabilitation merges seamlessly with adjacent undisturbed land.

[9] Condition 80, Schedule 4 of DA305-7-2003.

Mine waste rock emplacements would cover an area of approximately 1,300 ha and be rehabilitated to a final landform up to 160m AHD. Where long slopes are present, contour drains or deep staggered rips would be established. Waste rock emplacements will be constructed in 15 to 20 metre lifts and shaped to the final landform profile when completed.

The surface of mine waste rock emplacements would be constructed to form a pattern of ridges and valleys. The valley areas would be shaped into a network of constructed drainage structures. Mine waste rock emplacement surfaces would be formed to maximise rainfall absorption and to minimise the requirement for artificial drainage structures. Mine waste rock emplacement berms would generally be reverse graded with perimeter bunds constructed as necessary.

Natural slopes commonly evolve to form an 'S' shape as a result of natural erosion and deposition processes. Mine waste rock emplacement slopes would generally be constructed in profile to form an 'S' shape with the upper 20 to 30% being convex and the lower 70 to 80% being concave.

Until an adequate vegetation cover is established, heavy rainfall may cause erosion, resulting in a dissected land surface, resource loss and the need for expensive remedial treatment. Therefore, slope length is reduced by fit for purpose designed structures such as contour drains, to intercept and divert water off the slopes. The structure(s) principle aim is to drain water safely from the landform, via a sediment detention structure if the water is to be discharged from the mine water management footprint.

Once bulk reshaping is completed, the landform is ripped to approximately 200-300 mm and then the final trim and rock raking are undertaken. The ripping loosens up any near surface strata within the landform that have been compacted during placement, aiding root penetration during vegetation establishment. The final trim smooths out any washouts, rough edges, temporary access tracks, local steep topography and prepares the surface for revegetation.

Rock-raking removes exposed surface rock greater than 200 mm in diameter. This raking is usually done along the contour, leaving a textured surface that assists with erosion minimisation until vegetation can be established.

Overburden characterisation will be completed to determine appropriate ameliorants and rates of application. Ameliorants, if required, are applied to the trimmed overburden surface. Overburden sampling and laboratory analysis will be undertaken to gain an understanding of the type and rate of ameliorant required to treat the overburden.

Gypsum is commonly applied at a rate of approximately 5-10 tonnes per hectare (t/ha) depending on laboratory soil results/analysis to assist in treating sodic, poorly structured or heavy clay material. Lime (calcium carbonate) may also be applied to treat hotspots of low pH (acidic) overburden if encountered; however, acidity has not historically been a problem with overburden at the Mine.

Following shaping of the landform the mine waste rock emplacements would be covered with approximately >100 mm of topsoil sourced from soil stockpiles or freshly stripped open cut mining areas. Site preparation works following the placement of topsoil would include chisel ploughing or deep ripping along contour, depending on the vegetation type to be established.

Mine waste rock emplacements would be progressively revegetated with a pasture cover crop and endemic woodland shrubs and trees planted on ridgelines and other selected areas, consistent with the proposed revegetation strategy as described in **Section 2.3.4.**

Material identified having potential spontaneous combustion risks will not be used in rehabilitation works. This material, if identified, will be covered to a depth of at least 5m below the final landform RL using inert waste rock material.

Likewise, coarse reject emplacements integrated into the landform will be covered to a depth of at least 2m below the final landform RL using compacted inert waste rock material.

Overburden material exhibiting hostile characteristics (acidity, excessive alkalinity, sodicity, etc.) will be identified during material characterisation of the final landform and isolated from vegetation root zones and areas of potentially high surface runoff (i.e. this material not be used in the final 2m of the final landform RL).

A dump mass balance was performed, based on a material swell of 1.25, to give the landform as shown in **Plan 5**.

Overburden removal is carried out mostly by excavators and haul trucks with the waste rock material hauled to open cut voids or waste rock emplacements. Approximately ~~26.7~~ 32.3 Mbcm of waste rock was excavated during the ~~2016~~ 2017 reporting period.

Overburden removal will be carried out typically by 500t excavators and a 290t or 220t truck fleet. Some overburden material will be loaded with the 250t excavator and loaders. The overburden material will generally be hauled and dumped in pit or on existing dump surfaces. Waste from the Montrose Pit (east) has been scheduled to report to an out-of-pit dump which will be adjacent to the pit limit (see **Plans 3A – 3C**).

The approximate annual volumes of stripped topsoil material, overburden, ROM coal, processing waste and product coal during the MOP term are provided in **Table 12**.

A small amount of overburden material above the Wambo and Whynot seams will be moved with dozers employing a combination of cast blast and dozer push. This overburden material will be disposed of in the immediately adjacent mined out strip. The stripping sequence will be planned so as to minimise any traffic on the exposed coal seams.

The disposal sequence of the overburden material is designed to form ongoing and continuous rehabilitation of the mined out areas. As no acid forming strata has been identified, dumping will be designed around the achievement of the most cost effective dump sequence.

The majority of overburden material from Montrose Pit (west) will be placed into the void created by mining. Some material from Montrose Pit (west) was placed into the Bates Pit void, and used to construct a pad for underground access to Whybrow seam within SBU.

Bates South Pit waste is primarily used as a pad for the underground access to the SBU. The initial overburden material from the Montrose Pit (east) was hauled out of pit to create a visual bund on the northern side of the operation. Now the bund is completed, all Montrose East overburden material will report in pit.

2.3.4.1 Final Landform Concepts

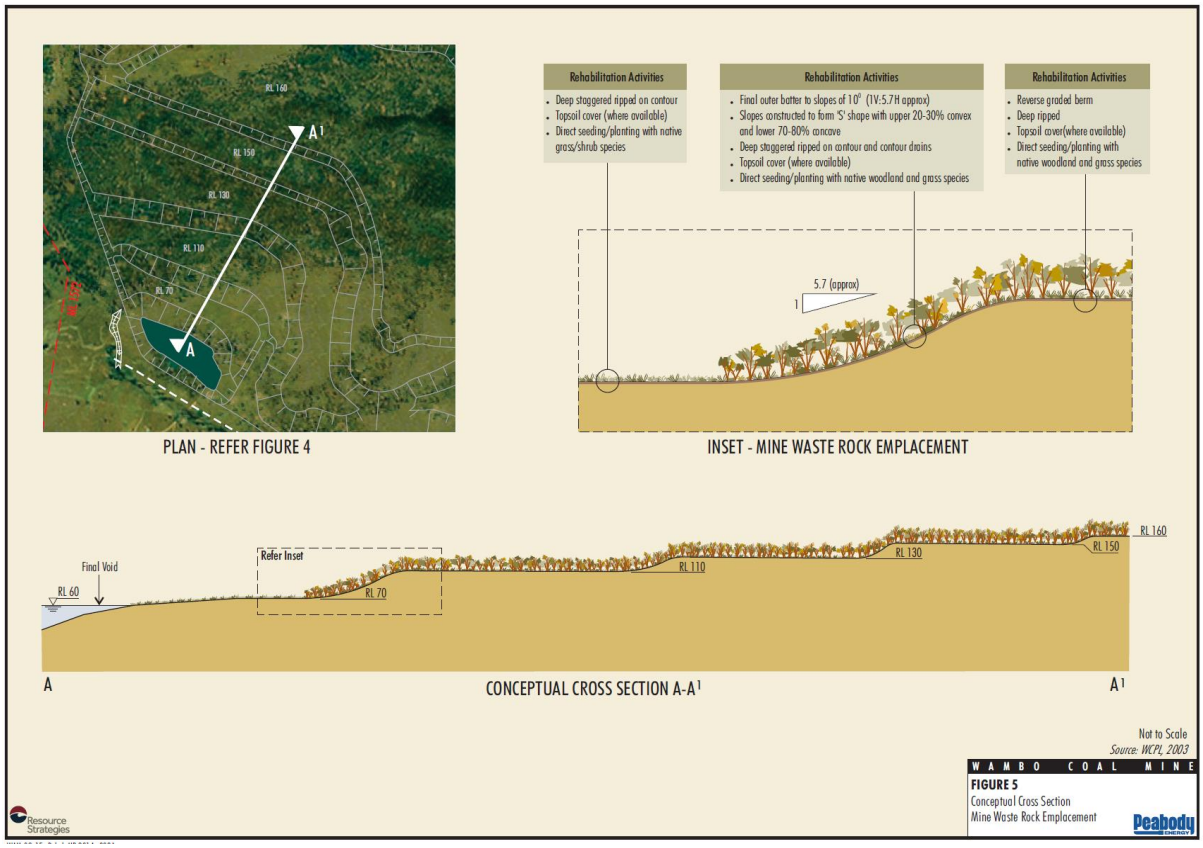
The current final landform design ~~will~~ consists of a single, broad ridgeline with a south-east to north-west alignment, which reaches approximately 160 metres (m) Australian Height Datum (AHD). Key features of the final landform include:

- Rehabilitated waste rock emplacements, infrastructure areas and tailings disposal areas which include woodland corridors to facilitate fauna movement across the rehabilitation areas and provide linkages with existing remnant vegetation and the Wollemi National Park;
- Two final voids located on the western extent of the final landform; and
- Permanent water management features including diversions and contour drains and some permanent ponds (located on the eastern extent of the final landform) to integrate landform drainage with the surrounding catchment.

Following determination of the United Wambo Open Cut Coal Mine Project applications, the final landform design will be updated to incorporate relevant changes.

Figure 7 illustrates the final landform concept and the revegetation strategy comprising a mixture of pasture and woodland communities. A conceptual cross section of a portion of rehabilitated mine waste rock emplacement is provided in **Figure 4.**

Figure 4 Conceptual Cross Section Waste Rock Emplacements



2.3.4.2 Coal Removal

Coal and partings operations will include:

- Coal will be mined with the 500t and 250t hydraulic excavator or front end loaders loading direct into 180t to 290t trucks;
- Thinner coal seams will be ripped and dozed into suitably sized stockpiles prior to loading;
- Coal in the floor will be dozed to the hydraulic excavator concurrent with the mining of the last pass thus minimizing dilution and/or losses at the floor of the coal;
- Parting bands will be removed by ripping with a track dozer and pushing into stockpiles prior to loading by the hydraulic excavator;
- Upon removal of each coal and parting band a dozer or grader will clean the floor to maximise coal recovery; and
- Utilising this coal mining fleet will eliminate, in most circumstances, the need for blasting of the coal. ROM coal is transported by haul trucks along internal haul roads to the ROM pad where it is directly dumped into ROM hoppers for crushing or is temporarily stockpiled and then rehandled to the ROM hoppers.

2.3.5 Processing Residues and Tailings

ROM coal is crushed and washed in the CHPP which operates at a rate of up to approximately 1,800 tph of ROM coal feed. A product coal stockpile with an approximate capacity of 500,000 t is used to stockpile product coal, prior to reclaim and loading to trains for transport off-site.

The CHPP operates up to 24 hours per day, 7 days per week and during the 2016 calendar year approximately 9.4 Mt of ROM coal was processed at the CHPP, producing approximately 6.3 Mt of product coal.

Coarse reject material and tailings produced by the CHPP require management at the Mine.

Approximately 6.79 Mt of coarse reject material will be produced over the MOP term from the washing of open cut and underground ROM coal and will primarily comprise minor quantities of coal as well as sandstone, siltstones, shales, conglomerates and mudstone (as predominantly gravel and cobble sized fragments). The coarse reject material produced from the CHPP is expected to be geochemically similar to that currently produced and will continue to be selectively handled and disposed of in waste rock emplacement areas or used as bulk fill in the covering and rehabilitation of tailings materials. The coarse coal reject material from the CHPP is hauled back to the mining operation and is dispersed throughout the mine waste rock emplacements to manage its geochemical characteristics.

Tailings Disposal Areas

Approximately 1.2 Mt of tailings will be produced over the MOP term from the washing of open cut and underground ROM coal. The tailings management procedures developed for the WCPL to address the physical characteristics of tailings generated to date will continue to be. Approximately 24.5 Mt of tailings (dry basis) are expected to be produced over the life of the Mine (WCPL, 2017).

Approximately 80-85% of the CHPP reject is in the form of coarse reject. The remainder is fine reject (tailings). The tailings are slurry with 18 to 20% solids, the solids comprising very fine stone and clay material. Tailings will be pumped as slurry to approved purpose-built tailings dams constructed within mined out voids from where supernatant waters will be recovered to the mine water management system for dust suppression or reuse in the CHPP.

Tailings from the CHPP will be directed to the Hunter Pit Tailings Dam (HPTD) until the end of 2018 ~~2017~~.

WCPL will also commence works to establish a new tailings facility in the former void of the old In-Pit in Q1 2019 ~~2018~~. Previously the Homestead Pit and In-Pit areas provided portal access to the NWU mine. Sealing the mine entries[10] in the Homestead In-Pit and In-Pit areas was completed in March 2016. Tailings will be alternated between the In-Pit and HPTD in 2019 and the In-Pit, HPTD and NETD in 2020 ~~2018~~.

Tailings produced at the CHPP primarily comprise carbonaceous shale, sands and clay materials (WCPL, 2003). The tailings are pumped as slurry to the approved[11] final void tailings facility. Once tailings disposal areas have reached capacity and allowed to consolidate, decommissioning will commence with a progressive covering of coarse rejects and/or waste rock material using a combination of encapsulation and incorporation when the surface of the tailings dam is deemed trafficable and safe.

The final capping of inert overburden material will be to a minimum depth of cover of 2m (or greater subject to final capping requirements), prior to final profiling and rehabilitation, to restrict oxygen and water ingress to the underlying tailings and prevent salts from rising to the soil surface.

[10] In accordance with *MDG6001 Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams (February, 2012).*

[11] As required by the relevant Section 100 Approval as issued under the *Coal Mines Health and Safety Act 2002.*

The engineered cover design would consider site topography, prevailing climatic conditions and the availability of suitable fine textures material (i.e. highly weathered mine water rock) as a cover material. The capping process creates a final landform that is stable and can be rehabilitated using the same rehabilitation concepts and methods as for the mine waste rock emplacements. Final rehabilitation of the tailings emplacement areas will occur when the dams have been capped and deemed stable and suitable for rehabilitation to occur.

Currently there are a number of tailing facilities in various life stages at the commencement of this MOP term, including:

- North East Tailings Dam (Decommissioned. Commencement of alternate capping method trial in ~~2018~~ 2019 until completed ~~in 2020~~ outside of the MOP term) (refer to **Section 2.3.2.7**);
- Hunter Pit Tailings Dam (Currently active but scheduled for decommissioning in ~~2018~~ 2019. Commencement of alternate capping method trial in ~~2018~~ 2020 until completed ~~in 2020~~ outside of the MOP term) (refer to **Section 2.3.2.7**); and
- In-Pit Tailings Dam (Commissioning expected in ~~2018~~ 2019 for the In-Pit subject to relevant approvals from government authorities).

Specific WCPL personnel have completed training to undertake inspection of all tailings facilities. These routine inspections are completed weekly. Other routine inspections include annual independent inspections as required by the relevant Dams Safety Committee (DSC) approval.

2.3.6 Underground Mining Operations

2.3.6.1 Underground Mining Equipment Fleet

Underground mining at WCPL during the MOP term will employ a longwall operating system. Mining equipment to be utilised during the MOP term at the SBU and the SBUE mines (within the Whybrow and Wambo Seam) will include the following:

- Construction fleet items will include cranes, low loaders, backhoes and other typical construction equipment.
- Major underground development equipment will include:
  - Up to four Joy 12CM30 5.4m single pass continuous miners;
  - up to four electric shuttle cars with 15 t payload;
  - two stamler feeder breakers to size coal produced during development;
  - four auxiliary fans (21.5 m^3/s);
  - eight Load Haul Dump (LHD) machines;
  - nine personnel transporters (PJBs or SMVs);
  - power reticulation and distribution system (11 kV/1 KV); and
  - mobile pumping stations and face dewatering system.
- Major longwall panel equipment will include:
  - longwall supports rated to 1,000 t capacity (1.75 m width);
  - AFC/BSL design of 2,000- 3,000 tph;
  - longwall shearer;
  - maingate equipment;

- monorail system for supply of services;
- hydraulic pumps and shearer water pumps; and
- longwall electrical transformers.

- The main headings conveyor will be approximately 1,200 m in length and will re-use the existing trunk conveyor from the sealed North Wambo Underground Mine and will comprise:
  - 2,500 T/Hr (Peak 3,000 T/Hr) rating;
  - 3 x 320 kW driveheads;
  - 5 m/s belt speed;
  - 1600 ply belt; and
  - PLC Control.
- The development panel conveyors will each be approximately 2,000m in length and will re-use the existing gate road conveyors at a capacity of approximately 1,500 tonnes/hr, including:
  - 2 x 600 kW driveheads;
  - 4.5 m/s belt speed;
  - 1500 ply belt; and
  - loop take up- 13 bays, 240 m belt storage.
- The main gate longwall conveyor will be approximately 2,000m in length and will comprise:
  - 1,800 – 2,200 t/hr rating;
  - 2 x 600 kW driveheads;4.5 m/s belt speed;
  - 1500 ply belt;
  - loop take up- 13 bays, 240 m belt storage;
  - 1 new tripper drives; and
  - 2 of 2 x600 kW tripper drives.

Surface conveyors will be required to transport coal from the South Bates bench on the Whybrow and Wambo seam level to the ROM pad adjacent located at previous Wollemi Underground Mine ROM pad.

Mobile surface fleet associated with the SBU and SBUE mine will include a front end loader and standard open cut haul trucks (777 or 785 dump trucks) that will be utilised occasionally from the open cut fleet to internally transport coal to the CHPP along the open cut main coal haul road.

2.3.6.2 Underground Mining Layout

The approved SBU (Wambo Seam) mine consists of three 222 - 240m longwall panels, with the panels oriented south-west to north-east. Longwall panels LW14, LW15 and LW16 will be developed off Main Headings developed off the Bates South East highwall. Longwall panels LW14, LW15 and LW16 are approximately 976 m, 1105 m and 1345 m in length. The shortened longwalls do not extend to the southern side of Stony Creek (**Plan 2**).

The SBUE mine consists of 250 m wide longwall panels, with the panels oriented south-west to north-east. During the MOP term, longwall panels LW17 to LW21 will be developed off Main Headings developed off the Bates South East highwall. Longwall panels LW17 to LW21 range from approximately 1,510 to 1,720 m in length. The shortened longwalls do not extend to the southern side of Stony Creek

(**Plan 2**). In 2018, during development of the first workings associated with the SBUE mine, WCPL identified geological structures that required the repositioning of the main headings and finishing ends of LW18 to LW20.

The SWU mine consists of longwall panels in the Woodlands Hill and Arrowfield Seams. The longwall panel widths vary between approximately 200 m and 300 m and the lengths vary from approximately 0.7 km to 3.7 km. As longwall mining of the SWU mine is not proposed to be undertaken during this MOP term, **Plan 2** will be updated to show these longwalls in the next MOP.

2.3.6.3 Underground Mining Method

WCPL primarily use Joy Mining Longwall equipment, including the longwall operating system. The longwall panels are formed by driving two sets of gateroads (the tailgate and maingate roads). Each gateroad requires two roadways (headings) to be driven parallel to each other (approximately 31 m apart). One of the roadways is used for personnel and materials access and fresh air intake ventilation while the other is used for coal clearance and return air ventilation. The roadways are developed using Joy 12CM30 continuous miners.

The headings are connected approximately every 120m by driving a cut through from one heading to another. This forms pillars of coal along the length of the gateroad. The tailgate and maingate roads are separated by the 222m-252m wide longwall panel. The maingate roads and tailgate roads are then linked together by driving an installation road and bleeder road at the inbye end of the longwall panels.

Generally roadway development height is 2.9m, while the average extraction height across the face will range from 2.2m to 2.9m depending on the seam thickness.

2.3.6.4 Underground Mining Sequence

SBU mine (Wambo Seam)

Longwall mining of LW14 commenced in July 2017 and will be completed during February 2018. Longwall mining of LW15 is scheduled to be completed in May 2018 (**Plan 3A**). Longwall mining of LW16 was completed in November 2018 (**Plan 3A**).

SBUE mine (Whybrow Seam)

Longwall mining of LW17 is scheduled to commence in ~~August~~ December 2018 and longwall extraction of these longwalls would occur throughout the term of the MOP (**Plans 3A – 3C**).

SWU mine (Woodlands Hill and Arrowfield Seams)

Longwall mining in the SWU mine is not scheduled to be undertaken in this MOP term. The next MOP will provide details on the proposed underground mining sequence in accordance with DA305-7-2003.

2.3.7 Waste Management

WCPL implements a total waste management system (TWMS). The TWMS facilitates the management and disposal of multiple waste streams, including hazardous waste, in accordance with the *Protection of the Environment Operations Act 1997* (POEO Act), *POEO (Waste) Regulation 2005* and the *POEO Amendment (Scheduled Activities and Waste) Regulation 2008*. The TWMS is managed by the Environment and Community Manager, with waste management operations being undertaken by the licensed waste management contractor. Key strategies of the TWMS include:

- Segregation of waste at the source;
- Appropriate transport, handling and disposal of hazardous waste;
- Recycling;

- Reduction in the risk of contaminating non hazardous waste;
- Waste tracking - comprehensive monthly reports detailing volumes, recycling, disposal and transportation of waste; and
- Improved data capture to increase the efficiency and accuracy when reporting.

Sewage is treated on-site at Main Administration Building and CHPP sewage treatment plants. Each sewage treatment plant is maintained by a licensed contractor. Some of the treated effluent is used for irrigation purposes around administration buildings.

Various waste materials are collected and sorted for recycling including paper, cardboard, metals, glass, air filters, oil filters, waste oil, waste grease, oil rags and hydraulic hoses by the Mine's licensed waste contractor.

In the event hydrocarbons have contaminated soil material as a result from spillages for example, the contaminated material will either removed from site by WCPL licensed waste contractor to an appropriate licensed facility for treatment or removed to WCPL's on-site bioremediation area for treatment. The treated material from the bioremediation area will be disposed of within the Mine's waste emplacement areas, only when the material has been deemed remediated.

During the MOP term, WCPL will review the hydrocarbon management procedure to ensure that contamination is prevented in the first instance and contaminated material is appropriately managed so that it is not a risk to rehabilitation.

2.3.7.1 Hazardous Materials

Hazardous reagents and explosives required for the Mine will be transported in accordance with the appropriate regulations under the NSW *Dangerous Goods (Road and Rail Transport) Act, 2008*. These regulations apply versions of the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). Explosives, including explosive precursors, will be managed in accordance with the NSW *Explosives Act, 2003* including a Security Plan developed in consultation with the explosives contractor for the Mine. All persons working with or having access to explosives will be licensed in accordance with the *Explosives Act, 2003*. Detonators and boosters are stored on-site in a purpose built compliant facility. Bulk explosives will only be mixed using a Mobile Manufacturing Unit.

Bulk ammonium nitrate (AN) and emulsion are stored on-site during the loading process and mixed using mobile manufacturing plants before being delivered down the blast holes.

Hydrocarbons used on-site for the Mine include diesel, oils, greases and degreaser. Hydrocarbon storage facilities are designed, located, constructed and operated in accordance with *AS 1940:2004* The storage and handling of flammable and combustible liquids and *NSW Work Health and Safety Act, 2011*. This will include the use of re-locatable self-bunded double skinned storage tanks.

Waste hydrocarbons will be collected, stored and removed by licensed waste transporters. All waste streams are captured by the site's TWMS. The workshop infrastructure includes waste oil extraction equipment for efficient removal of waste oil during machinery servicing. Runoff from the workshop floor and apron, refuelling pads and truck washdown area pass through a purpose built oil/water separator system which is inspected and maintained on a regular basis. Oily water from the oil/water separator is removed from site by WCPL licensed waste contractor.

WCPL operate *ChemAlert*, a comprehensive tracking, storage and chemical information management system. No chemical or hazardous material will be permitted on-site unless a copy of the appropriate Material Safety Data Sheet (MSDS) is available. All chemicals brought on-site will be recorded in a register which will identify the type of product, dangerous goods class, liquid class, hazardous chemical class and the quantity held on-site. The inventory register will also identify the compatibility of materials and the emergency response procedures in the event of a spill.

Chemical storages will be provided within the workshop and storage buildings and will be separated according to chemical type and storage requirements. Notifications, placarding and preparation of safety plans will be in accordance with the *WorkCover Guideline for Dangerous Goods*.

2.3.8 Decommissioning and Demolition Activities

Infrastructure with no ongoing beneficial use will be removed from the site at the completion of the Project. Foundation slabs of certain buildings may be retained for suitable end-use goals in agreement with the relevant authorities and stakeholders. Alternatively, they would be excavated for disposal or buried in a void in an approved manner.

Process reagents and fuels unused at the completion of mining will be returned to the supplier in accordance with relevant safety and handling procedures.

Foundation soils will be chemically tested, contour ripped and chemically ameliorated, as required and in accordance with relevant regulatory requirements. Stockpiled soils will then be applied as necessary and stabilised. Revegetation would be undertaken with suitable endemic tree species or pastures, consistent with the revegetation strategy (**Section 3.3.7**).

Roads that have no specific post-mining use will be ripped, topsoiled and revegetated. Some access roads may be retained post-mining to enable access and for use in bushfire and other land management activities.

Ventilation infrastructure, including fans and vents will be removed. A detailed plan of each ventilation shaft will be prepared and the sealing/capping procedure determined in consultation with the relevant authorities and other stakeholders. Post-mining, ventilation shafts will be backfilled and sealed in accordance with ~~DRG~~ RR requirements (currently the *Mine Design Guideline [MDG] 6001 Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams* [NSW Department of Trade and Investment, Regional Infrastructure and Services [DTIRIS] Mine Safety Operations, 2012]).

At the completion of underground mining operations all underground infrastructure (e.g. conveyors and dewatering systems) that can be recycled or reused will be removed. The various drift accesses and portals will be sealed to prevent discharge of waters from the workings as they become flooded by groundwater.

Portals will be sealed (or access restricted) in accordance with ~~DRG~~ RR requirements (*MDG 6001 Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams* [DTIRIS Mine Safety Operations, 2012]). Box cut areas will be regraded, where necessary, and revegetated using appropriate plant species.

Areas in the vicinity of the rail loop will be revegetated with native species characteristic of the Warkworth Sands Woodland (such as *Angophora floribunda* and *Banksia integrifolia*) to compensate for the removal of a small portion of Warkworth Sands Woodland.

Other decommissioning activities will generally involve capping trials of the North East Tailings Dam and consolidation of Hunter Pit Tailings Dam, once the storage capacity of the tailings dam has been reached (**Section 2.3.2.7** and **Section 2.3.5**).

2.3.9 Temporary Stabilisation

Several waste rock emplacement areas have been identified by WCPL for stabilisation works during the MOP term, commencing with a trial in 2018. The objective will be to stabilise outer batters temporally in active pit areas with a vegetative cover (e.g. by aerial seeding) to minimise erosion, but primarily to assist in the management of dust. Finalisation of the waste rock emplacement areas will be subject to further assessment of their dust risk potential during the MOP term. Other temporary stabilisation works

completed in 2016 included seeding with couch a small area of mine disturbed land adjacent to the South Bates underground haul road.

2.3.10 Progressive Rehabilitation & Completion

To minimise the area of disturbance at any one time, rehabilitation occurs progressively at the Mine of final mine landforms when they become available for revegetation. The mine waste rock emplacements behind the advancing open cut would be constructed to approximate the pre-mining topography or the final landform (**Plan 4**) approved by DA305-7-2003.

Mine waste rock emplacements would be shaped by dozer prior to the commencement of rehabilitation activities i.e. re-profiling, reapplication of topsoil/subsoil and revegetation and soil amelioration activities (**Section 3.3.6** and **Section 3.4.1**).

Rehabilitation activities during the MOP term ~~will~~ are displayed in **Table 11**. At the completion of the MOP term, a total of 144.8 ha will be rehabilitated. Progressive rehabilitation of waste rock emplacement areas within the open cut is identified in MOP **Plans 3A – 3C**.

In addition, WCPL plan to decommission the Hunter Pit Tailings Dam in ~~2018~~ 2019, under the relevant Section 101 Approval[12] for discontinued use of a tailings emplacement area. It is anticipated that rehabilitation of the Hunter Pit Tailings Dam would occur after the capping phase, during the next MOP term.

As previously discussed, capping trials for the North East Tailings Dam will continue during the MOP term. The method of capping tailings dams, prior to rehabilitation activities commencing, are detailed in **Section 5.2 ~~5.3~~**. Further details regarding the rehabilitation activities during the MOP term are provided in **Section 7** of this MOP.

Table 12 Open Cut Planned Rehabilitation

Open Cut Planned Rehabilitation	2018 Area (ha)	2019 Area (ha)	2020* Area (ha)	Summary 2018-2020 Area (ha)
RL160	~~7.7~~ 20.3	~~0~~ 24.1		~~7.7~~ 44.4
Rug Dump	~~12.9~~ 9.9	~~23.2~~ 13.0		~~36.1~~ 22.9
Barren Zone	~~16.8~~ 3.4			~~16.8~~ 3.4
RL110 Embankment	~~3.9~~ 5.6			~~3.9~~ 5.6
~~Waterfall Ramp~~	~~2.6~~			~~2.6~~
Montrose East	~~8.6~~ 15.0	~~0~~ 15.6	~~0~~ 3.6	~~8.6~~ 34.2
Montrose		~~21.1~~ 0	~~42.4~~ 61.4	~~63.5~~ 61.4
Bates South Slip Area	~~5.56~~ 4.3			~~5.56~~ 4.3
Totals	**~~58.1~~ 58.5**	**~~44.3~~ 52.8**	**~~42.4~~ 65**	**~~144.8~~ 176.3**

[12] *Work Health and Safety (Mines) Regulation 2014 [NSW] Schedule 3 High risk activities.*

2.3.11 Material Production Scheduled During MOP Term

The indicative mining schedule and sequence of open cut and underground mining operations during the MOP term is outlined in **Section 2.3.3** and **Section 2.3.4** and displayed in **Plans 3A – 3C**. An indicative material production schedule during the MOP term is provided in **Table 12**.

Table 13 Material Production Schedule during the MOP Term

Material Production Schedule during the MOP term				
Material	**Unit**	**2018**	**2019**	**2020**
Open Cut				
Stripped Topsoil	Mm^3	0.27	0.06	0.07
Rock/Overburden	Mm^3	31.59	26.49	26.59
ROM Coal	Mt	4.46	3.50	3.42
Coarse Reject Material	Mt	1.36	1.00	0.96
Tailings	Mt	0.24	0.18	0.17
Product Coal	Mt	2.86	2.32	2.00
SBU Mine (Wambo Seam)				
ROM Coal	Mt	2.30	-	-
Coarse Reject Material	Mt	0.63	-	-
Tailings	Mt	0.11	-	-
Product Coal	Mt	1.56	-	-
SBUE Mine (Whybrow Seam)				
ROM Coal	Mt	0.5	4.09	4.12
Coarse Reject Material	Mt	0.17	1.25	1.19
Tailings	Mt	0.03	0.22	0.2
Product Coal	Mt	0.33	2.7	2.7
SWU Mine (Woodlands Hill Seam)[1]				
ROM Coal	Mt	-	-	0.143
Coarse Reject Material	Mt	-	-	0.06
Tailings	Mt	-	-	0.005
Product Coal	Mt	-	-	0.064

Notes: [1] assumes SWU development commences in February 2020.

3.0 Environmental Issues Management

3.1 Environmental Risk Assessment

A Broad Brush Risk Assessment (BBRA) workshop for the MOP was undertaken in May 2014. A revision of the sites Environmental BBRA for the site was also completed in May 2016. The BBRA was conducted generally in accordance with the Australian Standard *AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines*, and the Peabody *Hazard Identification and Risk Management Standard (PEA-S&H-STD-001.3)*.

The BBRA identified a number of 'medium and low' risks13 associated with the rehabilitation and mining operations that may be encountered during the MOP term. **Table 14** provides a summary of key mining and rehabilitation risks identified in the BBRA (identified by shaded cells) and where they are addressed in the MOP.

WCPL have developed environmental management plans (EMP)[14] incorporating the necessary controls to manage environmental risks, as identified through the BBRA process.

Table 14 Key Elements from the BBRA

Key Environmental & Community Aspects Assessed	Potential Consequence and/or Hazard	Mitigation Measures addressed in MOP
Aboriginal Cultural Heritage	Damage or loss of Aboriginal Cultural Heritage	**Section 3.4.12**
Approvals	Non-compliances with operating approval conditions	**Section 1.3**
Blasting	Blasting at the mine exceeds criteria or results in a complaint	**Section 3.4.9**
Bushfire	Fire impacts new revegetation in open cut	**Section 3.4.14**
Dust/Air Quality	Mine generated dust that exceeds criteria or results in a complaint	**Section 3.4.3**
Erosion & Sediment Control	Pollution of surface water and breach of environmental protection licence (EPL)	**Section 3.3.5**
Flora & Fauna	Breach of legislation and site procedures from unauthorised clearing	**Section 3.3.7**
Green House Gases	Non-compliance with the abatement requirements in the Project Approval	**Section 3.4.7**
Hazardous Materials & Dangerous Goods	Contamination or pollution events and breach of EPL and legislation	**Section 2.3.8 & 3.4.6**
Historic (European) Heritage	Damage or destruction of European heritage sites	**Section 3.4.12**
Land & Property Management	Poor land management practices and loss of community reputation	**Section 5.0**
Reject Management	Rehabilitation and mine closure impacts as a result from spontaneous combustion and AMD.	**Sections 3.3.2 & 3.3.3**
Land Contamination	Potential land contamination risk include chemical spills, storage etc.	**Section 3.3.19**
Monitoring & Reporting	Non compliance with reporting requirements for the Project	**Section 8.0**
Noise	Mine generated noise that exceeds criteria or results in a complaint	**Section 3.4.10**
Rehabilitation & Mine Closure	Unstable landform, poor drainage and failure to meet lease relinquishment	**This document Section 1.6.1**
Spontaneous Combustion	Spontaneous combustion of carbonaceous material	**Section 3.3.2**
Mine Subsidence	Subsidence impacts compromise final land use	**Section 3.3.4 and Section 5.5**
Stakeholders	Inadequate consultation leads to negative community perception	**Section 1.5**
Topsoil	Loss of topsoil resource from poor storage, handling and maintenance	**Sections 3.3.5 & 3.3.6**
Visual Impact	Poor rehabilitation outcomes and increased mining footprint	**Section 3.4.11**
Waste Management	Inappropriate waste disposal resulting in a EPL and legislative breaches	**Section 2.3.7**
Water	Pollution to surface and groundwaters	**Section 3.4.4 & 3.4.5**

Section 9.0 outlines potential risks and consequences associated with rehabilitation activities. A Trigger Action Response Plan (TARP) has been developed to identify appropriate response measures to

13 Note that all residual risks were acceptable/as low as reasonably practicable with the implementation of appropriate controls.

14 As required by the DA305-7-2003.

manage any potential rehabilitation risk. **Table 36** illustrates how the various rehabilitation risks, management measures and responsibilities are structured to achieve compliance with the relevant statutory requirements, and the framework for management and contingency actions.

3.2 Environmental Risk Management

An Environmental Management Strategy (EMS)[15] for the existing mining operations has been prepared by WCPL. The EMS has been developed to meet corporate and statutory requirements and was prepared generally in accordance with IS0 14001. The EMS encompasses a range of management plans and monitoring programmes overseen by statutory planning provisions (Figure 5).

Further information regarding how specific environmental issues are managed in accordance with the appropriate management plan are provided further in this section. WCPL's approved management plans and monitoring programmes include, but not limited to:

- Environmental Management Strategy (EMS001);
- Environmental Monitoring Program (EMP003);
- Biodiversity Management Plan (EMP010);
- Air Quality and Greenhouse Gas Management Plan (EMP008);
- Noise Monitoring Program (EMP011);
- Blast Monitoring Program (EMP007);
- Water Management Plan incorporating the following:
  - North Wambo Creek Diversion Plan;
  - Groundwater Monitoring Program (EMP016);
  - Surface Water Monitoring Program (EMP015);
  - Erosion and Sediment Control Plan (EMP012); and
  - Surface and Groundwater Response Plan (EMP017)
- SBU Extraction Plan Longwalls 11 to 16;
- Bushfire Management Plan (EMP005);
- Heritage Management Plan (EMP510); and
- Wambo Homestead Complex Mine Management Plan (EMP002).

As required by DA305-7-2003, the EMS and all associated management plans will be reviewed for adequacy during the MOP term.

In addition, an EP will be prepared and approved prior to the commencement of any secondary extraction at SBUE. This will occur during this MOP term.

WCPL maintains an extensive environmental monitoring program whereby data is collected, analysed and maintained to establish baseline data, reporting, future examination and assessment.

On behalf of WCPL, Peabody maintains a website for all stakeholders to access recent environmental assessments, environmental management plans, environmental monitoring reports and community information using the following link: https://www.peabodyenergy.com/Operations/Australia-Mining/New-South-Wales-Mining/Wambo-Approvals,-Plans-Reports

[15] Condition 1, Schedule 6 of DA305-7-2003.

In accordance with Condition 10, Schedule 6 of DA305-7-2003, the results from the environmental monitoring program are provided on the website. In accordance with Condition 5, Schedule 6 of DA305-7-2003 annual reporting from the environmental monitoring program is also provided within the Annual Review and accessible on the website.

The Mine maintains a 24 hours a day, 7 days per week community complaints line which is directed to the Environment and Community Manager (phone: **02 6570 2245**). Community complaints can also be directed to the community email: wambocommunity@peabodyenergy.com.

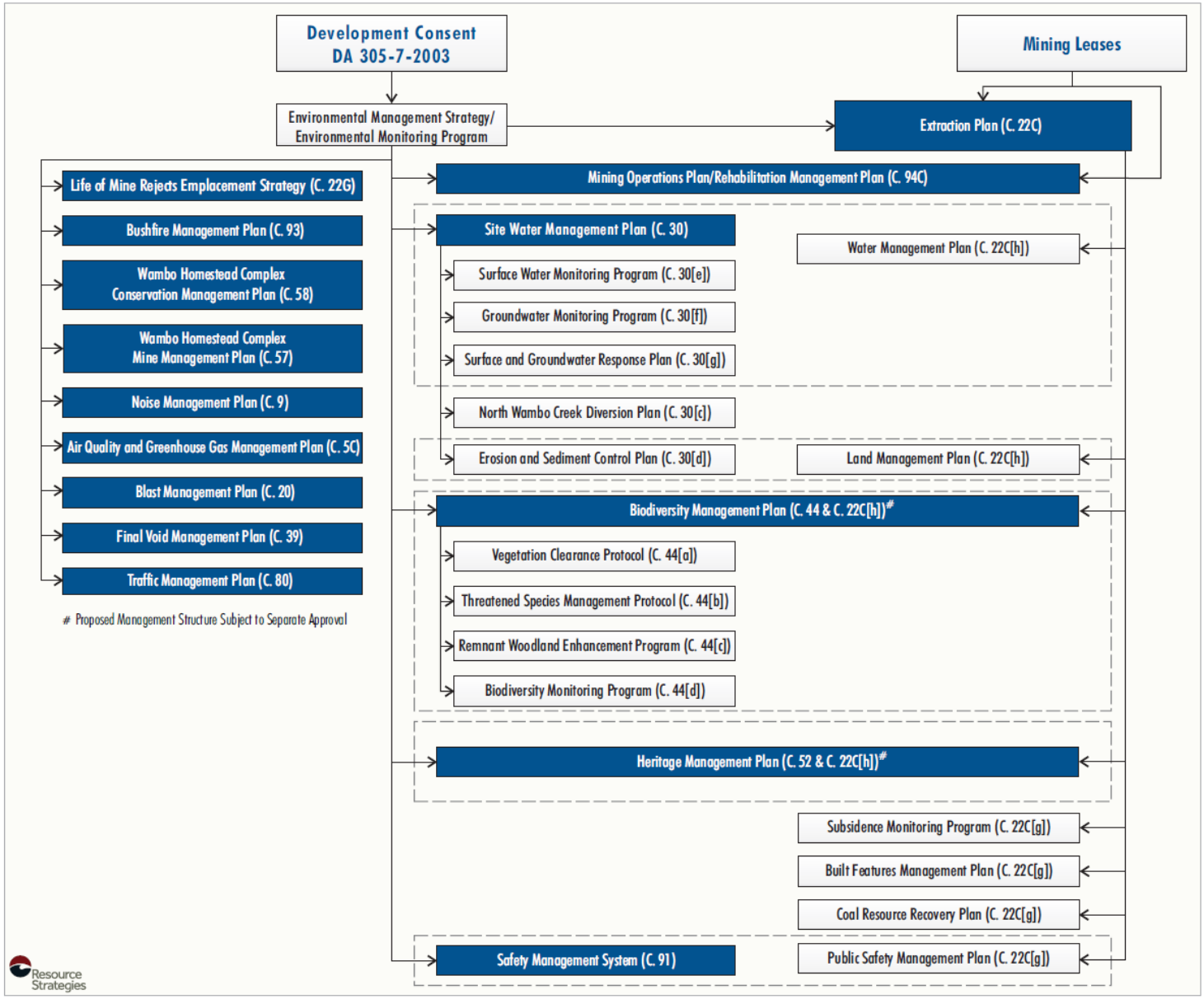
3.2.1 Pollution Incident Response Management Plan

A Pollution Incident Response Management Plan (PIRMP) has been prepared by WCPL, as holder of Environment Protection Licence No.529 (EPL 529) in accordance with Part 5.7A of the *Protection of the Environment Operations Act 1997* (POEO Act) and Part 3A of the *Protection of the Environment Operations (General) Regulation 2009* (POEO Regulation).

The PIRMP has been implemented by WCPL, including all of its employees and contractors, in the event of a pollution incident at WCPL. In particular the PIRMP provides information regarding procedures for:

- The identification of a pollution incident;
- Notification of pollution incidents in certain circumstances; and
- Responses to pollution incidents by WCPL including all of its employees and contractors.

Figure 5 Wambo Coal Mine Environmental Management System



3.3 Specific Risk Relating to Rehabilitation

3.3.1 Geology and Geochemistry

WCPL is situated within the Hunter Coalfield, a subdivision of the Sydney Basin, which forms the southern part of the Sydney-Gunnedah-Bowen Basin. The coal bearing rocks of the Sydney Basin are Permian in age (i.e. approximately 225 to 270 million years old) and are typically associated with low-lying gentle topography. The overlying rocks of Triassic age (i.e. approximately 180 to 225 million years old) cover large parts of the Sydney Basin and tend to form prominent escarpments where they outcrop.

The Whittingham Coal Measures are divided into the Jerrys Plains Subgroup, Vane Subgroup, Denman Formation and Archerfield Sandstone. The upper part of the Whittingham Coal Measures, the Jerrys Plains Subgroup, contains some 15 formally named coal seams (**Figure 3**). Seam structure is relatively simple with the seams dipping gently to the southwest at approximately 2-3 degrees. Minor local variations do occur around fault zones that are well known, having been mapped in previous open cut and underground operations. Previous longwalls and pillar extraction workings exist within the Whybrow Seam above the NWU mine.

The Open Cut operations extract coal from Whybrow[16], Redbank Creek[17], Wambo[18] and Whynot[19] Seams (**Figure 3**). The SBU mine extracted the Whybrow Seam and is currently extracting in the Wambo Seam. The SBUE mine will extract the Whybrow Seam.

The waste rock materials generated by the WCPL are typically alkaline and slightly sodic which are common geochemical characteristics of coal mine waste rock material in the Hunter Valley (Project EIS). If inappropriately managed, the sodicity of the WCPL soils and waste rock materials has the potential to impede revegetation success due to typical sodicity-related problems such as poor soil structure, surface crusting, low infiltration and increased erosion potential.

Section 2.3.4 and **2.3.5** of describes the management strategies for waste rock and tailings emplacement respectively. **Section 3.4.1** describes the general process for characterisation of the waste rock material to determine the appropriate application of ameliorants where necessary. These ameliorative measures include the use of lime, gypsum and/or fertiliser to improve the chemical and/or nutrient properties of the soil. Further management measures are provided in **Section 6.0** of this MOP. WCPL will continue to use these types of soil management strategies where appropriate to optimise the potential for achieving rehabilitation objectives and maintaining a stable, sustaining vegetation cover.

[16] The Whybrow Seam is part of the Mount Leonard Formation (the uppermost unit of the Jerrys Plains Subgroup) and consists of piles A, B and C.

[17] The Redbank Creek Seam is part of the Malabr Formation (the uppermost unit of the Jerrys Plains Subgroup) sequence consists of four plies A, B, C and D.

[18] The Wambo Seam is part of the Malabr Formation (the uppermost unit of the Jerrys Plains Subgroup) and is mined as a single seam.

[19] The Whynot Seam is part of the Malabr Formation (the uppermost unit of the Jerrys Plains Subgroup) and is mined as a single seam.

3.3.2 Material Prone to Spontaneous Combustion

Spontaneous combustion is oxidation at exposed coal surfaces which occurs at or near ambient temperature producing heat energy. No major incidents of spontaneous combustion within rehabilitation areas have been reported at WCPL during the past 30 years of operation, even though laboratory testing results indicate a moderated to high propensity for spontaneous combustion. Minor spontaneous combustion events at WCPL have historically been rare and associated with heating events in long term coal stockpiles.

Therefore the risk to rehabilitation, as a direct result of possibly spontaneous combustion events, is considered low at WCPL. However, routine inspections for indicators of spontaneous combustion in the Open Cut will continue to be conducted by Production Supervisors and Open Cut Examiners (OCE) during the MOP term. Inspections for indicators of spontaneous combustion will also be carried out during each monthly environmental inspection undertaken by WCPL Environmental Department.

With respect to rehabilitation, material that has the potential to have spontaneous combustion risks will not be used in rehabilitation works. This material, if identified, will be covered to a depth of at least 5m below the final landform RL using inert waste rock material.

Likewise, reject emplacements integrated into the landform being reshaped will be covered to a depth of at least 2m below the final landform RL using inert waste rock material.

3.3.3 Material Prone to Acid Mine Drainage

Waste rock samples were taken from exploration drill holes within the Project open cut area and were assessed for acid mine drainage (AMD) potential and element leaching (2003 EIS). Results of the testwork undertaken classified the waste rock samples as non-acid forming (NAF) and unlikely to generate environmentally harmful leachate when exposed to surface oxidation processes. These results are consistent with the observed behaviour of waste rock at the Mine i.e. acidity has not historically been a problem with the Mine waste rock material. The pH of the tested overburden material and interburden materials range from pH 6.8 to pH 9.6, which is typical of unweathered rocks in the Singleton Coal Measures (EIS 2003). Therefore the risk to rehabilitation, as a direct result of possibly AMD events, is considered low at the Mine.

Coal reject samples (coarse reject and tailings) taken from the CHPP were classified as indeterminate (IND) and potentially acid forming (PAF), respectively. However, AMD has not been identified at the Mine and is not expected to occur during the life of the Mine provided appropriate CHPP reject management practices are implemented, whereby tailings are incorporated and encapsulated and/or capped with bulk non-acid forming (NAF) waste rock (**Section 2.3.5**).

Characterisation of soil and waste rock material during the mine planning phase will be undertaken. With respect to rehabilitation, overburden material exhibiting hostile characteristics (acidity, excessive alkalinity, sodicity, etc.) will be identified and isolated from vegetation root zones and areas of potentially high surface runoff (i.e. will not be used in the final 2m of material in the final landform).

WCPL routinely monitors surface water quality, groundwater quality and rehabilitation aspects as required by SWMP and GWMP to monitor the water levels, electrical conductivity (EC) and pH in site water storages. Historical surface water monitoring of sediment dams around the CHPP, coal stockpile areas and other mine water dams typically return a pH range between pH 8 and pH 9.

3.3.4 Mine Subsidence

The overriding objective for subsidence management is to minimise the potential for, or extent of, the predicted subsidence impacts. The key issues relating to subsidence impacts on rehabilitation, surface water and groundwater resources, land resources and agricultural activities, biodiversity, built features, heritage sites and values and public safety are described in detail in the relevant Extraction Plan (EP). The EP also details relevant monitoring and management measures that will be undertaken relevant to each identified impact.

As required by the EP, remediation will be conducted of subsidence impacts or environmental consequences detected by subsidence monitoring, where required in consideration of the potential impacts of the unmitigated impact (including potential risks to safety and the potential for self-healing or long-term degradation) and the potential impacts of the remediation.

A number of potential management measures are available to mitigate/remediate subsidence impacts on land in general resulting from underground mining operations. The requirement and methodology for any subsidence remediation techniques will be determined in consideration of:

- Potential impacts of the unmitigated impact, including potential risks to public safety and the potential for self-healing or long-term degradation; and
- Potential impacts of the remediation technique, including site accessibility.

Minor cracks that develop are not expected to require remediation as geomorphologic processes will result in natural filling of these cracks over time.

Remediation of typical surface cracks (generally in the order of 25mm to 50mm, but up to approximately 150mm) will use conventional earthmoving equipment (e.g. a backhoe) and will include:

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

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

If surface crack remediation works are required in remnant vegetation areas, compact mobile equipment will be utilised, where practicable, to minimise damage to surrounding vegetation. If the remediation work requires clearing of remnant vegetation to an extent that would exceed the benefit of the remediation, the requirement for remediation will be reviewed. Vegetation that requires clearance will be subject to the VCP.

The need for further remediation works will be assessed against the completion criteria outlined in **Section 6.0**, and in accordance with the TARP (Ref # 14) outlined in **Section 9.0**.

Contingency plans will be implemented where a potential exceedance of a subsidence impact performance measure or an unexpected impact is detected including consideration of identified potential contingency measures.

In accordance with the relevant EP, if subsidence impacts from either the SBU mine or SBUE mine result in greater than predicted impacts, exceedance of the performance criteria or requires greater than expected remediation activities as described in relevant EP, WCPL will notify and consult with the ~~DRG~~ RR.

If required, a revision of this this MOP will be undertaken to ensure rehabilitation activities are consistent with the revised subsidence predictions and mitigation measures outlined in the EP.

3.3.4.1 Subsidence on Steeper Slopes and NWC Diversion

All longwall panels associated with the SBU mine and SBUE mine are offset a minimum of 26.5° from the base of the Wollemi National Park escarpment. Subsidence monitoring to date of the SBU Mine has determined no significant deviations from subsidence modelling predictions.

Potential impacts and the relevant mitigation and management measures on steep slopes in the Wollemi National Park escarpment resulting from the proposed extraction of longwalls, associated with the SBU mine, is provided in *Extraction Plan - South Bates (Whybrow Seam) Underground Mine Longwalls 11 to 16*.

Potential impacts and the relevant mitigation and management measures on steep slopes in the Wollemi National Park escarpment resulting from the proposed extraction of longwalls, associated with the SBUE mine, is provided in *Extraction Plan - South Bates (Whybrow Seam) Underground Mine Longwalls 17 to 20*.

The remediation measures and implementation of additional measures if required, regarding subsidence impacts on sections of the North Wambo Creek Diversion, are outlined in the approved *Extraction Plan - South Bates Underground Mine Longwalls 11 to 16* and *Extraction Plan - South Bates (Whybrow Seam) Underground Mine Longwalls 17 to 20.* All subsidence remediation measures to be undertaken by WCPL, in regards to the North Wambo Creek Diversion, will be in consultation with the ~~DRG~~ RR.

3.3.4.2 Historical Subsidence

As described in **Section 2.3.2**, WCPL has commenced subsidence repairs to an adjacent landholder's property in 2015 (**Plan 2**). The subsidence was a result of underground mining activities associated with the former Homestead underground workings. The nature of the works primarily involves filling in pot holes and surface cracks, soil amelioration and reseeding with pasture species of these areas.

More recent subsidence events have been associated with the NWU mine on WCPL owned land. Subsidence monitoring has identified surface cracking in the predicted range of 20mm to 100mm wide, however surface cracking within the predicted range 150mm to 200mm has been identified on LW8a. In general, as the depth of cover decreases to the north, subsidence cracking widths tend to increase.

Remedial actions to date of subsidence impacts from the NWU mine have included repairs to internal roads i.e. filling in cracks to reduce safety risks. WCPL will also be recommissioning South Dam in consultation with the DSC (before water is returned to the dam) during the MOP term.

WCPL are developing a subsidence remediation program to address a number of subsidence impacts (mainly surface cracking) within areas of existing pasture (Domain C) utilised for grazing and previously rehabilitated areas in the open cut (Domain 6). The results of the subsidence remediation activities will be provided in the Annual Review.

3.3.4.3 Subsidence Management and Extraction Plans

A subsidence impact assessment was undertaken by G.E. Holt and Associates (2003) for the Project EIS. Following the modification of Development Consent (DA 305-7-2003), G.E. Holt and Associates re-assessed the potential subsidence impacts of the re-orientation of the longwall panels in the NWU mine as part of the Wambo Development Project Wambo Seam Underground Mine Modification (2005 SEE). Further subsidence impact assessments have been completed including:

- Ditton Geotechnical Services (2012) NWU Mine Subsidence Assessment for LW 7 and 8;
- MSEC (January 2014) NWU Mine Subsidence Assessment for LW7 to 10;
- MSEC (August 2014) NWU Mine Subsidence Assessment for LW10a;
- MSEC (July 2015) SBU MOD15 and EP LW11 to LW13; and

- MSEC (December 2016) Extraction Plan for WYLW11 to WYLW13 in the Whybrow Seam and WMLW14 to WMLW16 in the Wambo Seam.
- MSEC (January 2017) South Bates Extension Modification Subsidence Assessment.
- MSEC (April 2018) Extraction Plan for WYLW17 to WYLW20 in the Whybrow Seam.

The various EP approvals are summarised below, and include:

- ***NWU SMP LW1 to 6***

  The NWU previously operated under an approved Subsidence Management Plan (SMP) for LW1 - 6. The SMP for First Workings was approved in October 2005 with mining commencing in November 2005. The SMP for Second Workings was lodged in March 2006 and was approved on the 11 December 2006. This SMP covered underground mining activities until 1/11/2013 which includes longwall panels 1 through to 6 (LW 1- 6).

- ***NWU EP LW7 to LW10a***

  The approved NWU EP for LW7 to LW10 was revised to include the approved LW10a. The revised EP for LW7 to LW10a was approved on the 24 June 2015;

- ***SBU – EP LW11 to 13***

  The EP for LW11 to LW13 for the SBU mine in the Whybrow Seam was approved by the DP&E on the 9 February 2016; and

- ***SBU – EP LW11 to 16***

  The EP for South Bates SBLW13 to SBLW16 (*Extraction Plan - South Bates Underground Mine Longwalls 11 to 16)* was conditionally approved by the DP&E on the 16 May 2017. The approval considered the reduced lengths of LW13 to LW16 would result in similar or less subsidence related impacts to those approved as part of the approved layout and therefore can be generally in accordance with the Development Consent DA305-7-2003 as modified.

- ***SBUE – EP LW17 to 20***

  An EP for LW17 to LW20 within the Whybrow Seam at the SBUE mine (*Extraction Plan – South Bates Underground Extension Mine Longwalls 17 to 20*) was prepared and submitted to DP&E on 27 April 2018. Subsequent to the submission of the EP for LW17 to LW20, WCPL identified geological structures that required changes to the main headings and the finishing ends of LW18, LW19 and LW20. On 7 September 2018, the DP&E approved the EP for LW17 to LW20 for the extraction of Longwall 17 only. An updated EP for LW18 to LW20 will be prepared and submitted to the DP&E for approval during the MOP term.

3.3.4.4 Subsidence Monitoring and Remediation Program

Details of subsidence impacts observed is GPS and photographically recorded in the Subsidence Impact Register, maintained by the WCPL's Chief Surveyor. Visual inspections will be undertaken in accordance with inspection checklists as provided in the relevant Extraction Plan.

Suitably experienced consultants conduct biannual subsidence monitoring of the WCPL subsidence areas. These inspections identify subsidence impacts and record subsidence location, length, width, depth, fill required, recommendations and risk ranking. Subsidence locations are also photographed to monitor visual changes. This monitoring forms the bases of subsidence remediation and repair work.

On an annual basis, Wambo will prepare a subsidence remediation action plan to remediate areas of subsidence that require action based on recommendations of the biannual monitoring. Areas will be prioritised based on the risk ranking. Visual monitoring of remediated subsidence areas will be

conducted monthly to identify any requirement for maintenance measures and/or remedial works (**Section 8.2**).

The 2018 biannual monitoring identified 46 new subsidence locations for remediation. A number of these will be remediated in 2019 once the South Bates Underground longwalls have been completed. Significant creek remediation works scheduled for the NWCD in 2019 will incorporate subsidence remediation works. Subsidence repairs required in RWEP areas will be conducted in consultation with OEH to ensure compliance with the current conservation agreement.

In 2019, WCPL will commission an audit to document historical subsidence impacts and add areas requiring further monitoring or remediation to the subsidence remediation action plan.

Any installed sediment control structures around subsidence remediation will be inspected on a monthly basis, or following rainfall events of equal to or greater than 20 mm/day (midnight to midnight) as recorded by the Wambo Meteorological Station. The sediment control structures will be inspected for capacity, structural integrity and effectiveness.

Subsidence monitoring and remediation undertaken each year will be reported in the WCPL Annual Review.

Throughout 2018 a Subsidence Remediation Plan was developed for a neighbouring property 'Kharlibe'. This plan was developed in consultation with the landowner and Resource Regulator. A copy of the document has been included in Appendix 4 and outlines the rehabilitation locations and methods used to repair subsidence and achieve the final land use.

3.3.5 Erosion & Sediment Control

An Erosion and Sediment Control Plan (ESCP) has been developed to satisfy Condition 32, Schedule 4 of the Development Consent (DA 305-7-2003) and details erosion and sediment control methods. The control measures described in the ESCP aim to:

- Minimise soil erosion and sediment generation in areas disturbed during the development; and
- Minimise the potential for mining activities to adversely affect the water quality of the Wollombi Brook or the Hunter River.

The ESCP includes:

- Identification of activities that have the potential to cause soil erosion and sediment generation;
- A description of the location and capacity of erosion and sediment control structures;
- A description of measures to minimise soil erosion and the potential for the migration of sediments to downstream waters; and
- A program to monitor the effectiveness of control measures.

The ESCP will be reviewed as required by DA305-7-2003 and in consultation with the relevant authorities and updated where necessary. The following control measures as identified in the ESCP for land disturbance, land rehabilitation, topsoil management and monitoring include:

- **Subsidence Management**

  Regular monitoring for surface cracking and ponding sites are carried out in accordance with the relevant EP. Should surface cracking and/or ponding sites be identified as presenting an immediate safety, environmental hazard (e.g. an erosion hazard) or risk to final land use, the area will be repaired and rehabilitated as identified in **Section 3.3.4.** As required by the ESCP, appropriate sediment controls must be in place during these repair works until the area is considered suitably stable.

- **Land Disturbance**

  Land disturbance will be minimised and limited to those areas outlined in this MOP. Prior to any disturbance of land, an SPD must be completed by the operational manager (or delegate), in consultation with the Environmental Department. The SDP process identifies potential erosion and sediment risks associated with proposed disturbance projects, and requires appropriate erosion and sediment control measures to be implemented prior to disturbance commencing.

- **Land Rehabilitation**

  Progressive rehabilitation is a key element for erosion and sediment control. Mining disturbed land (with altered topography, surface conditions and increased catchment sizes) represents a high potential for erosion and sediment impacts. The potential for erosion and sedimentation impacts decreases substantially as disturbed land is reshaped and revegetated as part of the land rehabilitation process. In order to minimise erosion and sedimentation impacts until the rehabilitated area is suitably stable, sediment control structures (such as contour drains, drop structures and sediment control ponds) will be designed and constructed. For further details refer to the ESCP.

- **Topsoil Management**

  Topsoil will be stripped and handled in accordance with the requirements of the SDP and Topsoil Stripping Permit. Erosion and sediment control measures, as identified in the completed SDP, will be implemented prior to topsoil removal. Once topsoil is stripped, it will either be placed directly onto shaped overburden (where possible) and seeded or will be stockpiled for later use. If stockpiling is required, stockpiles will be managed as outlined in **Section 3.3.6** and **Table 16**.

- **Inspections and Monitoring**

  Sediment control structures and tailings dams will be inspected on a frequency as specified in the ESCP. The sediment control structures and tailings dams will be inspected for capacity and visual integrity by the Environmental Department (or delegate).

3.3.6 Soil Types & Suitability

Soil landscapes of the Project were classified and mapped in accordance with descriptions in the Soil Landscapes of the Singleton 1:250,000 Sheet (Kovac and Lawrie, 1991) and the Project EIS. Major soil types identified include alluvial soils along major drainage lines, siliceous sands to the east of Wollombi Brook, yellow podzolics and yellow solodic intergrades adjacent to the alluvials on lower slopes and undulating plains, soloths on moderately elevated slopes and lithosols along the eastern boundary of the Wollemi National Park.

Due to the known variability and distribution of the soils at the Mine, the concept of soil complex units is used to identify the soil types, and provide guidance on appropriate stripping depth. The different soil complex units found at Wambo, as identified in the EIS (WCPL, 2003), include:

- Red Podzolic – found on the ridges and middle to upper slope position of the site. The upper 0.10 m of the profile of each soil type is suitable for use as topsoil.
- Yellow Podzolic / Solodic – found on the mid to lower slopes of the hills within the site. The upper 0.20 m of the profile of each soil type is suitable for topsoil.
- Lithosols – Stony or gravely soils generally occurring on upper slope and hill top areas. No depth of the profile is suitable for topsoil.
- Alluvials – found around North Wambo Creek. Suitability for topsoil recovery highly variable from 0.30 m, to limited areas of 1.0 m.

A rural land capability assessment was conducted in accordance with the standard NSW eight class system (Cunningham *et al.*, undated) which assesses biophysical soil properties and categorises land according to limitations such as erosion hazard, climate and slope. Seven of the eight classes were identified in the vicinity of the WCPL. **Table 15** lists the pre mining land classification within the proposed disturbance area of the open cut.

Table 15 Pre-Mining Land Classification for the Disturbed Area

Land Capability Classes	Definition	Areas (ha)
Class IV	*Land not capable of being regularly cultivated but suitable for grazing with occasional cultivation with soil conservation practices such as pasture improvement, stock control, application of fertiliser and minimal cultivation for the establishment or re-establishment of permanent pasture.*	**428**
Class V	*Land not capable of being regularly cultivated but suitable for grazing with occasional cultivation and structural soil conservation works such as absorption banks, diversion banks and contour ripping, together with the practices in Class IV*	**733**
Class VI	*Land not capable of being regularly cultivated but suitable for grazing with soil conservation practices such as limitation of stock, broadcasting of seed and fertiliser, prevention of fire and destruction of vermin.*	**84**
Class VII	*Land best protected by green timber*	**14**
	TOTAL	**1259**

Table 16 provides a summary of the soil resource strategies undertaken by the Mine. In areas of significant earthworks, topsoil and subsoil resources will be identified, stripped and, wherever practicable, spread directly onto areas prepared for rehabilitation to make use of the potential seed bank.

Table 16 Soil Resource Management Strategies

Prior to Soil Stripping	During Soil Stripping and Stockpiling	Stockpiled Soil Awaiting use in Rehabilitation Works
• Quantification of soil resources. • Characterisation of the suitability of soil resources for rehabilitation works. • Topsoil will be stripped prior to any land disturbance. • Recommended stripping depths[1] as provided by the soil survey in the WCPL EIS: – Red Podzolic (100mm) – Yellow Podzolic (200mm) – Alluvial (300mm) • Topsoil will be placed directly onto reshaped areas where possible. **Note:**[1] Subject to quantification of soils	• Minimisation of vegetation clearance. • Mulching of vegetation prior to topsoil stripping, where possible, to provide additional organic matter. • Selective stockpiling of soil according to soil type and chemical characteristics. • Stockpiling of soils in a manner that does not compromise the long-term viability of the soil resource. • Maximum height for stockpiles will be 3 m.	• Implementation of measures to ensure long-term viability of soil resources and manage soil salinity, including: – Soil stockpiles to be located outside of active mining areas; – Stockpiles to be constructed with a rough surface to reduce erosion hazard, improve drainage and promote vegetation; – Stockpiles which are to be inactive for extended periods to be fertilised and seeded with cover crop and/or preferred native pasture species (**Table 17**) mix to maintain soil structure, organic matter, and microbial activity; – Silt fencing to be installed around soil stockpiles to control potential loss of soil where necessary; and – Soil stockpiles to be deep ripped to establish aerobic conditions, prior to re-application for rehabilitation. – Annual (or as required) weed control and maintenance program of topsoil stockpiles. – Sign posted to clearly identify topsoil stockpile areas.

Prior to soil stripping, soil resources will be quantified. Where a deficit of topsoil is identified, investigations will be undertaken to determine the viability of the use of subsoils and to identify the need for treatment measures (e.g. use of fertilisers) applied where there is a deficit of topsoil. Where direct spreading is not practicable, the stripped soil will be stockpiled and seeded with grasses, as outlined below to maintain soil viability prior to being re-spread.

Spoil areas reshaped following mining to construct a post mining landform will contain appropriate drainage works prior to the topsoil application. The area will then be ripped and seeded using direct seeding techniques. Waste rock/soil characterisation will assist in determining appropriate ameliorates in rehabilitation where necessary (e.g. the use of lime, gypsum and/or fertiliser to improve the chemical and/or nutrient properties of the soil).

Topsoil Stripping and Handling

During topsoil stripping operations, direct placement of excavated topsoil onto re-shaped areas is preferred to stockpiling, to avoid rehandling and reduce the potential for topsoil degradation or loss. If a re-shaped surface is not available, the topsoil will be stockpiled.

The following management measures shall be observed during topsoil stripping and handling:

- Stripping depths and limits (including areas of no recovery), as pegged or taped, are to be adhered to during stripping operations;
- Topsoil stripping must be adequately supervised by a member of the Environmental Department (or delegate), with operations being checked to ensure continued suitability of stripping methods and topsoil management;
- Topsoil stripping should be limited to daylight hours where possible;
- Stripping operators shall be experienced in topsoil work, or otherwise be closely supervised, to ensure topsoil stripping depths are adhered to;
- Care is to be taken during topsoil stripping to avoid structural degradation of soils – taking particular care to avoid excessive compaction (i.e. avoiding re-handling and limit stripping activities in wet conditions);
- Potential generation of dust will be considered in planning of topsoil stripping, with weather conditions, water truck availability, potential downtime and alternate standby tasks being key planning considerations;
- Preferably, soils should be stripped in a slightly moist condition and should not be stripped in either a dry or wet condition, thus reducing deterioration in topsoil quality and dust generation;
- Grading or pushing topsoil into windrows with graders or dozers for later collection for loading into rear dump trucks by front-end loaders, is the preferred soil stripping method, as it minimises compression effects of the heavy equipment generally used transport of soil material; and
- Work must be stopped if any aboriginal heritage artefacts, or other items of archaeological interest are uncovered during stripping activities. Any such items will be inspected and cleared by a member of the Environment & Community Department before stripping activities continue.

Topsoil Stockpile Management

Where direct placement of topsoil is not possible, the period of stockpiling should be minimised to reduce the detrimental effects of storage on topsoil quality, especially topsoil structure, aeration and permeability, native seed bank viability, and biological activity levels in material stockpiled greater than one metre deep. Where topsoil is likely to exceed three months, the following measures should be followed.

Location of Topsoil Stockpiles

- Topsoil stockpiles should not be located in the path of planned, or potential, projects or operations. A long-term perspective should be adopted during this planning (preferably life-of-mine) and organisation-wide consultation should be undertaken during this process. Rehandling of topsoil is expensive and detrimental to topsoil quality.
- The planned final rehabilitation location for the topsoil should be considered when locating the stockpile (i.e. where it is to be used for rehabilitation). Haulage requirements (distance and volume) to get it to the stockpile location and how it will be recovered from that stockpiled location and transported to that final destination should also be considered.
- Stockpiles should:
    - Not be placed on excessively steep landform, that will increase erosion and potentially hamper recovery;
    - Not be placed adjacent to, or amongst, existing woodland vegetation, that will potentially cause topsoil loss or damage to remnant vegetation;
    - Be located away edges of dumps, ramps, dams, drains and pits, where future recovery may be constrained, increasing cost or planning complexity;
    - Be shaped to reduce their susceptibility to wind erosion, especially if placed on top of overburden dumps;
    - Not be located in, across or adjacent to watercourses or drainage lines with potential to flow; and
    - Not be located on flat and/or low-lying areas susceptible to flooding.

Stockpile Construction

- If soil is to be stored in stockpile for more than three months, the proposed stockpile pad should be cleared of large surface rocks, vegetation and isolated from local drainage;
- Materials of different quality, source location or vegetation type should not be stockpiled together (i.e. subsoil with topsoil, exotic pasture with native woodland), and should be clearly distinguished if co-located in same vicinity;
- Preferably, topsoil stockpiles shall be no greater than three metres in height;
- Topsoil will be block tipped. Under no circumstances will topsoil be tipped over a tip head or a second lift of block tip be used;
- Stockpiles should be trimmed and graded to ensure they shed water, to avoid pooling or waterlogging;
- Stockpile surfaces should be left coarsely textured to minimise erosion until vegetation is established, and avoid surface compaction and surface sealing;
- The working face of the stockpile should be battered down to approximately 30^{o};
- Every effort will be made to avoid equipment trafficking over topsoil. Stockpiles should be isolated from adjacent operations and accidental vehicle access (by berm, ditch, substantial fence, bollards, old electricity poles, etc.), and clearly identified by a sign to reduce the likelihood of interference;

- Following construction, stockpiles will be surveyed and recorded on mine plans. This information will be recorded on the topsoil stockpile register, along with other relevant data pertaining to each stockpile.

Guidance on Temporary Rehabilitation

- If long-term stockpiling is planned (i.e. greater than three months), stockpiles should be ripped, fertilized and sown with pasture cover (**Table 18**) to provide sufficient erosion control, weed suppression and promote biological activity in the stockpiled soil; and
- Sterile cover crop species should be selected in consideration of secondary pasture/woodland species.

Maintenance of Existing Stockpiles

- Vegetation establishment should be regularly monitored for the first three months (or until a cover crop has successfully established), with remedial works undertaken immediately, as required, until vegetation establishment;
- On an annual basis, the stockpiles will be inspected for erosion, vegetation cover health, weed infestation and other general degradation or interference;
- Maintenance and remedial works will be scheduled, as needed. Such maintenance or remedial works may include:
    - Repair of erosion (i.e. re-grading of eroded areas), diversion of drainage paths and de-silting of sediment control structures;
    - Slashing, re-seeding or supplementary planting;
    - Application of fertiliser to address nutrient deficiency;
    - Application of ameliorants;
    - Replacing signage and access barriers; and
    - Weed and pest animal control measures.
- If stockpiles are borrowed from, but not completely removed, the excavated face will need to be re-shaped to ensure water shedding and stockpile stability, and re-sewn with a protective cover crop. Those stockpiles will also need to be ear-marked for re-survey as part of the annual topsoil survey; and
- For long-term stockpiles, a weed control and maintenance fertilising is required as part of the stockpile management program.

Stockpile Management

- All records pertaining to the assessment, inspection, management and maintenance of stockpiles will be recorded on the topsoil stockpile register;
- At the beginning of each planning/reporting year, topsoil requirements should be estimated for rehabilitation programs in the upcoming year, and adequate stockpiled topsoil allocated to meet that requirement;
- Considerations for selection of appropriate material include proximity of stockpiles to rehabilitation area, age and quality of topsoil, topsoil source vegetation type compared to selected rehabilitation outcomes, and direct placement opportunities;

- If the stockpiled topsoil is old (greater than five years) an assessment of topsoil quality should be undertaken. Such an assessment should include visual inspection, soil sampling and analytical testing to determine whether the material is still usable, or whether application of supplements and/ or ameliorants may be required; and
- Sufficient evidence of a stockpile's complete loss of inherent value would need to be recorded, and approved by the Environment and Community Manager, before a stockpile was entirely written off and spoiled or abandoned.

Topsoil Placement and Treatment

- Prior to recovery and re-spreading of stockpiled topsoil, an assessment of weed infestation on stockpiles should be undertaken to determine if individual stockpiles require herbicide application and / or "scalping" of weed species prior to topsoil spreading.
- A pre-rehabilitation topsoil stockpile inspection and testing program to characterise stockpiled material, identify suitability for the proposed rehabilitation and identify any requirement for soil ameliorants.
- Topsoil should be spread to the depth nominated.
- Preferably, topsoil should be spread, treated with fertiliser and seeded in one consecutive operation, to reduce the potential for topsoil loss to wind and water erosion.
- All topsoiled areas should be contour ripped (after topsoil spreading) to create a "key" between the soil and the spoil. Ripping should be undertaken on the contour. Best results will be obtained by ripping when soil is moist and when undertaken immediately prior to sowing.
- The respread topsoil surface should be scarified prior to, or during seeding, to reduce runoff and increase infiltration. This can be undertaken by contour tilling with a fine-tyned plough or disc harrow for example.

Ameliorant Application

- If the pre-rehabilitation assessment determines the stockpiled material is sodic, gypsum should be applied at a standard rate of 5 - 10 t/ha, depending on material sodicity.
- Preferably gypsum should be mixed in with the topsoil as part of the stripping operation (ameliorants applied to topsoil surface prior to stripping), irrespective of whether the topsoil is to be placed in storage or directly applied to a rehabilitation area.
- Application of ameliorants as part of the topsoil stripping process is cost effective, and – in the case of gypsum in particular - gives the ameliorants additional time to react and modify the soil to ensure it is a stable growing medium.
- Although low pH soil has not historically been a concern, a lime requirement test should be undertaken to determine the lime application rate, if low pH material is identified during the pre-rehabilitation assessment.
- Addition of organic supplements is recommended for high and low pH, sodic (dispersive) and low fertility soils. Such supplements can also assist in returning favourable soil microorganisms to sterile long-stockpiled material.
- Organic material application will also be considered, if sub-optimal (sterile, low fertility, poorly structured) material is identified in stockpiles.

3.3.7 Biodiversity

The management of flora and fauna, including the implementation of a vegetation clearance protocol, threatened species management protocol, RWEP and flora and fauna monitoring programme is described in the BMP.

A flora survey and assessment was conducted by Orchid Research in spring and summer 2002 for the Project EIS. Areas of remnant vegetation were systematically surveyed using quadrats and spot sampling sites to compile a comprehensive species list and to detect threatened species which may have been present. The BMP provides a summary of the 16 vegetation communities recognised in the study area.

No threatened flora species or endangered[20] populations listed in the schedules of the NSW *Threatened Species Conservation Act, 1995* (TSC Act) and/or Commonwealth *Environment Protection and Biodiversity Conservation Act*, *1999* (EPBC Act) were recorded at WCPL by Orchid Research in 2003. At the time of the Project EIS, two Endangered Ecological Communities were identified, namely, the Warkworth Sands Woodland Endangered Ecological Community (listed in the TSC Act) and the White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodlands Endangered Ecological Community (listed in both the TSC Act and EPBC Act).

Avifauna, mammals, reptiles and amphibians were surveyed in September and October 2002 as part of the Project EIS terrestrial fauna assessment. Bat fauna were surveyed separately in September 2002. A number of reference sources containing the results of regional fauna surveys and database records (e.g. NPWS Atlas of NSW Wildlife, Birds Australia, Australian Museum and Hunter Bird Observers Club) were also reviewed and, where appropriate, included in these assessments. The fauna surveys recorded a relatively large number of woodland birds and birds associated with waterbodies. Threatened fauna species recorded in the vicinity of WCPL are summarised in the FFMP and include eight birds and five mammals.

Aquatic macroinvertebrate, fish and water quality sampling was conducted for the Project EIS. North Wambo, Wambo and Stony Creeks are intermittent streams which cease to flow in extended dry periods. These creeks have been highly disturbed by historic and present day grazing activities. In some locations on Wambo and Stony Creeks, earthworks have been conducted to re-contour the stream channel and banks to remediate subsidence effects from past underground mining activities.

North Wambo and Wambo Creeks are considered to represent minimal fish habitat. Two native and one introduced fish species were recorded from North Wambo Creek, and three native and one introduced species recorded from Wambo Creek. A summary of specific flora and fauna management measures undertaken by WCPL, as outlined in the existing BMP, for the management of flora and fauna are provided below.

3.3.7.1 Vegetation Clearance Protocol

A Vegetation Clearance Protocol (VCP) has been developed to minimise impacts on both non-threatened and threatened flora and fauna (as listed under the TSC Act or the EPBC Act). The VCP is applicable across all WCPL managed land. The key components of the VCP are:

- Pre-clearance surveys;
- Fauna management strategies;
- Seed Collection;

[20] In 2003, the flora and fauna assessment for the expansion of Wambo mine identified the vegetation community adjacent to North Wambo Creek as *Acacia anuera*. During 2004, an inspection of the vegetation community above LW4 was undertaken by and Acacia expert who concluded that this stand was most likely *A. pendula*. WCPL have developed and implemented the *A. pendula Management Plan for* LW4.

- Vegetation Clearance; and
- Salvage and re-use of materials.

Procedures in relation to the salvage of Aboriginal sites prior to vegetation clearance are detailed in the HMP. An updated VCP, which meets the requirements of DA305-7-2003 and DA177-8-2004, is included as Appendix J of the BMP.

3.3.7.2 Threatened Species Management Protocol (TSMP)

A Threatened Species Management Protocol (TSMP) has been developed to facilitate implementation of threatened species management strategies to minimise the potential impacts on threatened flora and fauna species. The key components of the TSMP are:

- Site observations/surveys;
- Threatened species management strategies;
- RWEP area restrictions;
- Threat abatement;
- Capture and release;
- Relocation; and
- Provision of habitat resources.

An updated TSMP, which meets the requirements of DA305-7-2003 and DA177-8-2004, is included as Appendix K of the BMP.

3.3.7.3 Seed Collection

Seed collection will be on-going over the life of the Mine the timing of which will be determined by WCPL's Environmental Department. Seed collection will be sourced from onsite ecological communities identified across WCPL mine and Remnant Woodland Enhancement Areas. Where seed is required and not available from onsite sources in adequate volumes supplies may be supplemented from external providers.

3.3.7.4 Revegetation Strategy

The revegetation program will establish significant areas (some 1,570 ha) and a net increase in woodland vegetation over the long-term (WCPL, 2003). The objectives of the revegetation program are to increase the amount of native vegetation, particularly in those landscapes that have been extensively cleared. The rehabilitation program will aim to increase the continuity of vegetation in the region through the establishment of woodland corridors. Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park (**Figure 7**). The revegetation strategy includes the revegetation of disturbance areas with areas of woodland (corridors), areas which contain a mixture of woodland and pasture, and riparian vegetation, as described further below.

Native Woodland Corridors

The revegetation program will aim to re-establish as much of the floristic diversity as possible within the native woodland areas. Revegetation of native woodland areas will include the:

- Use of endemic plant species which are characteristic of the vegetation communities to be disturbed within the open cut operations area;
- Establishment of upper, mid and lower storey native vegetation; and
- Use of regionally significant flora species where practicable and appropriate.

A provisional list of species for use in the revegetation program for native woodland corridor areas is provided in **Table 17**. Plant species selection will be subject to prior rehabilitation experience/performance, the outcome of revegetation trials, consultation with regulatory authorities and stakeholders and availability.

Mixed Native Woodland/Pasture Areas

The areas proposed to contain a mixture of native woodland and pasture will be rehabilitated in a manner that results in strips or zones of native woodland which are connected to the native woodland corridors, as opposed to scattered patches of native woodland within the pasture areas. The strips or zones of native woodland will be revegetated in a similar manner and with similar species to that described for the native woodland corridors. The areas proposed to be revegetated with pasture will be revegetated using native grass and non-native species, and select exotic grass species suitable as an initial cover crop. A provisional list of native and non-native grasses that may be used in the revegetation of pasture areas is provided in **Table 18**. Species selection will be subject to prior rehabilitation experience/performance, the outcome of revegetation trials, consultation with regulatory authorities and stakeholders and availability.

Riparian Zone

The revegetation strategy for Wambo includes the planting of the banks of the NWCD (**Figure 2**) with such species as River Oak (*Casuarina cunninghamiana*) and Rough-barked Apple (*Angophora floribunda*) for example. A comprehensive species list is being developed by WCPL and external consultants to identify appropriate species diversity for the NWCD. A net increase in the quantity of riparian vegetation along NWCD is proposed. A selection of native and non-native grasses (such as those listed in **Table 18**) may also be used in the revegetation of the North Wambo Creek riparian zone. Other riparian zones (Stony Creek, Wollombi Brook, Wambo (South) Creek within Wambo Coal lands are also targeted for riparian revegetation and weed control throughout the life of mine.

Table 17 Provisional Species Lists for Woodland Corridors

Scientific Name	Common Name
Trees*	
Allocasuarina luehmanii	Bulloak
Allocasuarina verticillata	Drooping Sheoak
Angophora floribunda^	Rough-barked Apple
Brachychiton populneum	Kurrajong
Casuarina glauca	Swamp Oak
Corymbia maculata	Spotted Gum
Eualyptus albens	White Box
Eualyptus crebra	Narrow-leaved Ironbark
Eucalyptus dawsonii	Slaty Gum
Eucalyptus fibrosa	Red Ironbark
Eucalyptus moluccana	Grey Box

Scientific Name	Common Name
Eucalyptus punctata	Grey Gum
Eucalyptus teretitornis^	Forest Red Gum
Melaleuca decora	A Honeymyrtle
Notelaea microcarpa	Native Olive
Geijera salicifolia	Brush Wilga
Shrubs*	
Acacia filicifolia^	Fern-leaf Wattle
Acacia implexa^	Hickory Wattle
Acacia amblygona	Fan Wattle
Acacia falcate	Sickle Wattle
Acacia decora	Western Silver Wattle
Acacia decurrens	Green Wattle
Acacia parvifolia^	-
Grevillea montana	A Grevillea
Hibbertia linearis	-
Cassinia quinquefaria	A Cough Bush
Grasses and Herbs*	
Dianella revoluta	Blue Flax Lily
Lomandra multiflora	Many-flowered Matrush
Chloris venticosa	Tall Windmill Grass
Laxmannia gracilis	Wire Lily
Gahnia aspera	Rough Saw-sedge
Aristida vagans	Threeawn Speargrass
Austrodanthonia sp.	A Wallaby Grass
Austrostipa scabra ssp. *falcata*	Speargrass
Cymbopogon refractus	Barbwire Grass

Note: ^ Species identified for the Montrose Tree Screening project. * *Sowing rates for tree and shrub species, pasture species will be in consultation with WCPL rehabilitation specialist.*

Table 18 Provisional Species Lists for Pasture

Scientific Name	Common Name
Native Species List*	
Austrodanthonia	Bunderra Wallaby Grass
Austrodanthonia caespitosa	Ringed Wallaby Grass
Austrodanthonia richardsonii cv. Hume	Hume Wallaby Grass
Austrodanthonia richardsonii cv. Taranna	Taranna Wallaby Grass
Austrodanthonia setacea	Smallflower Wallaby Grass
Austrostipa aristiglumis or *Austrostipa bigeniculata*	Plains Grass
Austrostipa scabra	Speargrass
Austrostipa verticillata	Slender Bamboo Grass
Dichelachne micrantha	Shorthair Plumegrass
Elymus scaber	Common Wheatgrass
Lachnagrostis filiformis	Blown Grass
Aristida ramosa	Wiregrass
Bothriochloa macra/decipiens	Redgrass/Pitted Bluegrass
Chloris truncata	Windmill Grass
Chloris ventricosa	Tall Windmill Grass
Cymbopogon refractus	Barbed Wire Grass
Dichanthium sericeum	Queensland Bluegrass

Scientific Name	Common Name
Digitaria brownii	Cotton Panic Grass
Digitaria divaricatissima	Umbrella Grass
Eriochloa pseudoacrotricha	Early Spring Grass
Panicum decompositum	Native Millet
Panicum effusum	Hairy Panic

Cover Crop and Pasture Species List		
	Rate (kg/ha) Autumn Sowing	Rate (kg/ha) Spring Sowing
Couch (Hulled/Unhulled)	3	3
Wimmera Rye Grass	5	5
Green Panic	4	4
Perennial Rye Grass	6	6
Sub Clover	2	2
Seaton Park Clover	3	3
Vetch (Namoi Wolley Pod)	5	5
Fescue (Dovey, Demter)	5	5
Sephi Medic	2	2
Cavaliar Medic	2	2
Japanese Millet		10 - 15
Kikuyu (Whittet)	2	2
Setaria (Spleda/Narok)	2	2
Lucerne	6	6
Oats	15 - 20	

Notes: *Shaded Cells: A light cover crop at 2-5kg/ha for assisting initial soil stabilisation when direct seeding with woodland corridor species.* *****Sowing rates for native pasture species will be subject to availability and in consultation with WCPL rehabilitation specialist.

3.3.7.5 Revegetation Establishment & Timings

Vegetation may be established by the following methods:

- Sowing or direct seeding;
- Propagules (seeds, lignotubers, corms, bulbs, rhizomes and roots) stored in the topsoil;
- Spreading harvested plants with bradysporous seed (seed retained on the plant in persistent woody capsules) onto areas being rehabilitated;
- Planting nursery-raised seedlings (tubestock); and
- The most common method of vegetation establishment is broadcast seeding of selected pasture or tree seed mixes.

Seed sowing is usually supplemented by the concurrent application of granulated fertiliser. Sowing is undertaken shortly after topsoil spreading to avoid loss of topsoil due to wind and rain action. Tubestock is generally only used to establish vegetation where rapid growth or specific species establishment is required, such as remedial revegetation, erosion control or visual bunding.

Fertiliser application is beneficial to vegetation establishment to replenish any nutrient deficiencies. The type of fertiliser and application rate varies according to the specific site, soil type and post-mining use of the area. When applying any additional chemical or products to the soil, the effects of runoff and leaching will be considered, as rapid leaching from organic wastes are known to provide ideal conditions for algal blooms and exacerbate weed growth and infestation.

Timing for initial vegetation establishment is an important factor for successful revegetation. Where possible, sowing and planting are planned to occur as soon as possible prior to the expected onset of reliable rains or after a break of the season (i.e.Autumn and Spring).

Following the changes in topography, drainage and soil conditions that results from open cut mining, some local provenance species may not be suitable for revegetation and seed sourced from outside the immediate district may be required. The most appropriate species to use to rehabilitate the area are those most suited to the soil types, drainage status, aspect and climate of the site. The biodiversity values of the surrounding native vegetation communities are considered during rehabilitation planning.

Distribution of vegetation type and species selection will be designed to enhance these values, whilst ensuring that weed and fire hazards are not increased for surrounding local agricultural areas. In recognition of the importance of vegetation corridors to regional biodiversity, rehabilitation initiatives aim to increase the connectivity of vegetation in the region through the establishment of woodland corridors. Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park. In doing so, WCPL will in some ways, assist in addressing the issue of discontinuity in remnant vegetation across the Hunter Valley floor.

3.3.7.6 Roosting & Nesting Resources

Where practicable, habitat features (e.g. large hollows) would be salvaged during vegetation clearance activities and utilised in the rehabilitation areas, regeneration areas and RWEP areas. In addition, artificial roosting/nesting boxes for fauna, particularly threatened fauna, may be used in the rehabilitation areas, regeneration areas and RWEP to provide additional habitat resources.

3.3.7.7 Weed and Feral Animal Control

WCPL's weed management program will involve six monthly inspections of the RWEP areas and Mine Revegetation Areas. In addition to this, an annual routine weed management program will be implemented whereby herbaceous weed species are treated to prevent further spread. Treatment of all weeds will be undertaken by suitably qualified and experienced personnel.

A variety of vertebrate pest species have been identified within WCPLs RWEP and rehabilitation areas. These have primarily consisted of feral pigs, rabbits, foxes and dogs. The WCPL operated pest control program (as detailed in Section 6.1.1.3.1 of the BMP) is complemented by a year round WCPL agister-managed pest control program. The agister-managed program primarily targets feral pigs on grazing and buffer lands surrounding WCPLs open cut mine site. The agister-managed program utilises WCPL-owned night vision cameras to monitor the movement of pet species. Humane trapping and shooting practices are employed to capture and euthanize targeted feral species.

3.3.7.8 Rehabilitation Monitoring Programme

- Rehabilitation performance will be monitored to ensure vegetation is establishing and to determine the need for any maintenance and/or contingency measures.
- A series of monitoring locations have been set up in the RWEP and rehabilitation areas to monitor regeneration of vegetation.
- Reference sites in the undisturbed woodland and grazing lands have also been established to develop suitable completion criteria against which rehabilitation/regeneration performance can be assessed.
- Sites will be monitored annually to record changes in vegetation progress and determine performance against reference sites and criteria (**Section 8**).
- Rehabilitated spoil areas will be monitored for spoil pH, Electrical Conductivity (EC), major cations and organic matter.

- Terrestrial fauna surveys are conducted to sample fauna species diversity and abundance in the rehabilitation areas, RWEP and regeneration areas. Systematic survey sites have been established to monitor amphibians, reptiles, birds and mammals.
- Subsidence remediation conducted on the Kharlibe property will be monitored as per the monitoring and inspection programme outlined in section 11 of the 'Kharlibe Subsidence Remediation Plan' provided in Appendix 4.

3.4 Other Environmental and Rehabilitation Risks

3.4.1 Overburden Characterisations

Overburden and interburden materials would typically comprise sandstone and claystones respectively. The overburden and interburden materials are expected to be non-saline and non-acid forming.

Overburden characterisation, for example pH and EC monitoring, of the final landform prior to the application of topsoil, will assist determine appropriate ameliorates in rehabilitation where necessary (e.g. the use of lime, gypsum and/or fertiliser to improve the chemical and/or nutrient properties of the soil), prior to the application of topsoil.

As previously mentioned in **Section 3.3.1**, rehabilitated areas will be monitored for pH, electrical conductivity (EC), major cations and organic matter to understand the soil ability to support vegetation goals and post mine land use. Additional testing may be undertaken annually at the recommendation of the Mine's rehabilitation specialist for some areas. For further details regarding soil monitoring refer to **Section 8.2.2**.

The data will be used to identify potential deficiencies over time and assist with the development of maintenance programs if under-performing areas are identified during visual and other monitoring. This will also assist with determining/demonstrating whether the waste rock is suitable as a long-term substrate for sustainable rehabilitation.

3.4.2 Slopes and Slope Management

Rehabilitated slopes of the final landforms are to be constructed to no greater than 1:6 (10 degrees or 17%). Graded banks will be constructed across the slope of rehabilitated areas to collect and direct water flowing from newly rehabilitated areas into rock waterways. For more information regarding water management on rehabilitated areas refer to **Section 3.3.5**.

3.4.3 Air Quality

WCPL currently implements general dust mitigation measures (e.g. haul road watering) as part of operations to minimise potential dust emissions as described in the Air Quality and Greenhouse Gas Management Plan[21] (AQGGMP) for the operations.

The AQGGMP summarises relevant air quality criteria, identifies potential sources of dust, provides the air quality monitoring station locations and presents the protocols for air quality monitoring. The AQGGMP also outlines proactive and reactive air quality management and mitigation measures and provides reporting procedures including complaints handling procedures and independent review.

[21] Condition 5C, Schedule 4 of DA305-7-2003

Dust generation from mining activities has been identified as one of the main potential impacts during the term of this MOP. The Mine will continue watering of haul roads[22] to reduce emissions of particulate matter during the MOP term. Other best practice measures are described below:

- The results of dust suppressant trials at other Peabody-owned operations will be used to determine the need (or otherwise) for additional investigations at the Mine;
- The air quality monitoring network has been installed and will continue to be used to monitor air quality during the term of this MOP;
- A rehabilitation programme to revegetate previously disturbed areas as soon as practicable. This seeks to minimise the amount of disturbed land susceptible to dust generation potential;
- Implementation of a real-time air quality management system to assist in the pre-emptive management actions and to avoid potential non-compliances. This involves monitoring of instantaneous (i.e. 5 minute) and 24-hour average PM_{10} concentrations and the implementation of a response protocol in the event that internal performance indicators are exceeded. The response protocol includes the modification or cessation of dust generating activities (i.e. excavation of material) as required.

3.4.4 Water Management

The site water management strategy is based on the containment and re-use of mine water as well as the control of sediment laden water that may be potentially carried with runoff from disturbed areas such as waste rock emplacement areas.

The water management system controls waters generated from development and operational areas while diverting upstream water around such areas. It includes both permanent structures that will continue to operate post-closure and temporary structures that will only be required until the completion of rehabilitation works. The water management system includes:

- Up-catchment diversion structures;
- Water storage dams;
- Sediment dams;
- Water transfer infrastructure (i.e. pumps and pipelines); and
- The North Wambo Creek Diversion.

The site water management system operates predominately as a closed self-contained system. The water balance of the system fluctuates with climatic conditions and as the extent of the mining operations evolves over time.

A section of the North Wambo Creek has been diverted to avoid the Open Cut Mine. The North Wambo Creek Diversion (NWCD) was constructed in accordance with the approved North Wambo Creek Diversion Plan (WCPL, 2013).

Water is predominantly required for operation of the CHPP, wash down of mobile plant, dust suppression on haul roads and hardstand areas and for dust emission control sprays in the ROM and product coal stockpile areas. Water is also used in underground mines to control dust emission in active mine areas. Some water is also used for watering vegetation establishment areas, fire fighting and other non-potable uses.

[22] *Wambo Coal Mine Pollution Reduction Program – Assessment and Best Practice Report*.

A Surface Water Monitoring Program (SWMP) has been prepared to satisfy DA 305-7-2003 to monitor the quality of water in adjacent natural waterways and mine water with the operations. The SWMP will be reviewed and updated where necessary during the MOP term.

3.4.5 Groundwater

A Groundwater Monitoring Programme[23] (GWMP) has been prepared to satisfy DA305-7-2003, a component of the Water Management Plan (WMP). The groundwater monitoring program involves the monitoring of water levels and water quality from the water supply bores and groundwater seepage and surface water runoff which collect in pit sumps during mining operations. The groundwater monitoring program also involves the monitoring of groundwater levels in alluvium and selected bores. The GWMP will be reviewed and updated where necessary during the MOP term.

The Surface and Groundwater Response Plan (SGWRP) outlines the triggers used to determine if an investigation is required (i.e. implementation of the ground water investigation and contingency protocol) in the event of a groundwater performance criteria exceedence. The SGWRP relevant to groundwater includes:

- Groundwater investigation triggers, including a process to deal with a groundwater-related complaint;
- Groundwater impact investigation protocol; and
- Response plan, in the event that an investigation conclusively attributes the Mine to an adverse impact to an existing groundwater supply user.

3.4.6 Hazardous Materials Storage

Hydrocarbon Storages

Hydrocarbons used on-site include fuels (i.e. diesel and petrol), oils, greases, degreaser and kerosene. Hydrocarbon storage facilities are constructed and operated in accordance with *Australian Standard (AS) 1940:2004 The Storage and Handling of Flammable and Combustible Liquids* and the *NSW Work Health and Safety Regulation, 2011*.

The workshop infrastructure includes waste oil extraction equipment. An oil/water separator is located downslope of the workshop area, located at the vehicle washdown bay area. All waste hydrocarbons collected in the separators are disposed of by a licensed contractor.

Explosives Storage

Explosives required for the Mine include initiating products and detonators, ammonium nitrate fuel oil and emulsion explosives. The explosives storage and blast reload facilities are currently located in the Rug Dump. Explosives on-site are stored and used in accordance with *AS 2187.2:2006 Explosives – Storage, Transport and Use – Use of Explosives. AS 2187.2:2006* details the requirements for the safe storage, handling and land transport of explosives, safe storage distances from other activities and bunding requirements.

[23] Condition 33 of Schedule 3 of the Project Approval.

3.4.7 Greenhouse Gases

Management of greenhouse gases are described in the AQGGMP[24]. As provided by the National Greenhouse Accounts Factors (NGA Factors) (Commonwealth Department of Climate Change and Energy Efficiency, 2012), direct greenhouse emissions are referred to as Scope 1 emissions, and indirect emissions are referred to as Scope 2 and Scope 3 emissions. The major sources of greenhouse gas emissions at the Mine include:

- Combustion of diesel during mining operations (Scopes 1 and 3);
- Use of explosives (Scope 1);
- Fugitive emissions of methane (Scope 1);
- Use of petroleum based greases and oils (Scopes 1 and 3);
- Off-site generation of electricity that is consumed at the Mine (Scopes 2 and 3); and
- Transport of product coal and combustion of product coal by third parties (Scope 3).

Greenhouse gas emissions from the Mine would continue to be monitored and reported annually in accordance with Peabody's obligations under the Commonwealth Government National Greenhouse and Energy Reporting System. Peabody and WCPL will also comply with obligations under the Commonwealth *Clean Energy Act, 2011*.

3.4.8 Acid Mine Drainage

As described in **Section 3.3.3**, coarse reject material produced from the CHPP is expected to contain some sulphur and is likely to have some capacity for acid generation, whilst tailings from the CHPP would be expected to be potential acid forming (low capacity).

The pH of overburden material and interburden materials range from pH 6.8 to pH 9.6. This is typical of unweathered rocks in the Singleton Coal Measures (EIS 2003). There are no known Acid Mine Drainage (AMD) issues at WCPL, however the implementation of management strategies in regards to material with the capacity for acid generation are described in **Section 3.3.3**.

3.4.9 Blasting

WCPL have prepared a Blast Management Plan[25] (BMgtP) which describes the blast management and mitigation measures for the Mine. Open cut blasting is undertaken to comply with Section L5 of EPL 529 and *AS 2187.2-2006*. The BMgtP provides details on best practice control measures, blasting criteria, adverse meteorological conditions, fume and dust management, management of heritage sites, cumulative impacts, monitoring and reporting.

The results of the blast monitoring program are assessed against the airblast overpressure and ground vibration criteria identified in **Table 19** and reported annually in the Annual Review, EPL Annual Return and updated regularly on the Peabody website. The BMgtP will be reviewed and updated where necessary during the MOP term.

The objective of the monitoring is to obtain assurance that amenity overpressure and vibration limits are being achieved at privately-owned residences, safety of mine employees.

[24] Condition 5C, Schedule 4 of the DA305-7-2003.

[25] Condition 20, Schedule 4 of DA305-7-2003.

The approved blasting hours are between 9.00 am and 5.00 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays, or at any other time without the written approval of the Secretary of the DP&E.

Condition 11 and Condition 12 of Schedule 4 of DA305-7-2003 stipulates the blast impact assessment criteria as displayed in **Table 19**.

Table 19 Blasting Impact Criteria

Location	Airblast overpressure (dB(Lin Peak))[1]	Ground vibration (mm/s)[2]	Allowable exceedance
Residence on privately owned land *(with the exception of property 13C)*	115	5	5% of the total number of blasts over a period of 12 months
	120	10	0%

Notes: [1] dB(Lin Peak) = decibel linear in peak. [2] mm/s = millimetres per second.

WCPL operate a Blasting Hotline and an SMS message service[26] to enable the public to get up-to-date information on blasting operations at the Mine. The Environmental and Community Manager (or delegate) updates the Blasting Hotline 24hrs (**ph. 02 8250 5205**) prior to the schedule blast event.

Advertisement of both the Community Enquires Line and Blasting Information Line contact details are provided local newspapers.

3.4.10 Noise

WCPL have prepared a Noise Management Plan[27] (NMP), describing the noise monitoring programme comprising both attended and real-time monitoring. Integrated protocols for both monitoring methodologies are outlined in the NMP.

Attended monitoring will be used for demonstrating compliance with noise criteria, whilst real-time monitoring will be used as a management tool for taking pre-emptive management actions to avoid potential non-compliances. Potential sources of noise at the Mine during operations include:

- Open cut mining activities involving the operation of trucks, dozers, excavators, the drill and ancillary equipment in the open cut pits;
- Coal handling and preparation, including conveyors, crushers, loading into bins, the Coal Handling and Preparation Plant (CHPP) and other material handling infrastructure and associated mobile equipment;
- Haul trucks running from the active pits to the ROM stockpile area; and
- Loading of product coal at the rail load out bin.

The NMP contains protocols for responding to noise related complaints (**Section 3.2**) and is subject to continual review and reporting through the Annual Review process. The NMP will be reviewed and updated where necessary during the MOP term. Real-time monitors are located adjacent to the mine at points indicative of local rural residential areas.

[26] WCPL provide a blast SMS notification service to members of the community who have registered for the service. The SMS message with blasting details is sent out the day before the scheduled blast event.

[27] Condition 9, Schedule 4 of DA305-7-2003.

The real-time system records 15 minute statistical noise data, continuous audio files and meteorological data. The continuous audio recording can also be downloaded, so that a listener can consider whether the noise being recorded is mine-related.

3.4.11 Visual and Lighting

The design and construction of surface infrastructure was undertaken in a manner that minimises visual contrasts where such infrastructure is potentially visible from private residences or public vantage points. Progressive revegetation onto rehabilitated landforms will further minimise the visual impact of the Mine and will be completed soon after landform shaping. Night-lighting effects will be minimised through the implementation of management measures and control structures designed to minimise light spillage.

3.4.12 Aboriginal and European Heritage

A complex-wide Heritage Management Plan (HMP) outlines the management of potential environmental consequences of the proposed secondary workings described in the Extraction Plans on heritage sites or values. The HMP has been prepared in accordance with Condition 22C(h) of Schedule 4 of the Development Consent (DA 305-7-2003). The HMP describes the management and mitigation measures for both the Wambo Homestead Complex and Aboriginal Heritage sites.

The *NSW National Parks and Wildlife Act*, 1974 (NPW Act) provides the primary basis for the legal protection and management of Aboriginal heritage in NSW. Implementation of the Aboriginal heritage provisions of the NPW Act is the responsibility of the NSW Office of Environment and Heritage (OEH).

The aim of the NPW Act is to prevent unnecessary or unwarranted destruction of Aboriginal objects and to protect and conserve objects where such action is considered warranted. Under section 86(4) of the NPW Act it is an offence for a person to harm or desecrate an Aboriginal place. Consents regarding impacts to Aboriginal objects are authorised by OEH under section 90 of the NPW Act and clauses 80D and 80E of the *National Parks and Wildlife Regulation*, 2009.

AHIP #2222 was issued to WCPL on the 20 June 2005 under sections 87 and 90 of the NPW Act. The AHIP allowed for the disturbance and/or salvage of all known and unknown Aboriginal objects. AHIP #2222 is scheduled to expire on 1 March 2025. AHIP #C0001474 was approved for the development of the South Bates Underground Mine on 19 November 2015 and is valid until 2025. On 16 January 2017, an additional AHIP #C0002000 was issued by the OEH to WCPL for the development of the South Wambo Underground Mine Modification, and is valid until 16 June 2033. On 27 February 2018, an AHIP #C0003213 was issued by the OEH to WCPL for the development of the SBUE, and is valid until 27 February 2040. WCPL obtained a Care and Control Permit (#3130) for the temporary storage of salvaged artefacts until they can be replaced on the post mining rehabilitated landscape.

3.4.13 Bushfire

A Bushfire Management Plan (BFMP) has been prepared to satisfy the requirements of DA 305-7-2003. The BFMP has been prepared to the satisfaction of the SSC and the NSW Rural Fire Service (RFS). The BFMP identifies bushfire management issues relevant to the local environment, analyses bushfire risk, discusses objectives and activities and outlines standard procedures to be followed in the event of a bushfire. The BFMP is revised as necessary to include activities such as the development of fire breaks in strategic locations around the Mine. Any revision of the BFMP is undertaken in consultation with SSC and the RFS.

3.4.14 Exploration

As previously discussed in **Section 2.3.1**, the exploration drilling program will continue during the MOP term to update gas and coal quality data for WCPL. In general, all land preparation required will be in accordance with the relevant SDP. Mitigation measures relevant to exploration and land clearing activities at WCPL include the following:

- Drilling sites and access will be located to avoid areas of remnant vegetation, other sensitive areas and minimise the requirement for vegetation clearance.
- A vegetation clearance protocol and a SDP have been developed. The SDP requires the approval of the Environmental Manager (or delegate) prior to any land clearing activities taking place. The vegetation clearance protocol and SDP aims to minimise environmental impacts, including minimising the area required for disturbance for drill sites and access tracks, identify environmental issues such as Aboriginal and European heritage sites, identify sensitive flora and fauna communities, outline erosion and sediment control measures, provide topsoil management and limiting soil disturbance measures, avoiding threatened species, and the identification of any seed or timber resources that can be salvaged. In accordance with SDP process, follow up inspections are completed by WCPL's Environmental Department to ensure the SDP is carried out and each drill site is rehabilitated to the appropriate standard. Please refer to **Appendix 3** for a copy of a SDP.
- Additionally, an Exploration Drilling Permit (EDP) has been developed that details the requirements and controls to be in place before the commencement of exploration activities. The EDP must be completed and signed off by the relevant departmental manager for all exploration activities.

3.4.15 Construction

A number of infrastructure projects are planned within the MOP term (**Section 2.3**). The existing infrastructure is largely located within the present approved open cut disturbance area. All ROM coal handling and haulage to the CHPP will remain within the confines of the existing approved open cut mining disturbance area. Notwithstanding, some minor construction activities may be required outside of the existing open cut disturbance area within WCPL's land ~~and will~~ including clean water diversion drains, light vehicle access tracks and environmental monitoring sites e.g. groundwater monitoring piezometers. Mitigation measures relevant to construction activities outside approved open cut disturbance area will include the following:

- Infrastructure will be located to avoid areas of remnant vegetation, RWEPs and regeneration areas. Vegetation clearance will be kept to a minimum where practicable and in accordance with Development Consent conditions;
- Implementing vegetation clearance protocol and SDP procedure;
- Topsoil resources will be identified, stripped and stockpiled for later use in rehabilitation in accordance with **Section 3.3.6**; and
- Where vegetation clearance is undertaken, timber will be cleared, mulched, salvaged and windrowed. Windrowed timber, where practicable, will then be used in rehabilitation.

Works associated with the United Wambo Open Cut Coal Mine Project outside of the approved open cut disturbance area would not be undertaken prior to the approval of SSD-7142 and DA 305-7-2003 MOD 16.

3.4.16 Public Safety

All efforts will be made to ensure the safety of the public, both as visitors to the Mine and off the Mine site. Measures to minimise risks to the public include:

- Induction programmes for employees, contractors and visitors;
- Signage and communication protocols for visitors and suppliers;
- Identification systems for visitor access to the site;
- First aid training requirements for employees and contractors;
- Maintenance of fire trails and fire management measures in accordance with the BFMP;
- Fence lines maintained in an operational condition;
- Right of way accesses to neighbours are maintained;
- Speed control signs have been installed on roads on Mine owned land; and
- Maintenance of locked gates around the site for security purposes.

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

3.4.17 Contaminated Land

As described in the EIS (WCPL, 2003), potential land contamination risk include spills, fires or explosions associated with the transport, storage and usage of fuels, chemical and explosives. **Section 2.3.7** and **Section 3.4.6** outlines the operational procedures or mitigation measures that will be implemented to prevent or reduce the potential for land contamination.

In addition to these measures at mine closure, a land contamination assessment of areas where potential land or soil contamination (e.g. fuel and explosive storage areas), will be completed in consultation with relevant regulatory authorities. Information regarding baseline knowledge of potential land contamination areas will be incorporated into the CMCP.

Any contaminated soils identified during the assessment would be remediated on site or excavated, removed from site and disposed of at a licensed facility and the area remediated in accordance with recommendations made by the contamination assessment.

4.0 Post Mining Land Use

4.1 Regulatory Requirements

Table 20 identifies the regulatory requirements that specially affect the post mining land use, landscape and rehabilitation outcomes as identified in the Development Consent (DA305-7-2003), the Project Environmental Impact Statement (Project EIS), mining and coal lease/s.

Table 20 Rehabilitation Regulatory Requirements

<table>
<tr><th>Rehabilitation Regulatory Requirements</th><th>Sections in the MOP</th></tr>
<tr><td colspan="2">Rehabilitation Conditions from DA305-7-2003</td></tr>
<tr><td>Final Void Strategy
39. At the end of Year 7 of the development, or as directed otherwise by the Secretary, the Applicant must prepare a Final Void Management Plan for the development, in consultation with the DRG, the Secretary and Council, and to the satisfaction of the Secretary. This Plan must:
(a) investigate options for the future use of the final void;
(b) re-assess the potential groundwater impacts of the development; 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 over time.
The Applicant must implement the approved management plan as approved from time to time by the Secretary.</td><td>Sections 5.2, 6.0 & 8.2.4</td></tr>
<tr><td>Rehabilitation
69. Following the cessation of the use of the coal haulage road which traverses the Wambo Homestead Complex property, the land is to be returned to its former condition (pre1999) and the half palisade fence on the southern alignment of the mounting yard, which was removed, is to be reinstated as required by the approval of the Heritage Council for the construction of the road on 12 February 1999.</td><td>Section 7.0</td></tr>
<tr><td>Visual Amenity
81. The Applicant must implement measures to mitigate visual impacts including:
(a) design and construction of development infrastructure in a manner that minimises visual contrasts; and
(b) progressive rehabilitation of mine waste rock emplacements (particularly outer batters), including partial rehabilitation of temporarily inactive areas.</td><td>Section 3.4.11</td></tr>
<tr><td>Overburden Dumps
84. The Applicant must construct the overburden emplacements generally in accordance with the EIS, and to the satisfaction of DRG.</td><td>Section 7.2.3</td></tr>
<tr><td>Rehabilitation Objectives
94. The Applicant must rehabilitate the Wambo Mining Complex to the satisfaction of DRG. The rehabilitation must be generally in accordance with the proposed rehabilitation strategy described by the documents listed in Condition 2 of Schedule 3 and the objectives in Table 18.
Table 18: Rehabilitation Objectives
<table>
<tr><th>Area/Domain</th><th>Rehabilitation Objectives</th></tr>
<tr><td>Mine site (as a whole)</td><td>• Safe, stable and non-polluting;</td></tr>
<tr><td>Surface infrastructure</td><td>• To be decommissioned and removed, unless DRG agrees otherwise.</td></tr>
<tr><td>Community</td><td>• Ensure public safety; and
• Minimise the adverse socio-economic effects associated with mine closure.</td></tr>
<tr><td>Landforms</td><td>Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.</td></tr>
<tr><td>All watercourses subject to subsidence impacts</td><td>Hydraulically and geomorphologically stable, with riparian vegetation established that is the same or better than prior to commencement of mining</td></tr>
</table></td><td>Section 4.3</td></tr>
</table>

Rehabilitation Regulatory Requirements	Sections in the MOP
Operating Conditions 94A. The Applicant must: (a) develop a detailed soil management protocol that identifies procedures for: • comprehensive soil surveys prior to soil stripping; • assessment of top-soil and sub-soil suitability for mine rehabilitation; and • annual soil balances to manage soil handling including direct respreading and stockpiling; (b) maximise the salvage of suitable top-soils and sub-soils and biodiversity habitat components such as bush rocks, tree hollows and fallen timber for rehabilitation of disturbed areas within Wambo Mining Complex and for enhancement of biodiversity offset areas; (c) ensure that coal reject or any potentially acid forming interburden materials must not be emplaced at elevations within the pit shell or out of pit emplacement areas where they may promote acid or sulphate species generation and migration beyond the pit shell or out of pit emplacement areas; and (d) ensure that no dirty water can drain from an out of pit emplacement area to any offsite watercourse or to any land beyond the lease boundary.	**Section 3.3.6** **Section 3.3.5** **Section 3.3.6** **Section 2.3.3.3** **Section 2.3.4** **Section 2.3.5** **Section 3.3.4**
Progressive Rehabilitation 94B. The Proponent must rehabilitate the site progressively as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies must be employed when areas prone to dust generation cannot be permanently rehabilitated. *Note: It is accepted that some parts of the site that are progressively rehabilitated may be subject to further disturbance at some later stage of the project*	**Section 2.3.10**
Rehabilitation Management Plan 94C. The Proponent must prepare and implement a Rehabilitation Management Plan for the project to the satisfaction of the DRG. This plan must (a) be prepared in consultation with the Department, CLWD, OEH, Council and the CCC; (b) be submitted to the DRG by the end of June 2013; (c) be prepared in accordance with any relevant DRE guideline; (d) describe how the rehabilitation of the site would be integrated with the implementation the biodiversity offset strategy; (e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary); (f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this approval, and address all aspects of rehabilitation including mine closure, final landform, and final land use; (g) include a detailed tailings management strategy that includes timing for rehabilitation of all tailings storage facilities, in order that final land form and land use objectives can be achieved in a timely manner; (h) include a plan that describes proposed grazing carrying capacity across the post mining landscape; (i) include interim rehabilitation where necessary to minimise the area exposed for dust generation; (j) include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and (k) build to the maximum extent practicable on the other management plans required under this consent.	**This MOP (see Table 4)**
Mine Exit Strategy 95. The Applicant must work with the Council to investigate the minimisation of adverse socio-economic effects of a significant reduction in local employment levels and closure of the Wambo Mining Complex at the end of its life.	**Section 1.6.1**
Rehabilitation Conditions from Mining & Coal Leases	
CL374, ML1572, ML1594 13(a). Land disturbed must be rehabilitated to a stable and permanent form suitable for a subsequent land use acceptable to the Director-General and in accordance with the Mining Operations Plan so that:- • There is no adverse environmental effect outside the disturbed area and that the land is properly drained and protected from soil erosion. • The state of the land is compatible with the surrounding land and land use requirements. • The landforms, soils, hydrology and flora require no greater maintenance than that in the surrounding land.	**Section 3.3.5** **Sections 4.2 & 4.3** **Section 4.0**

Rehabilitation Regulatory Requirements	Sections in the MOP
• In cases where revegetation is required and native vegetation has been removed or damaged, the original species must be re-established with close reference to the flora survey included in the Mining Operations Plan. If the original vegetation was not native, any re-established vegetation must be appropriate to the area and at an acceptable density. • The land does not pose a threat to public safety. 13(b). Any topsoil that is removed must be stored and maintained in a manner acceptable to the Director-General. **CL397** 30. Subject to any specific condition of this lease providing for rehabilitation of any particular part of the subject area affected by mining or activities associated there within, the registered holder shall: (a) reinstate, level, regrass, reforest and contour to the satisfaction of the Minister any part of the subject area that may, in the opinion of the Minister have been damaged or deleteriously affected by mining operations; and (b) fill in, seal or fence, to the satisfaction of the Minister, any excavation within the subject area. **CCL743, ML1402,** 7. Disturbed land must be rehabilitated to a sustainable/agreed end land use to the satisfaction of the Director-General.	**Section 3.3.7** **Section 3.4.17** **Section 3.3.6** **This MOP**

4.2 Post Mining Land Use and Landscape Goals

Land use in the vicinity of the Mine is characterised by a combination of coal mining operations, agricultural land uses and the village of Warkworth. Wollemi National Park is located to the south and west of Wambo and forms part of the Greater Blue Mountains World Heritage Area (WCPL, 2003). Accordingly, the final landform proposes a balanced rehabilitation outcome which recognises the alternative land uses that exist in the region, and therefore aims to establish the potential for both sustainable agriculture and endemic woodland habitat (**Section 3.3.7**). The proposed design of final landforms and the revegetation strategy is described in **Section 5.0** and illustrated by **Figure 6** and **Plan 4** (**Appendix 1**).

The post mining land use will be considered in further detail in the revision of the CMCP. The revision of the CMCP will incorporate a review of the constraints and opportunities to identify potential sustainable land-use options, in consultation with relevant stakeholders in order to obtain feedback of any issues that need to be considered as part of the final land use analysis. The revised CMCP will be submitted to the ~~DRG~~ RR and other relevant stakeholders for comment and approval ~~by the end of 2018~~ following the determination of the United Wambo Open Cut Coal Mine Project (SSD 7142) (**Section 1.6.1**).

Surface infrastructure with no ongoing beneficial use will be removed from the site at the completion of mining. Some infrastructure (e.g. site access roads, water storages) may be retained for alternate post mining uses (where agreed in consultation with relevant authorities and local landholders). The revision of the CMCP will also examine WCPL-owned lands that are not subject to mining operations or land affected by mine subsidence, which are currently used for the agistment of stock and whether the land can be transferred to local landholders or sold.

4.2.1 Integration with RWEP Areas (Biodiversity Offsets)

In recognition of the importance of vegetation corridors to regional biodiversity, rehabilitation initiatives will aim to increase the continuity of vegetation in the region through the establishment of woodland corridors. Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park (WCPL, 2003).

Remnant Woodland Enhancement Program (RWEP) areas have been established at WCPL to help to conserve regional biodiversity, whilst enhancing the habitat available to flora and fauna. Details of the management of the RWEP areas are provided in the BMP. WCPL has finalised agreements to conserve the RWEP areas A, B, C, D, D Extension, E and the Coal Terminal area as part of a Voluntary Conservation Agreement under Part 4, Division 12 of the NSW *National Parks and Wildlife Act, 1974* in accordance with Condition 41, Schedule 4 of Development Consent (DA 305 7 2003). ~~WCPL is in the process of varying the Conservation Agreement to include RWEP area E.~~ Wherever possible, it is proposed to link existing woodland with woodland rehabilitation areas to provide corridors for the movement of fauna and to establish a net increase in woodland areas in the Hunter catchment. The revegetation strategy includes revegetation of disturbance areas with areas of woodland (corridors), areas which contain a mixture of endemic woodland and pasture, and riparian vegetation. A detailed description of the revegetation strategy is provided in **Section 3.3.7**.

The final distribution of woodland to be established on rehabilitated landforms will ultimately depend on the outcome of closure planning including the shape of final landforms and the agreed post mine land use (WCPL, 2003). The final rehabilitated landform at lease relinquishment is shown on **Plan 4**. The rehabilitation phases during this MOP term are described in **Section 5.3**.

4.3 Rehabilitation Objectives

The objectives for rehabilitation are guided by the rehabilitation objectives outlined in **Table 20** from the Development Consent (DA 305-7-2003) as shown in **Table 22**. The overall rehabilitation objectives for Wambo (as provided in Wambo Development Project Environmental Impact Statement [the EIS] [WCPL, 2003]) build on and incorporate the rehabilitation objectives outlined in the Development Consent (DA 305-7-2003) and include:

- The creation of safe, stable, adequately drained post-mining landforms that are consistent with the local surrounding landscape;
- Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park;
- Preservation of existing beneficial use of water resources; and
- Development of a sustainable post-mining land use plan towards the end of mine life.

The following key rehabilitation principles form the basis for rehabilitation planning and design at Wambo (WCPL, 2003):

- Existing remnant vegetation to be preserved wherever possible;
- Integration of open cut mining and rehabilitation planning to minimise the area of disturbance at any one time;
- Progressive rehabilitation of disturbed areas, including partial rehabilitation of temporarily inactive waste rock emplacements;
- Creation of post-mining landforms that enhance the amenity of the local landscape and contribute to local and regional habitat corridors as presented in the Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales (NSW Department of Mineral Resources, 1999);
- Consideration of issues of public safety in the design of final landforms;
- Consultation with the relevant state government authorities, SSC and the CCC during the final design and planning of rehabilitated landforms;

- Implementation of trials and design studies as necessary to maximise effectiveness of the rehabilitation program; and
- Routine monitoring in order to identify rehabilitated areas requiring maintenance works.

4.3.1 Progressive Rehabilitation of Disturbed Areas

As an integral component of staged mining operations, rehabilitation of the final mine waste rock landform (when they become available) and other areas of disturbance will be conducted progressively over the life of the mine and will be scheduled to minimise the disturbed area at any point in time. Particular focus will be placed on the outer batters of the mine waste rock emplacements. Interim rehabilitation measures, including the establishment of cover crops and dust management controls on incomplete landforms and other inactive disturbance areas, will be implemented where they may remain inactive for an extended period. These measures will provide initial stabilisation of mine landforms, reduce the visual impact of the mine and minimise the potential for generation of windblown dust and sediment laden runoff.

5.0 Rehabilitation Planning

5.1 Domain Selection

Mine closure or rehabilitation domains for this MOP (**Plan 2**) have been identified on the basis of their operational and functional purpose within the mining disturbance boundary and presented in **Table 21** and displayed in **Figure 6**.

Primary domains can be defined as land management units within the mine site, usually with unique operational and functional purpose and therefore similar geophysical characteristics. Primary domains outline current land use during the MOP period.

Secondary domains are land management units characterised by a similar post mining land use objective. Secondary domains define the final land use at mine closure.

Table 21 MOP Rehabilitation Domains

Primary Domains	Code	Secondary Domains	Code
Mine Infrastructure Areas	1	Water Management	A
Water Management	2	Existing Native Vegetation	B
Tailings Emplacement Areas	3	Existing Pasture	C
Waste Rock Emplacement Areas	4	Rehabilitation (Mixed Pasture/Woodland)	D
Subsidence Area	5	Rehabilitation (Woodland Corridors)	E
Rehabilitation (Pre MOP)	6	Final Void	F
North Wambo Creek Diversion	7	Mine Infrastructure Areas	G
Active Mining Area	8	Rehabilitation Pasture	H
Future Mining	9		
Coal Handling Preparation Plant	10		

In summary, the following rehabilitation domains have been developed for WCPL (as shown on **Figure 6** and **Plan 2**) for the MOP term, including:

- Domain 1D – Mine Infrastructure Areas – Rehabilitation Mixed Woodland/Pasture.
- Domain 2A – Water Management Area.
- Domain 3D – Tailings Emplacement Area – Rehabilitation Mixed Pasture/Woodland.
- Domain 4D/4E – Waste Rock Emplacement Areas – Rehabilitation Mixed Woodland/Pasture and Woodland Corridor.
- Domain 5B/5C – Subsidence Area – Existing Native Vegetation or Existing Pasture or Rehabilitation Pasture.
- Domain 5H – Subsidence Area – Existing Pasture.
- Domain 6C/6D – Rehabilitation Pre MOP – Existing Pasture or Rehabilitation Mixed Woodland/Pasture.
- Domain 7H – North Wambo Creek Diversion – Rehabilitation Pasture or Rehabilitation Mixed Woodland/Pasture.
- Domain 8F – Active Mining Area – Final Void.
- Domain 9D or 9E – Future Mining Area – Rehabilitation Mixed Woodland/Pasture or Woodland Corridor.
- Domain 10D, 10E, or 10G – Coal Handling Preparation Plant – Rehabilitation Mixed Woodland/Pasture or Woodland Corridor or Mine Infrastructure Area (decommissioned).

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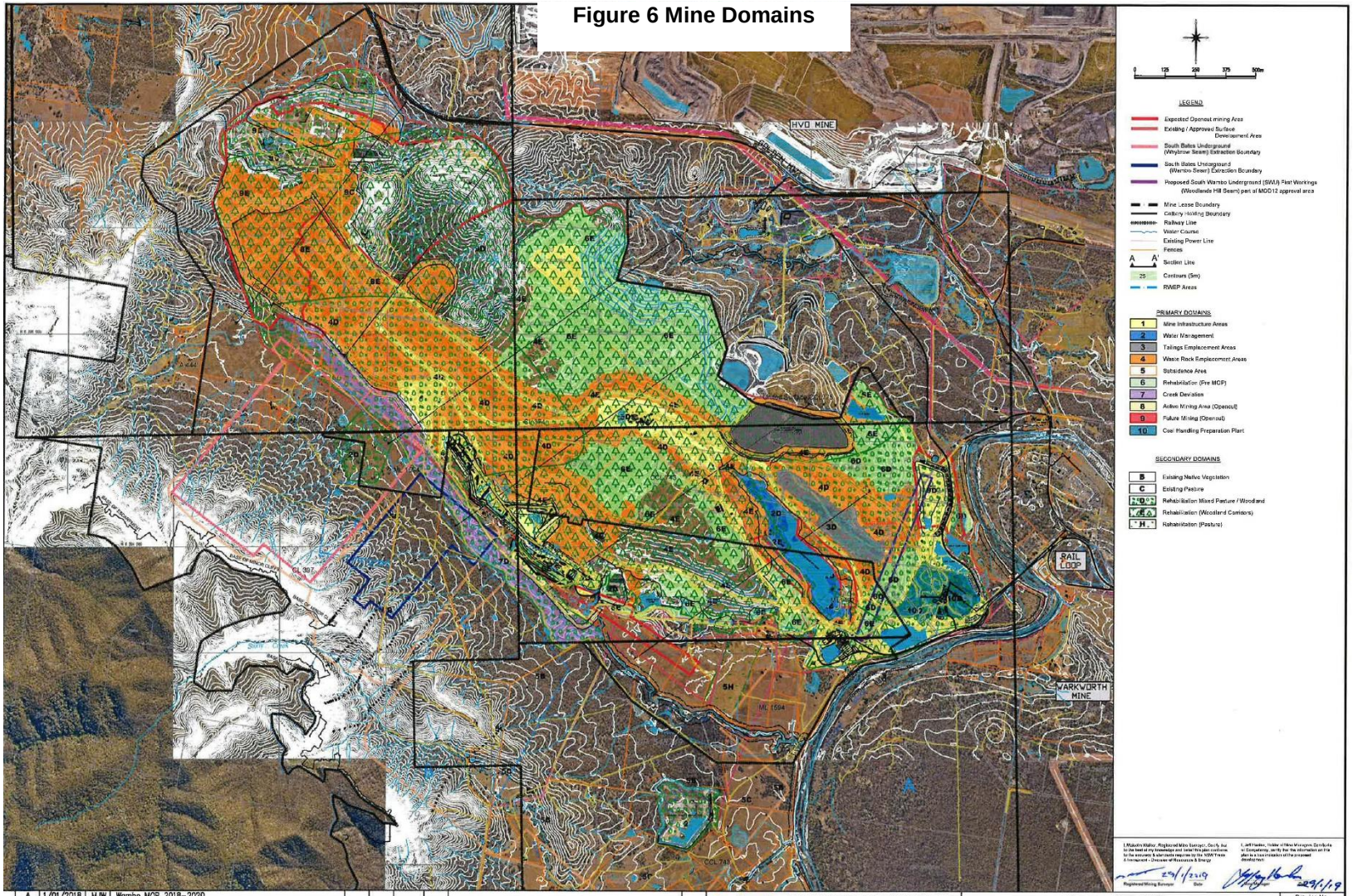
Figure 6 Mine Domains



REVISIONS	REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
	A	1/01/2018	MJW	Wambo MOP 2018-2020						
	H	21/01/2019	MJW	Amendment A						

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WAMBO COAL PTY LIMITED
ABN 13 000 668 057
Jerry's Plains Rd, Warkworth: Phone: 02 65 702200
Via Singleton, NSW, 2330 Fax: 02 65 702290
Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 2
Mine Domains - At Commencement of MOP

Drawing No. 2345
Revision No. H_21/01/2019

Date	Scale	Drawn	Checked	Approved	Sheet Size
1/01/2018	1:11,000	MJW	PJ	JH, DG	A0

5.2 Domain Rehabilitation Objectives

As discussed in **Section 4.2 and Section 4.3,** the objectives of final rehabilitated landform is to establish a safe, non-polluting and stable landform that is compatible with the surrounding landscape and that meets the requirements of the post mining land use (**Section 4.2** and **Figure 7**). In addition, domain rehabilitation objectives are further outlined in **Table 22**. This will incorporate selective vegetation communities determined by beneficial post closure land uses, to be defined and agreed in consultation with relevant stakeholders, the community and government.

Final rehabilitation requirements would ultimately be refined and developed in consultation with key government authorities and other relevant stakeholders and reported in consecutive Open Cut MOP's for approval prior to implementation.

Table 22 Domain Rehabilitation Objectives

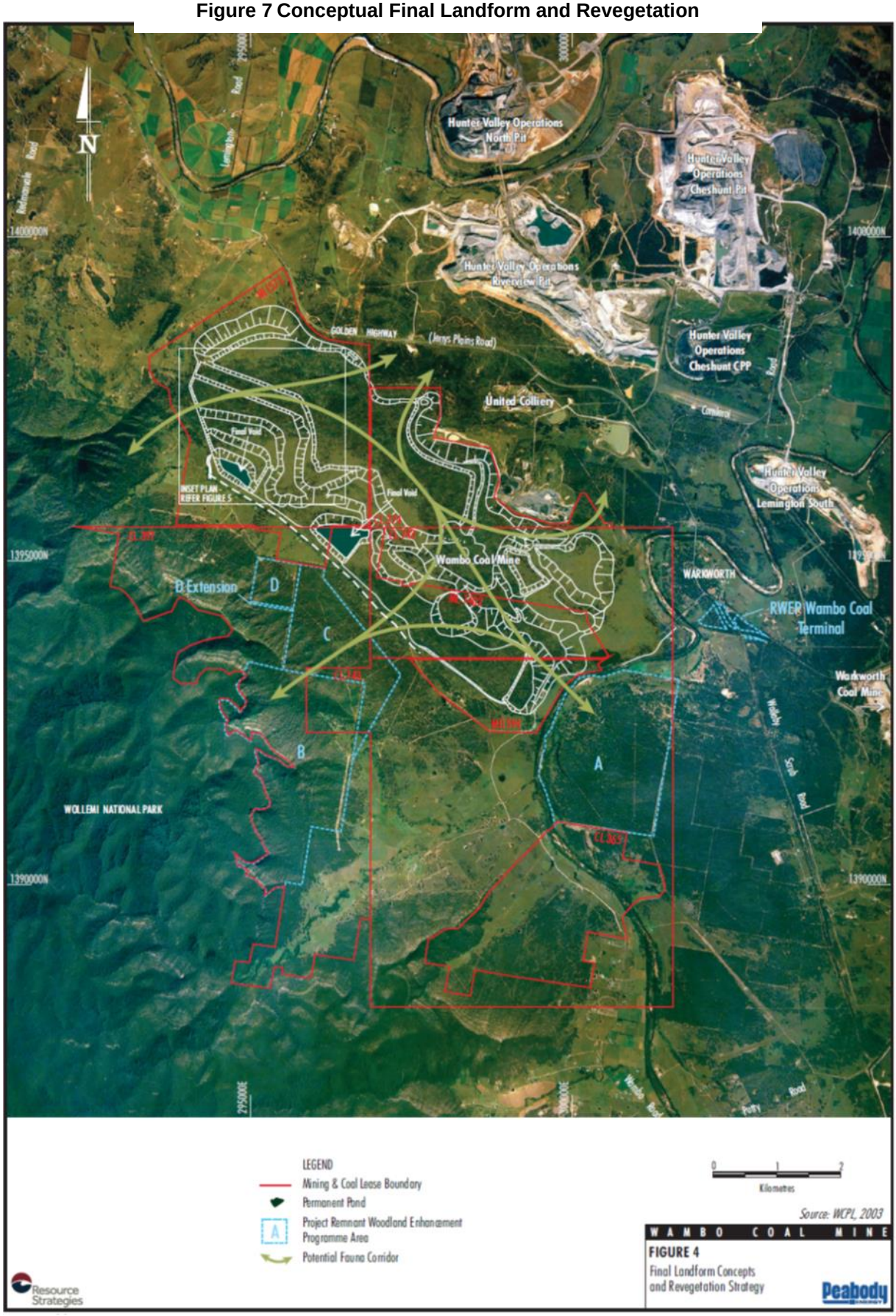
Domain	Rehabilitation Objectives
Primary Domains	
Domain 1: **Mine Infrastructure Areas**	• All infrastructure removed that is not required post closure. • All hazardous materials and contaminated materials removed. • Entrances to underground mine workings sealed and made safe. • Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than • surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI) • Woodland Corridor and Mixed Woodland/Pasture Areas established consistent with revegetation strategy. • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.
Domain 2: **Water Management**	• All hazardous materials and contaminated materials removed. • All infrastructure removed that is not required post closure. • Preservation of existing beneficial use of water resources. • Provide a self-sustaining land form post mine closure. • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. – Water quality non-polluting and appropriate for conservation end land use. – Water quality leaving site to be in accordance with the EPL water quality criteria.
Domain 3: **Tailings Emplacement Areas**	• All hazardous materials and contaminated materials removed. • Design of capping to prevent soil erosion and exposure to tailings material beneath. • Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI) • Woodland Corridor and Mixed Woodland/Pasture Areas established consistent with revegetation strategy. • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.

Domain	Rehabilitation Objectives
Domain 4: **Waste Rock Emplacement Areas**	• All hazardous materials and contaminated materials removed. • Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI) • Woodland Corridor and Mixed Woodland/Pasture Areas established consistent with revegetation strategy. • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.
Domain 5: **Subsidence Area**	• Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options. • All watercourses subject to subsidence impacts shall be hydraulically and geomorphologically stable, with riparian vegetation established that is the same or better than prior to commencement of mining.
Domain 6: **Rehabilitation (Pre MOP)**	• Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI) • Woodland Corridor and Mixed Woodland/Pasture Areas established consistent with revegetation strategy. • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.
Domain 7: **North Wambo Creek Diversion**	• Pasture species established consistent with revegetation strategy. • Tree species established along creek line consistent with riparian zone.. • Creek diversion stable and will not present a greater safety hazard than surrounding land. • Creek diversion able to shed water safely without causing excessive erosion, jeopardising landform integrity or increasing pollution of downstream watercourses. • All watercourses subject to subsidence impacts shall be hydraulically and geomorphologically stable, with riparian vegetation established that is the same or better than prior to commencement of mining.
Domain 8: **Active Mining Area**	• Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI) • Woodland Corridor and Mixed Woodland/Pasture Areas established consistent with revegetation strategy. • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.

Domain	Rehabilitation Objectives
Domain 9: Future Mining	• Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI) • Woodland Corridor and Mixed Woodland/Pasture Areas established consistent with revegetation strategy. • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.
Domain 10: Coal Handling Preparation Plant	• All infrastructure removed that is not required post closure. • All hazardous materials and contaminated materials removed. • Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI) • Woodland Corridor and Mixed Woodland/Pasture Areas established consistent with revegetation strategy. • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.
Secondary Domains	
Domain A: Water Management	• Objectives as outlined for Domain 2
Domain B: Existing Native Vegetation	• Conserve regional biodiversity, whilst enhancing the habitat available to flora and fauna. • Existing remnant vegetation to be preserved wherever possible. • Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options.
Domain C: Existing Pasture	• Conserve and maintain existing pasture, wherever possible, to support sustainable land use e.g. grazing activities. • Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options.
Domain D: Rehabilitation (Mixed Pasture/Woodland)	• Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V) • Mixed Woodland/Pasture Areas established consistent with revegetation strategy and analogue vegetation communities. • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.

Domain	Rehabilitation Objectives
Domain E: Rehabilitation (Woodland Corridors)	• Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. • Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. • Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class VI) • Woodland Corridor Areas established consistent with revegetation strategy and analogue vegetation communities • Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; • Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. • Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.
Domain F: Final Void	• Objectives as outlined for Domain 2 • **Note:** The final land form use of the Final Void is subject to review and will be included in the CMCP.
Domain G: Mine Infrastructure Areas	• All infrastructure removed that is not required post closure. • All hazardous materials and contaminated materials removed. • Stable landform and non-polluting.
Domain H: Rehabilitation Pasture	• Land capability returned to a class similar to that existing prior to disturbance (i.e. Class III). • Pasture Areas established consistent with analogue pasture communities. • Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options.

Figure 7 Conceptual Final Landform and Revegetation



5.3 Rehabilitation Phases

The objective of the final rehabilitated landform is to establish a safe, non-polluting and stable landform that is compatible with the surrounding landscape and that meets the requirements of the post mining land use. The following key rehabilitation phases will be undertaken, including:

- **Stage 1: Decommissioning** – removal of hard stand areas, buildings, contaminated materials, hazardous materials;
- **Stage 2: Landform Establishment** – incorporates gradient, slope, aspect, drainage, substrate material characterisation and morphology;
- **Stage 3: Growth Medium Development** – incorporates physical, chemical and biological components of the growing media and ameliorants that are using to optimise the potential of the media in terms of the preferred vegetative cover;
- **Stage 4: Ecosystem and Land Use Establishment** – incorporates revegetated lands and habitat augmentation; species selection, species presence and growth together with weed and pest animal control /management and establishment of flora;
- **Stage 5: Ecosystem and Land Use Sustainability** – incorporates components of floristic structure, rehabilitation maintenance including subsidence remediation, nutrient cycling recruitment and recovery, community structure and function which are the key elements of a sustainable landscape; and
- **Stage 6: Relinquished Land** – lands that have met the required mine rehabilitation and closure requirements for lease relinquishment.

The rehabilitation phases identified within Primary Domains during the MOP period are outlined in **Plans 3A** to **3C** and summarised in **Table 23**.

Table 23 Rehabilitation Phases During the MOP term

Primary Domains / Rehabilitation Phase	(Domain 1) Mine Infrastructure Areas	(Domain 2) Water Management	(Domain 3) Tailings Emplacement Areas	(Domain 4) Waste Rock Emplacement	(Domain 5) Subsidence Area	(Domain 6) Rehabilitation (Pre MOP)	(Domain 7) North Wambo Creek Diversion	(Domain 8) Active Mining Area	(Domain 9) Future Mining Area	(Domain 10) Coal Handling Preparation Plant
Decommissioning	x	x	✓	x	x	x	x	x	x	x
Landform Establishment	x	x	x	✓	x	x	x	x	x	x
Growth Medium Development	x	x	x	✓	x	x	x	x	x	x
Ecosystem Establishment	x	x	x	✓	x	x	x	x	x	x
Ecosystem and Land Use Sustainability	x	x	x	✓	✓	✓	✓	x	x	x
Relinquished Lands	x	x	x	x	x	x	x	x	x	x

6.0 Performance Indicators and Completion Criteria

WCPL have prepared the following rehabilitation tables to address each rehabilitation phase during the MOP term as identified in **Table 23**. The rehabilitation tables provide the preliminary performance indicators and criteria to achieve the rehabilitation objectives applicable to each domain.

Although no decommissioning of infrastructure (other than decommissioning activities associated with Domain 3), is currently scheduled to occur during the MOP term, **Table 24** provides the appropriate performance indicators and criteria should WCPL require decommissioning of infrastructure during the term of the MOP in Domain 1 and Domain 2.

Landform establishment, growth medium development, ecosystem and land use establishment activities during the MOP term will primarily be undertaken in Domain 4 and Domain H. **Tables 23** to **27** provide the appropriate performance indicators and criteria applicable within Domain 4 during the MOP term. However, should areas within other Domains be identified for rehabilitation during the MOP term, these performance indicators and criteria will also apply.

Ecosystem and land use and sustainability activities during the MOP term will primarily be undertaken in Domain 4, Domain 5, Domain 6 and Domain 7. The objectives, indicators and completion criteria for each rehabilitation phase are specified in following tables:

- Decommissioning Phase – **Table 23**;
- Landform Establishment Phase – **Table 24**;
- Growth Medium Development Phase – **Table 25**;
- Ecosystem and Land Use Establishment Phase – **Table 26**; and
- Ecosystem and Land Use Sustainability Phase – **Table 27**.

WCPL have not identified areas within the mining lease that will be subject to relinquishment during the MOP term. As mining activities at WCPL are scheduled to continue past the MOP period and the Mine has an approved mine life until 2039, there will be no areas subject for lease relinquishment at the end of the MOP term. Therefore no Relinquishment Land Phase table has been developed for this MOP.

Further details regarding the rehabilitation activities during the MOP term are provided in **Section 7.0** and Appendix 4 of this MOP.

WCPL have developed preliminary completion criteria and indicators for each domain and rehabilitation phase. In consultation with the ~~DRG~~ RR, the preliminary completion criteria and associated rehabilitation tables will be reviewed and refined throughout this MOP period. The refinement of the criteria will involve, but not limited to, results from research and rehabilitation trials and monitoring results from the various monitoring programs and proposed monitoring programs as outlined in **Section 8.0**.

Where relevant, the performance indicators and preliminary completion criteria have been based on monitoring results collected from selected reference sites representative of the proposed post-mining land use for that domain (e.g. woodland corridors and pasture areas).

The refinement of the completion criteria during the MOP term will be utilised to quantitatively demonstrate the progress and ultimate rehabilitation success throughout the life of the mine.

The rehabilitation objectives and final landuse for the Kharlibe property are different to the rest of the rehabilitation areas. As a result, performance indicators and completion criteria are also different and specified within Section 10.1 of Appendix 4.

Table 24 Rehabilitation Performance Indicators and Completion Criteria – Decommissioning Phase

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
Rehabilitation Phase - Decommissioning						
Domain 1 (Infrastructure), Domain 10 (Coal Handling Preparation Plant)						
All infrastructure is removed that is not required post closure. All hazardous materials and contaminated materials removed. Entrances and shafts to underground mine workings sealed and made safe. Domain does not present a greater safety hazard than surrounding land.	Removal of services	All redundant services (including electrical, water and communication services) have been disconnected and removed.	Condition 94, Schedule 4 of DA305-7-2003. *Table 18 Rehabilitation Objectives* Volume 1 - 2003 Project EIS: Section 5.7 *Mine Closure and Lease Relinquishment*	No	15	Ongoing Operations
	Removal of infrastructure	All redundant infrastructure (including all buildings, fixed plant and other infrastructure with no beneficial use at mine closure) has been demolished and removed from site.		No		Ongoing Operations
	Removal of roads and car parks	Removal of hardstand areas, car parks, concrete footings and roadways (with no beneficial use) at post mining has been completed.	Section 6.3 Conceptual Mine Closure Plan	No		Ongoing Operations
	Removal of carbonaceous material	All carbonaceous material on the surface has been removed and disposed on-site within appropriate coarse reject emplacement areas.	Section 6.3 Conceptual Mine Closure Plan	No		Ongoing Operations
	Removal of hazardous materials	All hazardous materials have been ~~have been~~ classified in accordance with the EPA's *Waste Classification Guidelines* and removed from site.	Section 6.3 Conceptual Mine Closure Plan	No		Ongoing Operations
	Removal of wastes	All wastes generated during decommissioning have been classified in accordance with the EPA's *Waste Classification Guidelines*, and have been disposed and/or removed from site.	Section 6.3 Conceptual Mine Closure Plan	No		Ongoing Operations
	Land contamination	All land contamination assessments have been completed and all identified contaminated sites have been successfully remediated and verified by contamination specialists reports.	Section 6.3.Conceptual Mine Closure Plan	No		Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Seal underground portals	All underground portals have been sealed in accordance with with the requirements of *MDG6001 (Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams).*	*MDG6001 Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams (February 2012)* - Mine Safety Operations NSW Trade & Investment).	No		Ongoing operations
	Seal ventilation shafts	All underground mine ventilation shafts have been sealed in accordance with *MDG6001 (Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams).*		No		Ongoing operations
	Management of mine water	All water discharged from site meets relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529.	Section 6.3 Conceptual Mine Closure Plan EPL 529	No	12	Ongoing Operations
	Signs of spontaneous combustion	No spontaneous combustion evident at mine closure and during decommissioning.	Section 7.0 Conceptual Mine Closure Plan	No	6	Ongoing Operations
Domain 2 (Water Management)						
All infrastructure is removed that is not required post closure. All hazardous materials and contaminated materials removed. Domain does not present a greater safety hazard than surrounding land.	Removal of services	All redundant services have been disconnected and removed.	Condition 94, Schedule 4 of DA305-7-2003. *Table 18 Rehabilitation Objectives* Volume 1 - 2003 Project EIS: Section 5.7 *Mine Closure and Lease Relinquishment* Volume 1 - Section 6.1.3 Project 2003 EIS (Mine Closure Plan) Section 6.3 Conceptual Mine Closure Plan	No	15	Ongoing Operations
	Removal of infrastructure	All redundant infrastructure (including pumps, pontoons and pipelines) have been removed.		No	15	Ongoing Operations
	Dewater mine water dams	All mine water dams that are not required at post-closure have been completely dewatered.		No	15	Ongoing Operations
	Removal of contaminates	Removal of contaminated sediments from mine water dams has been completed. Removal of contaminated sediments verified in contamination specialists reports.		No	15	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Reshape mine water dam	Reshaping of mine water dams to their intended post mining use has been completed.		No	15	Ongoing Operations
	Management of mine water	All water discharged from site meets relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529.	Section 6.3 Conceptual Mine Closure Plan EPL 529	No	12	Ongoing Operations
Domain 3 (Tailings Emplacement)						
All infrastructure is removed that is not required post closure. All hazardous materials and contaminated materials removed. Domain does not present a greater safety hazard than surrounding land.	Removal of services	All redundant services have been disconnected and removed.	Condition 94, Schedule 4 of DA305-7-2003. *Table 18 Rehabilitation Objectives*	No	15	Ongoing Operations
	Removal of infrastructure	All redundant infrastructure has been removed.	Volume 1 - 2003 Project EIS: Section 5.7 *Mine Closure and Lease Relinquishment*	No	15	Ongoing Operations
	Removal of supernatant water	Dewatering (where necessary) of remaining surface water above tailings has been completed.	Volume 1 - Section 6.1.3 Project 2003 EIS (Mine Closure Plan)	No	15	Ongoing Operations
	Desiccation of tailings	Desiccation of tailings completed and permits a trafficable surface. Confirmation of trafficable surface verified in geotechnical reports.	*Work Health and Safety (Mines) Regulation 2014 [NSW] Schedule 3 High risk activities.*	No	15	Ongoing Operations
	Signs of spontaneous combustion	No spontaneous combustion evident during decommissioning.	Section 5.6 Conceptual Mine Closure Plan	No	6	Ongoing Operations
	Management of mine water	All water discharged from site meets relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529.	Section 6.3 Conceptual Mine Closure Plan EPL 529	No	12	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
Domain 4 (Waste Rock Emplacement Areas), Domain 5 (Subsidence Area), Domain 6 (Rehabilitation Pre-MOP), Domain 8 (Active Mining Area), Domain 9 (Future Mining)						
All infrastructure is removed that is not required post closure. All hazardous materials and contaminated materials removed. Domain does not present a greater safety hazard than surrounding land.	Removal of services	All redundant services have been disconnected and removed.	Condition 94, Schedule 4 of DA305-7-2003. *Table 18 Rehabilitation Objectives* Volume 1 - 2003 Project EIS: Section 5.7 *Mine Closure and Lease Relinquishment*	No	15	Ongoing Operations
	Removal of infrastructure	All redundant infrastructure has been removed.		No	15	Ongoing Operations
	Removal of carbonaceous material	All carbonaceous material on the surface has been removed and disposed on-site within appropriate coarse reject emplacement areas.	Section 6.3 Conceptual Mine Closure Plan	No		Ongoing Operations
	Signs of spontaneous combustion	No spontaneous combustion evident during decommissioning.	Section 6.3 Conceptual Mine Closure Plan	No	6	Ongoing Operations
	Subsidence cracking	No subsidence surface cracks remaining that present a risk to the environment, safety and the final land use objectives.	Section 5.11 Conceptual Mine Closure Plan	No	14	Ongoing Operations
	Management of mine water	All water discharged from site meets relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529.	Section 6.3 Conceptual Mine Closure Plan EPL 529	No	12	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
Domain 7 (North Wambo Creek Diversion)						
All infrastructure is removed that is not required post closure. All hazardous materials and contaminated materials removed. Domain does not present a greater safety hazard than surrounding land.	Removal of services	All redundant services have been disconnected and removed.	Section 6.3 Conceptual Mine Closure Plan	No	15	Ongoing Operations
	Removal of infrastructure	All redundant infrastructure has been removed.	Section 6.3 Conceptual Mine Closure Plan	No	15	Ongoing Operations
	Management of surface water	Water quality discharged from diversion meets water quality trigger values for North Wambo Creek, under normal flow conditions, as provided in the SWMP.	Section 6.4 Conceptual Mine Closure Plan Surface Water Monitoring Program	No	12	Ongoing Operations

Table 25 Rehabilitation Performance Indicators and Completion Criteria – Landform Establishment Phase

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
Rehabilitation Phase – Landform Establishment						
Domain 1 (Infrastructure), Domain 4 (Waste Rock Emplacement Areas), Domain 8 (Active Mining Area), Domain 9 (Future Mining), Domain 10 (Coal Handling Preparation Plant)						
All hazardous materials and contaminated materials removed. Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. Mined land will be re-contoured to a landform compatible with the surrounding natural landscape. Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses. Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape.	Waste rock material characterisation	Material characterisation of the final land form surface (to identify appropriate soil ameliorants and application rates) has been completed.	Volume 1 - Section 5.3 of the Project 2003 EIS (Final Landform Design Concepts)	No	4	Ongoing Operations
	Application of ameliorants	Application of appropriate soil ameliorants applied (at specified rates) has been completed.	Section 5.6 Conceptual Mine Closure Plan	No	4	Ongoing Operations
	pH	Soil pH (H_2O) range: pH 5.5 – pH 7.8	Volume 4, Appendix G Tailings Management Project 2003 EIS *Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	4	Ongoing Operations
	Electrical conductivity (EC)	Soil EC (H_2O) ≤1200 µS/cm		No	4	Ongoing Operations
	Coarse rejects capped	Coarse rejects capped with a minimum of 2m of inert overburden material.	Volume 1 - Section 5 Rehabilitation, Project EIS 2003	No	6	Ongoing Operations
	Coarse rejects on surface	No coarse rejects within the waste rock emplacement areas to be within 2m of the final landform surface RL.	Volume 1 - Section 5 Rehabilitation, Project EIS 2003	No	6	Ongoing Operations
	Large rocks on surface	Rock racking of the final landform completed to remove rocks >200mm in diameter.	*Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	6	Ongoing Operations
	Slope gradients	No greater than1:6 (10 degrees or 17%) across the entire ML area (unless otherwise agreed by ~~DRG~~ RR).	Volume 1 - Section 5 Rehabilitation, Project EIS 2003	No	8	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Slope lengths	Slope length within range of 50 m – 80 m (subject to slope gradient)	*Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	7	Ongoing Operations
	Landform stability	No slumping evident.	*Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	6	Ongoing Operations
	Final landform height	Final landform height ≤160 m AHD.	Volume 1 - Section 5.3 of the Project 2003 EIS (Final Landform Design Concepts)	No	8	Ongoing Operations
	Slope shape (Preferred Profile)	Mine waste rock emplacement slopes constructed to form an 'S' shape with the upper nominally at 20 to 30% being convex and the lower 70 to 80% being concave.	Volume 1 - Section 5 Rehabilitation, Project EIS 2003	No	8	Ongoing Operations
	Slope shape (Profile design when external features limit the Preferred Profile)	Mine waste rock emplacement slopes constructed with a "back-sloped bench', approximately 4 m wide, constructed on the contour approximately mid-point of the slope.	Section 5.6 Conceptual Mine Closure Plan	No	8	Ongoing Operations
	Drainage designs	Drainage lines with <3% fall have been appropriately armoured.	Volume 1 - Section 5.3 of the Project 2003 EIS (Final Landform Design Concepts)	No	6	Ongoing Operations
	Landform drainage	Reinstatement of natural drainage patterns (where possible).	Volume 1 - Section 5 Rehabilitation, Project EIS 2003	No	6	Ongoing Operations
	Signs of spontaneous combustion	No spontaneous combustion evident during decommissioning.	Section 6.3 Conceptual Mine Closure Plan	No	6	Ongoing Operations
	Acid mine drainage (AMD)	No evidence of AMD.	Appendix G of Project EIS 2003 Waste Rock and CHPP Rejects/Tailings Management	No	6	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan Erosion and Sedimentation Control Plan	No	13	Ongoing Operations
	Management of mine water	Water runoff is contained and managed within internal water management system. No water discharged from site, unless relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529 can be achieved.	Section 6.3 Conceptual Mine Closure Plan EPL 529	No	12	Ongoing Operations
Domain 2 (Water Management)						
Preservation of existing beneficial use of water resources. Provide a self-sustaining land form post mine closure. Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses.	Dam dewatering	Mine water from dam returned to mine water system.	Volume 1 - Section 5.3 of the Project 2003 EIS (Final Landform Design Concepts) Section 6.3 Conceptual Mine Closure Plan	No	15	Ongoing Operations
	Contaminates removal	Contaminates removed from dam and placed within open cut voids is completed.		No	15	Ongoing Operations
	Dam reshaping	Re-shaping dams (where required) in accordance with their intended use completed.		No	15	Ongoing Operations
	Material characterisation	Material characterisation of the final land form surface (to identify appropriate soil ameliorants and application rates) has been completed.		No	4	Ongoing Operations
	Application of ameliorants	Application of appropriate soil ameliorants applied (at specified rates) has been completed.		No	3	Ongoing Operations
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan Erosion and Sedimentation Control Plan	No	13	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Management of mine water	Water runoff is contained and managed within internal water management system. No water discharged from site, unless relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529 can be achieved.	Section 6.3 Conceptual Mine Closure Plan EPL 529	No	12	Ongoing Operations
Domain 3 (Tailings Emplacement)						
All hazardous materials and contaminated materials removed. Design of capping to prevent soil erosion and exposure to tailings material beneath. Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land. Mined land will be re-contoured to a landform compatible with the surrounding natural landscape.	Tailings capping	Tailings capped with 2m to 5m (subject to final design requirements) of inert overburden material.	Approvals granted under *Work Health and Safety (Mines) Regulation 2014 [NSW] Schedule 3 High risk activities* Section 5.10 Conceptual Mine Closure Plan	No	5	Ongoing Operations
	Capping drainage	Capping layer has been designed to allow for surface water runoff, with slope grades of <1%.		No	5	Ongoing Operations
	Capping landform	Capping layer has been re-profiled and is compatible with the local surrounding landscape.	Volume 1 - Section 5 of the Project 2003 EIS (Final Landform Design Concepts	No	5	Ongoing Operations
	Material characterisation	Material characterisation of the final land form surface (to identify appropriate soil ameliorants and application rates) has been completed.	Volume 1 - Section 5.3 of the Project 2003 EIS (Final Landform Design Concepts) Section 5.6 Conceptual Mine Closure Plan	No	4	Ongoing Operations
	Application of ameliorants	Application of appropriate soil ameliorants applied (at specified rate) has been completed.		No	4	Ongoing Operations
	pH	Soil pH (H_2O) range: pH 5.5 – pH 7.8	Volume 4, Appendix G Tailings Management Project 2003 EIS *Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	4	Ongoing Operations
	Electrical conductivity (EC)	Soil EC (H_2O) ≤1200 µS/cm		No	4	Ongoing Operations
	Spontaneous combustion	No spontaneous combustion evident at mine closure and during landform establishment.	Section 6.3 Conceptual Mine Closure Plan	No	6	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan Erosion and Sedimentation Control Plan	No	13	Ongoing Operations
	Management of mine water	Water runoff is contained and managed within internal water management system. No water discharged from site, unless relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529 can be achieved.	Section 6.3 Conceptual Mine Closure Plan EPL 529	No	12	Ongoing Operations
Domain 5 (Subsidence Area)						
Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options. All watercourses subject to subsidence impacts shall be hydraulically and geomorphologically stable.	Subsidence cracking	No subsidence surface cracks remaining that present a risk to the environment, safety and the final land use objectives. Remediation of surface cracks >50 mm.	Section 5.11 Conceptual Mine Closure Plan SBU Extraction Plan LW11-16 Appendix 4 - Kharlibe Subsidence Remediation Plan	No	14	Ongoing Operations
	Creek stability	Creeks affected by subsidence have been repaired and their functionality and stability has been confirmed by a hydrological engineer (or equivalent).	DA305-7-2003	No	14	Ongoing Operations
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Groundcover is >60%. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan SBU Extraction Plan LW11-16 Erosion and Sedimentation Control Plan	No	13	Ongoing Operations
Domain 6 (Rehabilitation Pre-MOP), Domain D (Rehabilitation – Mixed Pasture/Woodland), Domain E (Rehabilitation – Woodland Corridors), Domain H (Rehabilitation Pasture)						
Land capability returned to a class similar to that existing prior to disturbance (i.e. Class III).	Subsidence cracking	No subsidence surface cracks remaining that present a risk to the environment, safety and the final land use objectives.	Section 5.11 Conceptual Mine Closure Plan	No	14	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options.	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan Erosion and Sedimentation Control Plan	No	13	Ongoing Operations
Domain 7 (North Wambo Creek Diversion)						
Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options. All watercourses subject to subsidence impacts shall be hydraulically and geomorphologically stable. Rehabilitated land will be geotechnically stable and will not present a greater safety hazard than surrounding land Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses.	Management of surface water	Water quality discharged from diversion meets water quality trigger values for North Wambo Creek under normal flow conditions, as provided in the SWMP.	Section 6.4 Conceptual Mine Closure Plan Surface Water Monitoring Program	No	12	Ongoing Operations
	Subsidence cracking	No subsidence surface cracks remaining that present a risk to the environment, safety and the final land use objectives. Remediation of surface cracks >50 mm.	Section 5.11 Conceptual Mine Closure Plan	No	14	Ongoing Operations
	Creek stability	Creeks affected by subsidence have been repaired and their functionality and stability has been confirmed by a hydrological engineer (or equivalent). Remediation of all visible surface cracks in the low flow channel as soon as practicable.	DA305-7-2003 SBU Extraction Plan LW11-16	No	14	Ongoing Operations
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Groundcover is >60%. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan SBU Extraction Plan LW11-16 Erosion and Sedimentation Control Plan	No	13	Ongoing Operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
Domain F (Final Void)						
All hazardous materials and contaminated materials removed. All infrastructure removed that is not required post closure. Provide a self-sustaining land form post mine closure. Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of downstream watercourses.	Surface water management	Surface water inflows to the final voids have been minimised through appropriate land forming and water management structures.	Volume 1, Section 5.3.4 Project EIS 2003 (Final Voids) Volume 1, Section 6.1.3 Project EIS 2003 (Mine Closure Plan) Final Void Management Plan[39] **NOTE: To be updated in revised CMCP.**	No	16	Ongoing Operations
	Geotechnically stable	Final voids have been geotechnically designed and profiled for long term stability.		No	16	Ongoing Operations
	Perimeter bunding	Perimeter bunding has been formed around final voids to reduce the risk for all flood events.		No	16	Ongoing Operations
	Safety fencing	Safety fencing erected to limit public access to voids		No	16	Ongoing Operations
	Carbonaceous material	No exposed carbonaceous materials remaining in the final void floor.		No	16	Ongoing Operations
	Covered coal seams	Coal seams sufficiently backfilled with overburden material so no coal seams are exposed in accordance with Final Void Management Plan.		No	16	Ongoing Operations
	Void design	Final void design in accordance with the Final Void Management Plan.		No	16	Ongoing Operations

Table 26 Rehabilitation Performance Indicators and Completion Criteria – Growth Medium Development Phase

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
Rehabilitation Phase – Growth Medium Development Phase						
Domain 1 (Infrastructure), Domain 3 (Tailings Emplacement Areas), Domain 4 (Waste Rock Emplacement Areas), Domain 8 (Active Mining), Domain 9 (Future Mining), Domain 10 CHPP						
All hazardous materials and contaminated materials removed. Provide a growth medium that is suitable for the establishment and maintenance of the selected revegetation species to achieve the final land use. Provide a growth medium that has physical and chemical properties comparable with reference sites. Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and/or VI).	Topsoil depth	Topsoil has been applied at a minimum of approximately 100mm thickness in all areas and/or otherwise been achieved with the addition of humus/compost material to form a topsoil/composite mix.	Volume 1 - Section 5 Rehabilitation, Project EIS 2003 *Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	1	Ongoing operations
	Topsoil characterisation	Topsoil characterisation of the final land form surface (to identify appropriate soil ameliorants and application rates) has been completed.			3	
	Topsoil (pH)	Soil pH (H_2O) range: pH 5.5 – pH 7.8	Appendix G Project EIS 2003 (Waste Rock and CHPP Rejects and Tailings Management) *Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009) *Hazelton, P.A., Murphy, B.W. (1992); A Guide for t e Interpretation of Soil Test Results, NSW Dept Conservation and Land Management.*	No	3	Ongoing operations
	Topsoil Electrical conductivity (EC)	Soil EC (H_2O) ≤1200 µS/cm			3	
	Topsoil (Phosphorous)	**Phosphate Test Method** / **Productive Pasture** / **Native Vegetation** Colwell / 20-40 mg/kg / 10-20 mg/kg Bray / 12-22 mg/kg / 6-12 mg/kg			3	
	Topsoil (Organic Carbon)	Organic Matter % (g/100g) >3%			3	
	Application of ameliorants	Application of appropriate soil ameliorants (at specified rate) has been completed.	Volume 1 - Section 5 Rehabilitation, Project EIS 2003 *Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	3	Ongoing operations
	Topsoil ripping	Ripping has been carried out to an approximate depth of 300 mm to 500 mm on the contour. Full and continuous ripping has been undertaken between rip lines.			1	

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Topsoil stockpile	Stockpiles which are to be inactive for extended periods have been fertilised and seeded with annual cover crop and/or preferred native pasture species (**Table 17**).	Volume 1 - Section 5 Rehabilitation, Project EIS 2003 *Rehabilitation Standards for Wambo Coal* (Global Soil Systems, February 2009)	No	2	Ongoing operations
	Topsoil stockpile signage	Once constructed, the topsoil stockpiles have been signposted. Barriers constructed if necessary.			2	
	Topsoil stockpile location	No topsoil stockpiles are to be placed in the invert of drainage lines or drainage works.			2	
	Exotic cover	Biometric monitoring confirms exotic cover <33%.	Biodiversity Management Plan	No	11	Ongoing operations
	Management of mine water	Water runoff is contained and managed within internal water management system. No water discharged from site, unless relevant volumes and quality as specified by Environment Protection Licence (EPL) No. 529 can be achieved.	Erosion and Sediment Control Plan (ESCP) EPL 529	No	12	Ongoing operations
	Water quality	Water quality discharged from diversion meets water quality trigger values for North Wambo Creek under normal flow conditions, as provided in the SWMP.	Surface Water Monitoring Program	No	12	Ongoing operations
	Spontaneous combustion	No spontaneous combustion evident.	Section 6.3 Conceptual Mine Closure Plan	No	6	Ongoing Operations
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan Erosion and Sedimentation Control Plan	No	13	Ongoing operations

Table 27 Rehabilitation Performance Indicators and Completion Criteria – Ecosystem and Land Use Establishment Phase

<table>
<tr><th>Objectives</th><th>Performance Indicator</th><th>Completion Criteria</th><th>Justification</th><th>Complete (Yes/No)</th><th>TARP Ref No#</th><th>Progress at start of MOP</th></tr>
<tr><td colspan="7">Rehabilitation Phase – Ecosystem and Land Use Establishment Phase</td></tr>
<tr><td colspan="7">Domain 1 (Infrastructure), Domain 3 (Tailings Emplacement Areas), Domain 4 (Waste Rock Emplacement Areas), Domain 7 (North Wambo Creek Diversion), Domain 8 (Active Mining), Domain 9 (Future Mining), Domain 10 CHPP, Domain D (Mixed Woodland/Pasture Areas), Domain E (Woodland Corridors)</td></tr>
<tr><td rowspan="3">Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and Class VI)
Mixed Woodland/Pasture Areas established consistent with revegetation strategy.
Woodland Corridor Areas established consistent with revegetation strategy.
Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform geotechnical integrity or increasing pollution of</td><td>Ground cover</td><td>Minimum 70% of area has a vegetative cover.
No single bare area <20m^2</td><td>Erosion and Sediment Control Plan</td><td>No</td><td>11</td><td>Ongoing operations</td></tr>
<tr><td>Habitat Augmentation</td><td>Where appropriate and practical salvaged tree hollows, timber logs etc will be incorporated into the final landform to augment the habitat value.</td><td>Volume 1 - Section 5 Rehabilitation , Project EIS 2003</td><td>No</td><td>17</td><td>Ongoing operations</td></tr>
<tr><td>LFA (Woodland Rehabilitation)
LFA (Pasture/ Woodland)
LFA (Riparian)</td><td>A colour system in the BMP highlights the performance of each LFA site within each rehabilitation area.
<table>
<tr><th>Green</th><th>Yellow</th><th>Orange</th><th>Red</th></tr>
<tr><td>Area is generally meeting or exceeding target values and values do not show trend of decline over time – where monitoring sites are meeting targets and values are relatively consistent, reduce monitoring to infrequent LFA when changes in landscape or management practices occur i.e. fire or grazing)</td><td>Area generally falls below target values but within 75% of targets or appears to be on a trajectory of improvement without the need for management intervention – further monitoring required</td><td>Area generally falls between 75% and 50% of target values or shows little sign of improvement over several monitoring events – further monitoring and possibly management actions required</td><td>Area falls below 50% of target and is unlikely to improve without management actions or shows trend of decline which is unlikely to improve without management actions</td></tr>
</table></td><td>Tongway, D.J. and Hindley, N.L.,2004. Landscape function analysis. Procedures for monitoring and assessing landscapes. CSIRO Sustainable</td><td>No</td><td>10</td><td>Ongoing operations</td></tr>
</table>

<table>
<tr><th>Objectives</th><th>Performance Indicator</th><th>Completion Criteria</th><th>Justification</th><th>Complete (Yes/No)</th><th>TARP Ref No#</th><th>Progress at start of MOP</th></tr>
<tr><td rowspan="4">downstream watercourses.
Soil properties are suitable for the establishment and maintenance of selected vegetation species
Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park.
Pasture Areas established consistent with analogue pasture communities.
Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options.</td><td></td><td>Target scores were developed to provide quantitative measures that can be used to compare rehabilitation areas with reference sites throughout the course of the monitoring program. These scores were developed using the baseline data and data from nearby sites within relatively undisturbed riparian habitat. Target scores are provided in below, along with the average scores from the 2015 baseline monitoring program
<table>
<tr><th>Site Type</th><th></th><th>LOI</th><th>SI</th><th>INFI</th><th>NI</th></tr>
<tr><td rowspan="2">Woodland Rehabilitation</td><td>Average Score</td><td>0.77</td><td>56.58</td><td>40.43</td><td>33.95</td></tr>
<tr><td>Target Score</td><td>>0.87</td><td>>59</td><td>>43</td><td>>36</td></tr>
<tr><td rowspan="2">Pasture Rehabilitation</td><td>Average Score</td><td>0.84</td><td>60.03</td><td>38.64</td><td>31.86</td></tr>
<tr><td>Target Score</td><td>>0.93</td><td>>61</td><td>>29</td><td>>25</td></tr>
<tr><td rowspan="2">North Wambo Creek Diversion</td><td>Average Score</td><td>0.56</td><td>53.26</td><td>28.76</td><td>19.34</td></tr>
<tr><td>Target Score</td><td>>0.84</td><td>>62</td><td>>41</td><td>>37</td></tr>
<tr><td rowspan="2">Wambo Creek</td><td>Average Score</td><td>0.67</td><td>52.3</td><td>45.0</td><td>29.6</td></tr>
<tr><td>Target Score</td><td>>0.84</td><td>>62</td><td>>41</td><td>>37</td></tr>
</table>
The ongoing use of LFA will be result-based, with achievement of a self-sustaining stable landform no longer requiring further monitoring.</td><td>Ecosystems, Canberra.

Biodiversity Management Plan</td><td rowspan="3">No</td><td rowspan="3">10</td><td rowspan="3">Ongoing operations</td></tr>
<tr><td>Exotic cover</td><td>Biometric monitoring confirms exotic cover <33%.</td><td>Biodiversity Management Plan</td></tr>
<tr><td>Management of mine water</td><td>Water runoff is contained and managed within internal water management system. No water discharged from site, unless relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529 can be achieved.</td><td>Erosion and Sediment Control Plan (ESCP)
EPL 529</td><td>No</td><td>12</td><td>Ongoing operations</td></tr>
<tr><td></td><td>Water quality</td><td>Water quality discharged from diversion meets water quality trigger values for North Wambo Creek under normal flow conditions, as provided in the SWMP.</td><td>Surface Water Monitoring Program</td><td>No</td><td>12</td><td>Ongoing operations</td></tr>
</table>

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Spontaneous combustion	No spontaneous combustion evident.	Section 6.3 Conceptual Mine Closure Plan	No	6	Ongoing Operations
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan Erosion and Sedimentation Control Plan	No	13	Ongoing operations

Table 28 Rehabilitation Performance Indicators and Completion Criteria – Ecosystem and Land Use Stability Phase

<table>
<tr><th>Objectives</th><th>Performance Indicator</th><th>Completion Criteria</th><th>Justification</th><th>Complete (Yes/No)</th><th>TARP Ref No#</th><th>Progress at start of MOP</th></tr>
<tr><td colspan="7">Rehabilitation Phase – Ecosystem and Land Use Establishment Phase</td></tr>
<tr><td colspan="7">Domain 1 (Infrastructure), Domain 3 (Tailings Emplacement Areas), Domain 4 (Waste Rock Emplacement Areas), Domain 7 (North Wambo Creek Diversion), Domain 8 (Active Mining), Domain 9 (Future Mining), Domain 10 CHPP, Domain D (Mixed Woodland/Pasture Areas), Domain E (Woodland Corridors)</td></tr>
<tr>
<td>Land capability returned to a class similar to that existing prior to the commencement of mining (i.e. Class V and Class VI)
Mixed Woodland/ Pasture Areas established consistent with revegetation strategy.
Woodland Corridor Areas established consistent with revegetation strategy.
Rehabilitated landforms will be designed to shed water safely without causing excessive erosion, jeopardising landform</td>
<td>LFA (Woodland Rehabilitation)

LFA (Pasture/ Woodland)

LFA (Riparian)</td>
<td>A green, yellow, orange and red colour system has been developed to rank each measured attribute according to the performance and management actions required. This colour ranking system is shown below. The number of hollow-bearing trees and length of fallen logs have been presented as a measure of fauna habitat attributes. However no performance criteria has been set for these attributes in remnant vegetation, as in some cases it may take many years (50+) for a suitable density of hollows and logs to form naturally.
<table>
<tr><th>Site Attribute</th><th>Red (needs greater improvement)</th><th>Orange (in need of improvement)</th><th>Yellow (Not meeting target but values still acceptable)</th><th>Green (Excellent – within target range)</th></tr>
<tr><td>Native Plant Species Richness (NPS)</td><td>0-10%</td><td>>10-<50% of target range</td><td>50-<100% of target range</td><td>≥ target range</td></tr>
<tr><td>Native Overstorey Cover (NOS)</td><td>0-10% or >200% of target range</td><td>>10-<50% or >150-200% of target range</td><td>50-<100% or >100-150% of target range</td><td>Within target range</td></tr>
<tr><td>Native Midstorey Cover (NMS)</td><td>0-10% or >200% of target range</td><td>>10-<50% or >150-200% of target range</td><td>50-<100% or >100-150% of target range</td><td>Within target range</td></tr>
<tr><td>Native Ground Cover – grasses (NGCG)</td><td>0-10% or >200% of target range</td><td>>10-<50% or >150-200% of target range</td><td>50-<100% or >100-150% of target range</td><td>Within target range</td></tr>
<tr><td>Native Ground Cover – shrubs (NGCS)</td><td>0-10% or >200% of target range</td><td>>10-<50% or >150-200% of target range</td><td>50-<100% or >100-150% of target range</td><td>Within target range</td></tr>
<tr><td>Native Ground Cover – other (NGCO)</td><td>0-10% or >200% of target range</td><td>>10-<50% or >150-200% of target range</td><td>50-<100% or >100-150% of target range</td><td>Within target range</td></tr>
<tr><td>Proportion of native overstorey species regenerating (OR) in vegetation zone</td><td>0</td><td>0-0.5</td><td>0.5-1</td><td>1</td></tr>
<tr><td>Exotic plant cover (EPC)</td><td>>66%</td><td>33-66%</td><td>5-33%</td><td>0-5%</td></tr>
</table>
</td>
<td>WCPL's Completion Criteria and monitoring program has been developed based on the Biometric (Gibbons et al 2009)

Biodiversity Management Plan</td>
<td>No</td>
<td>10</td>
<td>Ongoing operations</td>
</tr>
</table>

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
geotechnical integrity or increasing pollution of downstream watercourses. Soil properties are suitable for the establishment and maintenance of selected vegetation species Establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park; Pasture Areas established consistent with analogue pasture communities. Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land or present a risk to future final land use options		Completion criteria for seven Plant Community Types (PCT) present within the RWEP areas has been developed considering both the baseline data collected during the 2014/2015 monitoring program and OEH benchmark values for each PCT . This criterion is included below, along with the average value calculated from the site value scores for each monitoring plot within the PCT.	WCPL's Completion Criteria and monitoring program has been developed based on the Biometric (Gibbons et al 2009) Biodiversity Management Plan	No	9	Ongoing operations

Plant Community Type (PCT)		NPS	NOS (%)	NMS (%)	NGC G	NGC S	NGC O	EPC	OR	HBT	FL
PCT 42: River Red Gum / River Oak riparian woodland wetland in the Hunter Valley	Average Value	14.3	15.3	14.5	28.9	1.1	6.9	38.3	1	0	14.9
	Benchmark Value	38	10-50	10-50	20-60	1-5	10-30	<5	1	0.1	10
	Completion Criteria	**>20**	**10-50**	**10-50**	**20-60**	**1-5**	**5-30**	**<10**	**1**	**-**	**-**
PCT 1658: Rough barked Apple–Narrow leaved Ironbark-Blakely's Red Gum-Bull Oak–Coast Banksia woodland on sands of the Warkworth area	Average Value	27	11.8	10.8	19.5	3.5	31	10.4	1	1	13.9
	Benchmark Value	26	13-40	10-50	4-15	5-30	5-25	0	1	0.8	20
	Completion Criteria	**>20**	**10-40**	**10-50**	**4-20**	**5-30**	**5-35**	**<10**	**1**	**-**	**-**
PCT 1603: Narrow leaved Ironbark – Bull Oak - Grey Box shrub- grass open forest of the central and lower Hunter	Average Value	29	13.8	9.2	26	7.4	4	0.2	1	0.7	26.35
	Benchmark Value	41	15-40	5-10	30-50	5-10	20-40	<5	1	3	5
	Completion Criteria	**>25**	**10-40**	**5-10**	**15-50**	**5-10**	**5-40**	**<5**	**1**	**-**	**-**

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP

Plant Community Type (PCT)		NPS	NOS (%)	NMS (%)	NGC G	NGC S	NGC O	EPC	OR	HBT	FL
PCT1604: Narrow leaved Ironbark – Grey Box - Spotted Gum shrub - grass of the central and lower Hunter		35	22.5	7.2	34	8	5.3	0	1	0	35.3
PCT1604: Narrow leaved Ironbark – Grey Box - Spotted Gum shrub - grass of the central and lower Hunter	Benchmark Value	41	15-40	5-20	30-50	5-10	20-40	<5	1	3	5
	Completion Criteria	**>35**	**15-40**	**5-20**	**30-50**	**5-15**	**5-40**	**<5**	**1**	**-**	**-**
	Average Value	31	12.1	11.6	23.5	3	6	0	1	0	26
PCT1176: Slaty Box – Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion	Benchmark Value	21	19-42	6-24	5-20	0-25	2-10	<5	1	1	30
	Completion Criteria	**21**	**15-40**	**5-30**	**5-30**	**0-25**	**2-10**	**<5**	**1**	**-**	**-**
PCT1176: Slaty Box – Grey Gum shrubby woodland on footslopes of the upper Hunter Valley, Sydney Basin Bioregion PCT 1584: White Mahogany – Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley	Average Value	50	10.5	19	70	16	8	0	1	0	25

Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
WCPL's Completion Criteria and monitoring program has been developed based on the Biometric (Gibbons et al 2009) Biodiversity Management Plan	No	9	Ongoing operations

Objectives	Performance Indicator	Completion Criteria											Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
		Plant Community Type (PCT)		**NPS**	**NOS (%)**	**NMS (%)**	**NGC G**	**NGC S**	**NGC O**	**EPC**	**OR**	**HBT**	**FL**				
		PCT 1584: White Mahogany – Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley PCT 1603: Narrowleaved Ironbark – Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter *	Benchmark Value	51	22-45	5-40	5-25	10-20	5-20	<5	1	1	20				
		PCT 1584: White Mahogany – Spotted Gum - Grey Myrtle semi-mesic shrubby open forest of the central and lower Hunter Valley PCT 1603: Narrowleaved Ironbark – Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter *	**Completion Criteria**	**>45**	**15-45**	**5-40**	**5-40**	**10-20**	**5-20**	**0**	**1**	**-**	**-**				
			Average Value	39	5.5	25.7	40.7	6.7	12.6	4	1	0	12.6				
			Benchmark Value	41	15-40	5-10	30-50	5-10	20-40	<5	1	3	5				
		PCT 1603: Narrowleaved Ironbark – Bull Oak - Grey Box shrub - grass open forest of the central and lower Hunter *	**Completion Criteria**	**>30**	**5-40**	**5-40**	**30-50**	**5-10**	**10-40**	**<5**	**1**	**-**	**-**				

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
		<table><tr><th></th><th>NPS</th><th>NOS (%)</th><th>NMS (%)</th><th>NGCG</th><th>NGCS</th><th>NGCO</th><th>EPC</th><th>OR</th><th>FL</th></tr><tr><td>Older Woodland Rehabilitation on areas with a canopy of Sugar Gum</td><td>>15</td><td>15-40</td><td>5-40</td><td>5-15</td><td>5-10</td><td>5-15</td><td><20</td><td>1</td><td>5</td></tr><tr><td>Rehabilitated areas of Narrow-leaved Ironbark – Bull Oak - Grey Box open forest</td><td>>20</td><td>10-40</td><td>5-10</td><td>15-50</td><td>5-10</td><td>5-40</td><td><20</td><td>1</td><td>-</td></tr></table>	WCPL's Completion Criteria and monitoring program has been developed based on the Biometric (Gibbons et al 2009) Biodiversity Management Plan	No	9	Ongoing operations
	Exotic cover	Biometric monitoring confirms exotic cover <20%.	Biodiversity Management Plan	No	11	Ongoing operations
	Management of mine water	Water runoff is contained and managed within internal water management system. No water discharged from site, unless relevant volumes and quality as specified by Environmental Protection Licence (EPL) No. 529 can be achieved.	Erosion and Sediment Control Plan (ESCP) EPL 529	No	13	Ongoing operations
	Water quality	Water quality discharged from diversion meets water quality trigger values for North Wambo Creek under normal flow conditions, as provided in the SWMP.	Surface Water Monitoring Program	No	13	Ongoing operations
	Spontaneous combustion	No spontaneous combustion evident.	Section 6.3 Conceptual Mine Closure Plan	No	6	Ongoing Operations
	Erosion control	No tunnel erosion evident. No gully erosion evident. No rill erosion >200mm deep and/or >200mm wide. Appropriate erosion controls are in place and effective.	Section 5.6.2 Conceptual Mine Closure Plan Erosion and Sedimentation Control Plan	No	13	Ongoing operations

Objectives	Performance Indicator	Completion Criteria	Justification	Complete (Yes/No)	TARP Ref No#	Progress at start of MOP
	Terrestrial fauna	Fauna monitoring will be used to qualitatively validate BioMetric and LFA monitoring results (i.e. self-sustaining stable landforms and vegetation structure have been successfully recreated or reintroduced and are being inhabited or frequented by local fauna).	Biodiversity Management Plan	No	17	Ongoing operations
	Feral animals	Annual feral animal control program implemented. Ecological monitoring confirms t feral animal control program effective.	Biodiversity Management Plan	No	17	Ongoing operations
	Bushfire management	Mitigation actions have been implemented as required by the Bushfire Management Plan.	Bush Fire Management Plan	No	18	Ongoing operations
	Sustainable Grazing	Monitoring confirms established pasture is able to sustain grazing activities comparable to that of the surrounding remnant pasture areas.	**Section 8.4**	No	TBA	Ongoing operations

7.0 Rehabilitation Implementation

7.1 Status of MOP Commencement

This section describes the status of each domain at the start of this MOP period. This information is also presented graphically in **Plan 2**. The rehabilitation status of domains which are currently active (areas subject to on-going mining operations), are not described in detail.

Mine waste rock emplacements have been progressively re-shaped behind the active mining areas to construct landforms generally consistent with the pre-mining landform surface. Other Project components including areas of tailings emplacements have also been progressively rehabilitated as the area has become available.

Revegetation of completed landforms has been progressively undertaken and has included establishing both woodland and grassland vegetation communities, consistent with the rehabilitation objectives (**Section 4.3**) and post-mining land use (**Section 4.2**). As at 31 December 2017 approximately 599ha of completed landforms have been rehabilitated (**Table 29**).

Table 29 Cumulative Rehabilitation Areas

Revegetation	Final Land Use	Area (Ha)	Performance Criteria Achieved at MOP Commencement
Pasture	Grazing	539	No - ongoing
Woodland	Woodland Corridor	60	No – ongoing
	Total Areas	**599**	

Table 29 provides a summary of the status of activities for the Primary Domains at the commencement of the MOP period. The activity status of the domains include:

- **Active:** Domains subject to on-going mining operations and associated mining activities;
- **Not Active:** Domains not subject to proposed mining operations; and
- **Maintenance*:** Domains subject to rehabilitation monitoring, ecological monitoring and rehabilitation maintenance activities.

Note: There are no domains at the commencement of this MOP term that have met their respective completion criteria. Therefore ongoing management, monitoring and maintenance activities will be ongoing during this MOP term.

Table 30 Primary Domain Mining Activity Status

Domain	Domain Status	Domain Activities
Domain 1 Mine Infrastructure Areas	Active	**Table 8** provides a summary of key assets within Domain 1. The infrastructure in this domain, includes but not limited to haul roads, mine entry road, main workshop, car park, mine administration and bathhouse facilities.
Domain 2 Water Management	Active	**Table 8** provides a summary of assets within Domain 2. This domain is a made up of a number of clean and dirty water dams used by the Mine for operational purposes.

Domain	Domain Status	Domain Activities
Domain 3 Tailings Emplacement	Active	This domain is a made up of active and decommissioned tailings storage facilities. At the commencement of the MOP period there were two tailing facilities in various life stages, including: • North East Tailings Dam (NETD) - Progressive capping of tailings of the NETD will commence in Q2 2019 ~~2018~~ and continue through the MOP term. • Hunter Pit Tailings Dam (HPTD) - Active at the commencement of the MOP until ~~March 2018~~ Q4 2019 when the tailings dam is scheduled to be decommissioned.
Domain 4 Waste Rock Emplacement Areas	Active	This domain is a made up of a number of out of pit and in pit waste rock emplacement areas. Progressive rehabilitation of waste emplacement areas has occurred during the mine life.
Domain 5 Subsidence Areas	Maintenance	Each relevant EP outlines the proposed management, mitigation, monitoring and reporting of potential subsidence impacts and environmental consequences from the secondary extraction of LW7 to LW10a at the NWU Mine, LW11 to LW13 and LW14 to LW16 at the SBU Mine, and LW17 to LW20 at the SBUE Mine. The EP for LW17 to LW20 at the SBUE Mine was approved only for the extraction of LW17 due to identification of geological structures that required the repositioning of the main headings and finishing ends of LW18 to LW20. ~~An EP for SBUE would be prepared prior to secondary extraction.~~
Domain 6 Rehabilitation (Pre MOP)	Maintenance	Revegetation of completed landforms has been progressively undertaken and has included establishing both woodland and grassland vegetation communities, consistent with the rehabilitation objectives and post-mining land use. Rehabilitation activities within this domain during the MOP term will primarily be associated with Ecosystem and Land Use Sustainability.
Domain 7 North Wambo Creek Diversion	Maintenance	Revegetation of completed landforms has been progressively undertaken and has included establishing both woodland and grassland vegetation communities, consistent with the rehabilitation objectives and post-mining land use. Rehabilitation activities within this domain during the MOP term will primarily be associated with Ecosystem and Land Use Sustainability.
Domain 8 Active Mining Area	Active	At the commencement of the MOP active mining in the open cut was undertaken as described in **Section 2.3.3**. The Open Cut mine has been divided into a number of pits. These pits comprise the Bates South Pit, Bates South Extended, Montrose West Pit and Montrose East Pit. Mining of the Highwall Pit (an extension of the South Bates Extended Pit [Roses Pit]) will be undertaken during 2019.
Domain 9 Future Mining	Active	This domain is made up from a number of proposed mining areas that have not commenced at the beginning of the MOP term.

Domain	Domain Status	Domain Activities
Domain 10 Coal Handling and Preparation Plant	Active	This domain contains the CHPP, rail load out facility, surface conveyors, product stockpile, ROM stockpiles, ROM crusher, reject bin, workshop, offices, bathhouse and employee car park.

7.2 Proposed Rehabilitation Activities this MOP Period

Mining and progressive rehabilitation activities over the term of this MOP are shown in **Plans 3A – 3C**. A description of proposed rehabilitation activities for each domain is provided in **Sections 7.2.1** to **7.2.10**. Final landform shaping of overburden emplacement areas will be progressively completed during the MOP term and rehabilitated.

As outlined in **Section 2.3.4**, reshaping results in a stable landform incorporating slopes and drainage which blend in with the surrounding natural topography. Slope stability is integral to rehabilitation design and the objective during rehabilitation planning is to design all slopes to a gradient of 10° or less (1V:5.7H). Slopes steeper than 10° may be necessary in some locations to ensure rehabilitation merges seamlessly with adjacent undisturbed land.

Mine waste rock emplacements would cover an area of approximately 1,300 ha and be rehabilitated to a final landform up to 160m AHD. Where long slopes are present, contour drains or deep staggered rips would be established. Waster rock emplacements will be constructed in 15 to 20 metre lifts and shaped to the final landform profile when completed.

Following shaping of the landform the mine waste rock emplacements would be covered with approximately 100 mm of topsoil sourced from soil stockpiles or freshly stripped open cut mining areas. Site preparation works following the placement of topsoil would include chisel ploughing or deep ripping along contour, depending on the vegetation type to be established.

Mine waste rock emplacements would be progressively revegetated with a pasture cover crop and endemic woodland shrubs and trees planted on ridgelines and other selected areas, consistent with the proposed revegetation strategy as described in **Section 3.3.7.**

Table 31 summarises the disturbance areas and where rehabilitation activities during the MOP period will be undertaken.

Revegetation will be progressive, commencing soon after the completion of landform shaping. Species to be planted in the rehabilitated landforms will be a mixture of native and introduced locally successful tree, native and exotic grasses and legume species. Locally collected tree and shrub seed will be used where practical.

Table 17 provides the list of species to be used in revegetation of woodland corridor areas. **Table 17** and **Table 18** provide the list of species to be used in revegetation pasture/woodland areas. Areas nominated for temporary rehabilitation, will use species as identified in **Table 18**.

In previously rehabilitated areas, ongoing maintenance activities will include controlling weeds and pests, repairing landforms, re-seeding and application of maintenance fertilisers as required. The requirement of these activities will be based on the annual rehabilitation monitoring program (**Section 8.0**) and opportunistic inspections of rehabilitated areas.

In RWEP areas, ongoing activities will include controlling weeds and animal pests as required. The requirement of these activities will be based on the annual monitoring program, opportunistic inspections (**Section 8.0**) and as required by the BMP.

Table 31 Rehabilitation and Disturbance Progression during the term of the MOP

Year	Total Disturbances (ha)	Total Rehabilitation (ha)	Cumulative Rehabilitation (ha)
2018	~~82.1~~ 35.5	~~58.1~~ 58.5	~~657.1~~ 657.5
2019	~~21.2~~ 82.1	~~44.3~~ 52.8	~~701.4~~ 701.3
2020	~~23.5~~ 52.3	~~42.4~~ 65	~~743.8~~ 754.9
At end of MOP	~~**126.8**~~ **169.9**	~~**144.8**~~ **176.3**	~~**743.8**~~ **754.9**

Note: If highwall mining does not proceed, total disturbance and rehabilitation will be reduced by 44.4 hectares.

Sections 7.2.1 to **7.2.16** provide a summary of rehabilitation activities scheduled for each domain during the MOP term, including the appropriate rehabilitation phase to be undertaken, with respect to the following rehabilitation activities, including:

- Timing and activities involved in decommissioning;
- Physical and chemical characteristics of mining and process waste of emplaced material relevant to rehabilitation;
- Method of landform establishment;
- Final landform profile and slopes;
- Characteristics of all cover material including sealing/drainage layers, subsoil/topsoil;
- Thicknesses of cover layers and methods of laying and compaction including topsoil, imported substrate material;
- Drainage and erosion control methods;
- Soil amelioration/treatment methods;
- Vegetation species and establishment techniques;
- Management of cleared vegetation;
- Habitat establishment techniques; and
- Maintenance activities/requirements.

7.2.1 Domain 1 – Mine Infrastructure Areas

No rehabilitation activities are scheduled for this domain during the MOP term. **Plan 3C** illustrates the infrastructure areas that will be remaining at the end of the MOP term.

This domain will remain active during the MOP term. At mine closure the infrastructure in this domain that is not required as part of a post closure land use will be decommission and removed. Interim rehabilitation measures, including the establishment of cover crops and dust management controls on incomplete landforms and other inactive disturbance areas, will be implemented where they may remain

inactive for an extended period. These measures will provide initial stabilisation of mine landforms, reduce the visual impact of the mine and minimise the potential for generation of windblown dust and sediment laden runoff during decommission activities. Temporary rehabilitation using pasture species as provided in **Table 17** will be used to stabilise these areas.

7.2.2 Domain 2 – Water Management

No rehabilitation activities are scheduled for this domain during the MOP term. **Plan 3C** illustrates the water management dams that will be remaining at the end of the MOP term.

This domain will remain active during the MOP term. At mine closure selected dams may be retained and transferred to regional landholders for use following mine closure, where agreed in consultation with relevant authorities and local landholders.

7.2.3 Domain 3 – Tailings Emplacement Areas

Rehabilitation activities, including decommissioning and consolidating are scheduled for this domain during the MOP term. **Plan 3C** illustrates the tailings emplacement areas that will be remaining at the end of the MOP term.

Currently there are a number of tailing facilities in various life stages at the commencement of this MOP term, including:

- North East Tailings Dam (Decommissioned and under care and maintenance until alternate capping method trial is completed);
- Hunter Pit Tailings Dam (Currently active but scheduled for decommissioning in 2019 ~~2018~~ and followed by consolidation of the tailings); and
- Homestead and In Pit Tailings Dams (Not developed. Commissioning of the In Pit Tailings Dam is scheduled for Q1 2019 ~~March 2018~~ subject to relevant approvals

The engineered capping design would consider site topography, prevailing climatic conditions and the availability of suitable fine textures material (i.e. highly weathered mine water rock) as a cover material. The capping process creates a final landform that is stable and can be rehabilitated using the same rehabilitation concepts and methods as for the mine waste rock emplacements. Final rehabilitation of the tailings emplacement areas will occur when the dams have been capped and deemed stable and suitable for rehabilitation to occur.

7.2.4 Domain 4 – Waste Rock Emplacement Areas

Portions of waste rock emplacement areas (**Plans 3A – 3C**) are scheduled for progressive rehabilitation during the MOP term. Overburden emplacement areas progressively rehabilitated during the MOP term will transfer to rehabilitated areas. The following rehabilitation phases identified within this domain during the MOP term include:

Decommissioning

No decommissioning activities required to rehabilitate overburden emplacement areas.

Material Characterisation

Material and soil characterisation will be undertaken at an appropriate scale across the site, prior to re-handling of topsoil and waste rock material.

Representative samples will be taken to characterise the nature of the soil material (e.g. sodicity, acid-generating potential, etc.) to determine the potential limitations to rehabilitation and sustainable plant growth.

The results will be used to determine specific ameliorant techniques that may be applied to the soil material in order for rehabilitation to be sustainable.

Some ameliorates may need to be added to rehabilitated areas, with these possibly including gypsum, lime, fertiliser and organic growth material (OGM). The use of soil ameliorants is designed to prevent surface crusting, increase moisture and organic content, and buffer surface temperatures to improve germination.

Landform Establishment

As outlined in **Section 2.3.4**, landform reshaping consists of re-contouring overburden dumps to the designed shape for final rehabilitation to a final landform up to 160m AHD.

Reshaping results in a stable landform incorporating slopes and drainage which blend in with the surrounding natural topography. Slope stability is integral to rehabilitation design and the objective during rehabilitation planning is to design all slopes to a gradient of 10° or less (1V:5.7H). Slopes steeper than 10° may be necessary in some locations to ensure rehabilitation merges seamlessly with adjacent undisturbed land.

Once bulk reshaping is completed, the landform is ripped to approximately 200-300 mm and then the final trim and rock raking are undertaken. The ripping loosens up any near surface strata within the landform that have been compacted during placement, aiding root penetration during vegetation establishment. The final trim smooths out any washouts, rough edges, temporary access tracks, local steep topography and prepares the surface for revegetation.

Rock-raking removes exposed surface rock greater than 200 mm in diameter. This raking is usually done along the contour, leaving a textured surface that assists with erosion minimisation until vegetation can be established.

Growth Medium Development

Topsoil stripped ahead of mining is applied to the reshaped surface in an even layer generally not less than 100 mm. Topsoil is placed using rear dump haul trucks and spread with dozers or graders. Once spread, the topsoil surface is disc or chisel cultivated to create a textured surface which assists in trapping surface runoff, provides seed entrapments and creates microclimates favourable for seed germination.

Where topsoil stockpiles are significantly weed infested, the top layer of the stockpile may require scalping before underlying material is used for topdressing.

If the pre-rehabilitation assessment determines the stockpiled material is sodic, gypsum should be applied at a standard rate of 5 - 10 t/ha, depending on material sodicity. If gypsum is required, it should be mixed in with the topsoil as part of the stripping operation (ameliorants applied to topsoil surface prior to stripping), irrespective of whether the topsoil is to be placed in storage or directly applied to a rehabilitation area. Application of ameliorants as part of the topsoil stripping process is cost effective, and – in the case of gypsum in particular - gives the ameliorants additional time to react and modify the soil to ensure it is a stable growing medium.

Although low pH soil has not historically been a concern at Wambo, a lime requirement test should be undertaken to determine the lime application rate, if low pH material is identified during the pre-rehabilitation assessment.

Addition of organic supplements is recommended for high and low pH, sodic (dispersive) and low fertility soils. Such supplements can also assist in returning favourable soil microorganisms to sterile long-stockpiled material.

Erosion and Sediment Control

The surface of mine waste rock emplacements would be constructed to form a pattern of ridges and valleys. The valley areas would be shaped into a network of constructed drainage structures. Mine waste rock emplacement surfaces would be formed to maximise rainfall absorption and to minimise the requirement for artificial drainage structures. Mine waste rock emplacement berms would generally be reverse graded with perimeter bunds constructed as necessary.

Natural slopes commonly evolve to form an 'S' shape as a result of natural erosion and deposition processes. Mine waste rock emplacement slopes would generally be constructed in profile to form an 'S' shape with the upper 20 to 30% being convex and the lower 70 to 80% being concave.

Until an adequate vegetation cover is established, heavy rainfall may cause erosion, resulting in a dissected land surface, resource loss and the need for expensive remedial treatment. Therefore, slope length is reduced by fit for purpose designed structures such as contour drains, to intercept and divert water off the slopes. The structure(s) principle aim is to drain water safely from the landform, via a sediment detention structure if the water is to be discharged from the mine water management footprint.

Ecosystem Establishment:

The revegetation strategy includes the revegetation of disturbance areas with areas of woodland (corridors), areas which contain a mixture of woodland and pasture, and riparian vegetation, as described **Section 3.3.7.4.**

Vegetation may be established by the following methods:

- Sowing or direct seeding;
- Propagules (seeds, lignotubers, corms, bulbs, rhizomes and roots) stored in the topsoil;
- Spreading harvested plants with bradysporous seed (seed retained on the plant in persistent woody capsules) onto areas being rehabilitated;
- Planting nursery-raised seedlings (tubestock); and
- Invasion from surrounding areas through vectors including birds, animals and wind.

The most common method of vegetation establishment at Wambo is broadcast seeding of selected pasture or tree seed mixes.

Seed sowing is usually supplemented by the concurrent application of granulated fertiliser. Sowing is undertaken shortly after topsoil spreading to avoid loss of topsoil due to wind and rain action. Tubestock is generally only used to establish vegetation where rapid growth or specific species establishment is required, such as remedial revegetation, erosion control or visual bunding.

Fertiliser application is beneficial to vegetation establishment to replenish any nutrient deficiencies. The type of fertiliser and application rate varies according to the specific site, soil type and post-mining use of the area. When applying any additional chemical or products to the soil, the effects of runoff and leaching will be considered, as rapid leaching from organic wastes are known to provide ideal conditions for algal blooms and exacerbate weed growth and infestation.

Timing for initial vegetation establishment is an important factor for successful revegetation. Where possible, sowing and planting are planned to occur as soon as possible prior to the expected onset of reliable rains or after a break of the season (i.e. Autumn and Spring).

Following the changes in topography, drainage and soil conditions that results from open cut mining, some local provenance species may not be suitable for revegetation and seed sourced from outside the immediate district may be required. The most appropriate species to use to rehabilitate the area are those most suited to the soil types, drainage status, aspect and climate of the site. The biodiversity values of the surrounding native vegetation communities are considered during rehabilitation planning.

Distribution of vegetation type and species selection will be designed to enhance these values, whilst ensuring that weed and fire hazards are not increased for surrounding local agricultural areas. In recognition of the importance of vegetation corridors to regional biodiversity, rehabilitation initiatives aim to increase the connectivity of vegetation in the region through the establishment of woodland corridors. Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park. In doing so, WCPL will address the issue of discontinuity in remnant vegetation across the Hunter Valley floor.

Revegetation will include the use of native species with the potential to offer habitat resources for native wildlife (e.g. breeding, roosting/nesting or foraging resources), including threatened fauna species. The revegetation program will include the use of food tree species for the Glossy Black-cockatoo (e.g. *Allocasuarina* sp.).

Ecosystem Development

At the ecosystem and land use sustainability phase, rehabilitation monitoring results would be used to confirm rehabilitation areas are on a trajectory towards a self-sustaining ecosystem and towards meeting the rehabilitation completion criteria. Monitoring results would also be used to determine the requirement for maintenance and/or contingency measures (e.g. supplementary plantings) to improve rehabilitation performance. Contingency measures are described further in **Section 8.3**.

It is expected that at this phase, the need for maintenance/intervention would be no greater than that required for the surrounding lands whether it be for grazed lands or for existing remnant vegetation areas such as the RWEP areas.

One rehabilitation objective is the establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park. Creation of post-mining landforms that enhance the amenity of the local landscape and contribute to local and regional habitat corridors as presented in the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales* (NSW Department of Mineral Resources, 1999).

Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park (WCPL, 2003).

Maintenance Activities

Key rehabilitation maintenance requirements include:

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

The requirement of these rehabilitation maintenance activities will be based on the annual rehabilitation monitoring program (**Section 8.0**) and opportunistic inspections of rehabilitated areas as described in the BMP. The rehabilitation maintenance activities are described in **Section 9.0**.

7.2.5 Domain 5 – Subsidence Area

Rehabilitation activities in this domain will be accordance with each relevant approved EP and would generally include the following.

Visual monitoring of remediated subsidence areas will be conducted monthly to identify any requirement for maintenance measures and/or remedial works.

Any installed sediment control structures will be inspected on a monthly basis, or following rainfall events of equal to or greater than 20 mm/day (midnight to midnight) as recorded by the Wambo Meteorological Station.

Details of any subsidence impacts observed will be recorded in the Subsidence Impact Register with visual observations documented in the Subsidence Impact Register. Visual inspections will be undertaken in accordance with an inspection checklist as provided in the Subsidence Monitoring Program.

Subsidence impacts (mainly surface cracking) within areas of existing pasture (Domain C) utilised for grazing and previously rehabilitated areas in the open cut (Domain 6) will be remediated. The implementation of the program to remediate these areas will be carried out in the MOP term. The results of the subsidence remediation activities will be provided in the Annual Review. Subsidence repairs on private property to be carried out in accordance with **Section 3.3.4**.

Rehabilitation activities proposed on the 'Kharlibe' property includes the remediation of historical subsidence impacts and unfinished remediation. A remediation programme will occur during the MOP period that aims to finalise all subsidence remediation on this property. Specific detail of the remediation plan is contained in Appendix 4.

7.2.6 Domain 6 – Rehabilitation (Pre MOP)

Ecosystem Development

At the ecosystem and land use sustainability phase, rehabilitation monitoring results would be used to confirm rehabilitation areas are on a trajectory towards a self-sustaining ecosystem and towards meeting the rehabilitation completion criteria. Monitoring results would also be used to determine the requirement for maintenance and/or contingency measures (e.g. supplementary plantings) to improve rehabilitation performance. Contingency measures are described further in **Section 8.3**.

It is expected that at this phase, the need for maintenance/intervention would be no greater than that required for the surrounding lands whether it be for grazed lands or for existing remnant vegetation areas such as the RWEP areas.

One rehabilitation objective is the establishment of woodland vegetation linking remnant vegetation to the north and east of the Project with the eastern borders of Wollemi National Park Creation of post-mining landforms that enhance the amenity of the local landscape and contribute to local and regional habitat corridors as presented in the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales* (NSW Department of Mineral Resources, 1999).

Accordingly, the rehabilitation program has been designed to establish linkages between the rehabilitation areas, existing remnant vegetation and Wollemi National Park (WCPL, 2003).

Maintenance Activities

Key rehabilitation maintenance requirements include:

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

The requirement of these rehabilitation maintenance activities will be based on the annual rehabilitation monitoring program (**Section 8.0**) and opportunistic inspections of rehabilitated areas as described in the BMP. The rehabilitation maintenance activities are described in **Section 9.0**.

7.2.7 Domain 7 – North Wambo Creek Diversion

A section of the North Wambo Creek has been diverted to avoid the Wambo Open Cut Mine. The North Wambo Creek diversion was constructed in accordance with the approved North Wambo Creek Diversion Plan.

Rehabilitation activities within this domain during the MOP term will primarily be associated with Ecosystem and Land Use Sustainability phase, including the following rehabilitation maintenance activities:

- Controlling weeds;
- Repairing landforms and the creek channel (as a result of mine induce subsidence);
- Revegetation (i.e. replanting and/or reseeding); and
- Application of maintenance fertilisers as required.

A selection of pasture/cover crops have been utilised in the revegetation of the North Wambo Creek diversion riparian zone. The revegetation strategy includes the planting of the riparian corridor with River Oak (*Casuarina cunninghamia*) and Rough-barked Apple (*Angophora floribunda*).

The requirement of these rehabilitation maintenance activities will be based on the annual rehabilitation monitoring program (**Section 8.0**) and opportunistic inspections of rehabilitated areas as described in the BMP. The rehabilitation maintenance activities are described in **Section 9.0**.

7.2.8 Domain 8 – Active Mining Areas

No rehabilitation activities are scheduled for this domain during the MOP term. Some areas of the active mining area will transfer to overburden emplacement areas during the MOP term as identified on **Plans 3A – 3C**.

7.2.9 Domain 9 – Future Mining Areas

No rehabilitation activities are scheduled for this domain during the MOP term, however some areas of the future mining area will transfer to active mining areas during the MOP term as identified on **Plans 3A – 3C**.

Surface Disturbance Permit Procedure

WCPL has implemented a Surface Disturbance Permit (SDP) procedure and checklist. The SDP requires the approval of WCPL's Environmental Department prior to any land disturbance and clearing activities taking place. The SDP aims to identify any environmental issues such as cultural heritage sites, flora and fauna communities, threatened species, surface drainage and the identification of any seed or timber resources that can be salvaged.

Where required, the following requirements must be addressed by the SDP prior to WCPL Environment and Community Manager granting approval:

- A plan with proposed area for disturbance delineated;

- Pre clearance surveys completed for both ecological and heritage assessments;
- An erosion and sediment control plan;
- Topsoil management measures;
- Noise management measures;
- Dust management measures; and
- Light management measures.

Salvage and Re-use of Materials

Where practicable, clearing operations will be managed to maximise the re-use of cleared vegetative material. Any seed or timber resources that can be salvaged will be identified as part of the SDP procedure. Unsuitable vegetative material will be mulched and stockpiled.

Cleared vegetation suitable for fence posts and habitat for fauna will be set aside and salvaged. Habitat features such as logs and hollows collected during a clearance campaign may be utilised in WCPL's existing rehabilitated areas or to augment habitat features for fauna in the RWEP areas.

Topsoil Stockpile Management

Where possible, direct placement of excavated topsoil onto re-shaped areas is preferred to stockpiling, in order to avoid rehandling and reduce the potential for further topsoil degradation or loss. If a re-shaped surface is not available, topsoil will stockpiled in accordance with **Section 3.3.6**.

Ideally topsoil will be stockpiled for no more than 12 months. Where practicable, the topsoil that has been stockpiled for the longest period of time will be used first on available rehabilitation areas.

The location for topsoil stockpiles will determined in consideration of where the soil is to be used for rehabilitation, the haul length and the fleet required in order to minimise rehandling of the topsoil as much as possible prior to it being used for rehabilitation.

Topsoil stockpiles will be stabilised to reduce their susceptibility to wind erosion and constructed to avoid drainage lines. Stockpiles will also be sited as far as possible from mining activities to reduce any further potential for degradation. The stockpile will be shaped/rounded and seeded to reduce the potential for erosion. The seed mix used would be consistent with the pasture species mix used for rehabilitation of pasture areas (**Section 3.3.7**)

Prior to the placement of topsoil, the ground surface will be levelled and cleared. Stockpiles will be limited to approximate heights of 3m to minimise the potential for compaction and will be constructed to be free draining.

Once constructed, the topsoil stockpiles will be signposted to minimise the potential for disturbance. Access barriers will also be constructed if necessary.

Once constructed, stockpiles will be surveyed and their location and volumes recorded in a Topsoil Stockpile Register along with other relevant data pertaining to each stockpile. On a quarterly basis, stockpiles will be assessed for erosion, vegetation coverage and weed infestation.

If weed infestations are significant, appropriate maintenance/control measures will be undertaken (e.g. spraying or manual removal).

Sampling of soil stockpiles and laboratory analysis of the samples may also be undertaken to determine the requirement for or rate of ameliorant required to improve the condition of stockpiled soils.

The Topsoil Stockpile Register (and site soil balance) will be revised/updated as soon as practicable following the replacement of soil on an available rehabilitation area and the register reviewed annually to track soil availability and soil demand.

7.2.10 Domain 10 – Coal Handling and Preparation Plant

No rehabilitation activities are scheduled for this domain during the MOP term. No rehabilitation activities are scheduled for this domain during the MOP term. **Plan 3C** illustrates the infrastructure areas that will be remaining at the end of the MOP term.

This domain will remain active during the MOP term. At mine closure the infrastructure in this domain that is not required as part of a post closure land use will be decommission and removed. Interim rehabilitation measures, including the establishment of cover crops and dust management controls on incomplete landforms and other inactive disturbance areas, will be implemented where they may remain inactive for an extended period. These measures will provide initial stabilisation of mine landforms, reduce the visual impact of the mine and minimise the potential for generation of windblown dust and sediment laden runoff during decommission activities. Temporary rehabilitation using pasture species as provided in **Table 17** will be used to stabilise these areas.

7.3 Summary of Rehabilitation Areas During the MOP

Table 31 outlines the proposed rehabilitation activities within primary and secondary domains during the MOP term. Shaded cells indicate rehabilitation phases are not applicable during the MOP term as the domains will remain Active.

Table 32 Summary of Rehabilitation Proposed during the MOP Period

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Area (ha) at start of MOP	Area (ha) at end of MOP
Mine Infrastructure Area (Domain 1)	Rehabilitation (Mixed Pasture/Woodland)	1D Ref: Plan 2	Active	272	247
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	0	0
			Relinquished Lands	0	0
Water Management (Domain 2)	Water Management	2A Ref: Plan 2	Active	70	59
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	0	0
			Relinquished Lands	0	0
Tailings Emplacement Areas (Domain 3)	Rehabilitation (Mixed Pasture/Woodland)	3D Ref: Plan 2	Active	59	100.2
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	0	0
			Relinquished Lands	0	0
Waste Rock Emplacement Area	Rehabilitation (Mixed Pasture/Woodland)	4D/4E Ref: Plan 2	Active	686	792
			Decommissioning	0	0
			Landform Establishment	0	0

Primary Domain	Secondary Domain	Code	Rehabilitation Phase	Area (ha) at start of MOP	Area (ha) at end of MOP
(Domain 4)	Rehabilitation (Woodland Corridors)		Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	0	0
			Relinquished Lands	0	0
Subsidence Area (Domain 5)	Existing Native Existing Pasture	5B/5E Ref: Plan 2	Active	198	461
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	1324	1325
			Ecosystem Development	As required	
			Relinquished Lands	0	0
Rehabilitation Area (Domain 6)	Existing Pasture Rehabilitation (Mixed Pasture/Woodland)	6C/6D Ref: Plan 2	Active	521	640
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	521	666
			Relinquished Lands	0	0
North Wambo Creek Diversion (Domain 7)	Rehabilitation (Pasture and selected woodland species)	7D Ref: Plan 2	Active	90.0	90.0
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	90.0	90.0
			Relinquished Lands	0	0
Active Mining Area (Domain 8)	Rehabilitation (Mixed Pasture/Woodland) Rehabilitation (Woodland Corridors) Final Void	4D/4E/8F Ref: Plan 2	Active	48	23
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	0	0
			Relinquished Lands	0	0
Future Mining (Domain 9)	Rehabilitation (Mixed Pasture/Woodland) Rehabilitation (Woodland Corridors)	9D/9E Ref: Plan 2	Active	375	114
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	0	0
			Relinquished Lands	0	0
Coal Handling And Preparation Plant (Domain 10)	Rehabilitation (Mixed Pasture/Woodland) Rehabilitation (Woodland Corridors) Mine Infrastructure Decommissioned	10D/10E 10G Ref: Plan 2	Active	28	28
			Decommissioning	0	0
			Landform Establishment	0	0
			Growth Medium Development	0	0
			Ecosystem Establishment	0	0
			Ecosystem Development	0	0
			Relinquished Lands	0	0

Note: The mining process at WCPL does not provide for areas of landform establishment at the year end or at the end of the MOP term. However, the mining process continually transitions from active mining, overburden emplacement, landform establishment, to growth medium establishment through the year.

7.4 Relinquishment Phase Achieved during MOP Period

As mining activities at WCPL are scheduled to continue past the MOP period and the Mine has an approved 35 year mine life until the year 2039, there will be no areas subject for lease relinquishment at the end of this MOP term.

8.0 Rehabilitation Monitoring and Research

8.1 Rehabilitation Monitoring

Rehabilitation performance, in accordance with the BMP, is currently monitored to ensure vegetation is establishing and to determine the need for any maintenance and/or contingency measures. The BMP was issued to the DP&E on the 28 October 2016 after extensive consultation with NSW Office of Environment and Heritage (OEH) and the Department of the Environment and Energy (DoEE). On the 17 November 2016 the DoEE approved the BMP. On the 1 November 2016 the OEH endorsed the BMP. Although the BMP did not receive final approval by the DP&E until 11 October 2017, key elements of the BMP applicable to this MOP including completion criteria, biodiversity management and monitoring programs have been implemented since late 2016.

The two main components of the Biodiversity Monitoring Programme include:

- Monitoring of mine rehabilitation areas; and
- Monitoring of the RWEP areas.

8.2 Monitoring of Rehabilitation & RWEP Areas

8.2.1 Monitoring Methodologies

8.2.1.1 Landscape Function Analysis

The LFA component of the WCPL monitoring program focuses on monitoring and providing quantitative assessment of the success of newly rehabilitated landscape establishment. Two separate assessments consisting of a varieties of measured site attributes make contribute to LFA as provided in Tongway and Hindley (2004), these are:

- Landscape Organisation Index (LOI); and
- Soil Surface Assessment.

Landscape Organisation Index is the initial LFA data acquisition step and collects information at the hill slope scale. It relates to the proportion of the transect occupied by patches of landscape elements that are relatively permanent and provide stable, resource accumulating structures, such as grassy tussocks and other ground cover, leaf litter and logs. LOI can vary from 0.0 (a totally bare site) to 1.0 (a site totally covered by vegetation).

Soil Surface Assessment results provide an index on stability, infiltration and nutrient cycling for all patch and inter-patch types for the whole of landscape (transect). The combined score from each patch type provides a stability, infiltration and nutrient cycling index.

Eleven Soil Surface Condition Indicators (SSCIs) (**Table 32**), each focusing on specific biological and/or physical processes, are used to develop three LFA indices: Stability Index (SI), Soil Infiltration (INFI) and Nutrient Cycling (NI).

Table 33 Soil Surface Condition Indicators

SSCI	Description	Relevant LFA Index		
		SI	INFI	NI
Soil Cover	Percentage cover of perennial vegetation to a height of 0.5 m. plus rocks > 2 cm and woody material > 1 cm in diameter or other long-lived, immoveable objects.	X		
Perennial Vegetation Cover	Percentage perennial vegetation cover.		X	X
Litter Cover	Percentage cover of annual grasses and ephemeral herbage (both standing and detached) as well as detached leaves, stems, twigs, fruit, dung, etc.	X	X	X
Cryptogam Cover	Percentage cover of algae, fungi, lichens, mosses, liverworts and fruiting bodies of mycorrhizas.	X		X
Crust Brokenness	Categorises soil crusts from 0-4 where 0 refers to 'no crust present' and 4 refers to an 'intact and smooth' soil crust.	X		
Erosion Type and Severity	Categorises the aerial extent and severity of various erosion types from 'Insignificant' to 'Severe'.	X		
Deposited Materials	Categorises the extent and depth of deposited alluvial material.			
Surface Roughness	Categorises the depth of surface depressions from 'smooth' to 'deep depressions'.	X	X	X
Surface Resistance to Disturbance	Categorises the soils capacity to resist disturbance based on the soils 'hardness' or 'brittleness'.	X	X	
Slake Test	Categorises the soils stability when exposed to water.		X	
Soil Texture	Categorises the soils water infiltration capacity from 'very slow' to 'high'.		X	

8.2.1.2 Biometric Vegetation Assessment

The BioMetric method (Gibbons et al 2009) is proposed as the model for determining meaningful, quantitative, biodiversity focused Completion Criteria. BioMetric, a NSW Government endorsed biodiversity assessment method (developed for the NSW BioBanking Assessment Methodology), provides a useful decision making framework founded on a standardised repeatable measurement method readily applicable to a monitoring program.

Management measures can be performance tested through the BioMetric process, thereby providing an appropriate evidence-based mechanism for optimising future management decisions. Evidence-based adjustments made to a predefined management regime are central to maximising the likelihood of a successful outcome.

BioMetric is a quantitative method developed to comparatively assess the condition of vegetation and habitat values of native vegetation against pre-defined benchmarks (i.e. pre European settlement). Vegetation and habitat condition is quantitatively evaluated by ten readily measurable 'site attributes' considered to reflect the relative health or level of disturbance of a specific vegetation class. These site attributes when measured against relative performance criteria provide meaningful ecological information used to inform management decisions. Site attributes measured in a BioMetric assessment are listed in **Table 33.**

Table 34 Biometric Site Attributes and Measurement Parameters

Site Attribute	Measurement parameter
Native Plant Species Richness (NPS)	Number of native plant Species within 400 m2 plot (count)
Native Over-storey Cover (NOS)	Projected foliage cover above 10 m height along a 50 m transect (%) – measured every 5 m
Native Mid-storey Cover (NMS)	Projected foliage cover between 1 and 10 m height along a 50 m transect (%) – measured every 5 m
Native Ground Cover (grasses) (NGCG)	Cover below 1 m along a 50 m transect (%) – measured every metre
Native Ground Cover (shrubs) (NGCS)	Cover below 1 m along a 50 m transect (%) – measured every metre
Native Ground Cover (other) (NGCO)	Cover below 1 m along a 50 m transect (%) – measured every metre
Exotic Plant Cover (EPC)	Cover along a 50 m transect (%) – measured every metre
Over-storey Regeneration (OR) within vegetation zone	Overstorey canopy species <5 cm diameter at breast height (DBH) within a 1,000 m2 plot (score 0 to 1)
Number Of Trees With Hollows (HBT)	Number of trees containing hollows within a 1,000 m2 plot (count)
Total Length of Fallen Logs (FL)	Log length touching ground >10 cm diameter and >0.5 m in length within a 1,000 m2 plot (metres)

8.2.2 Monitoring Program

A summary of WCPL's Biodiversity Monitoring Program is provided in **Table 35**. Monitoring locations are shown on **Figures 8 and 9.** Details on the monitoring program requirements and timing are provided in the following sections.

Table 35 Biodiversity Monitoring Program

Monitoring Type	Area	Site	Monitoring Frequency and Timing	Details
Biometric	RWEA A	V1-B1, V1-B2, V1-B3, V2-B1, V2-B2, V3-B1, V5-B1, V5-B2, V5-B3, V6-B1, V6-B2, V6-B3	Annually (Spring)	A number of permanent flora survey quadrats have been established in RWEP areas to obtain quantitative data on plant species diversity and abundance. Quadrat data will be collected at each of the floristic quadrat monitoring sites. Note: Biometric monitoring in the Woodland Rehabilitation Areas will be undertaken at the same time as the LFA monitoring in the Woodland Rehabilitation Areas.
	RWEA B	V9-B1, V9-B2, V10-B1, V13-B1, V14-B1, V14-B2		
	RWEA C	V6-A1c, V6-B1c, V6-B2c, V11-B1, V11-B2		
	RWEA D	V10-A1, V10-B3		
	RWEA E	V14-A1		
	Rail Loop	V5-B4, V6-B4		
	Reference Sites	V1-A1, V1-A2, V2-A1, V6-A3, V9-A1, V10-A2, V14-A1		
	Woodland Rehabilitation	3R, 4R, 6R & 8R		
LFA	Woodland Rehabilitation	3R, 4R, 6R & 8R	Annually (Autumn or Spring)	LFA consists of a number of permanent transects being established in areas of revegetation, along with corresponding transects in adjacent undisturbed areas to provide reference/ analogue sites. LFA transects are monitored annually either in autumn or spring following the commencement of revegetation.

Figure 8 Floristic Monitoring Sites

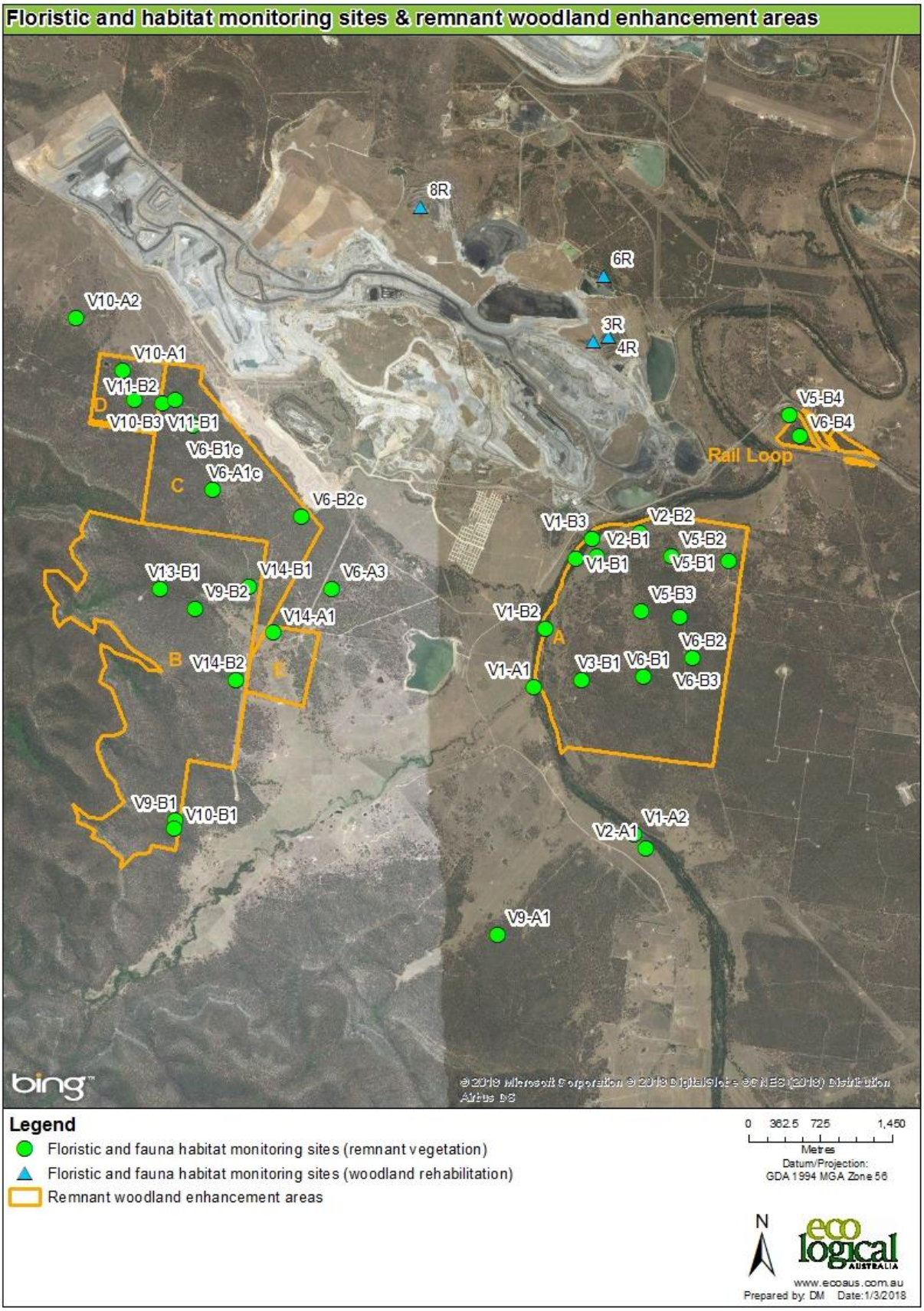
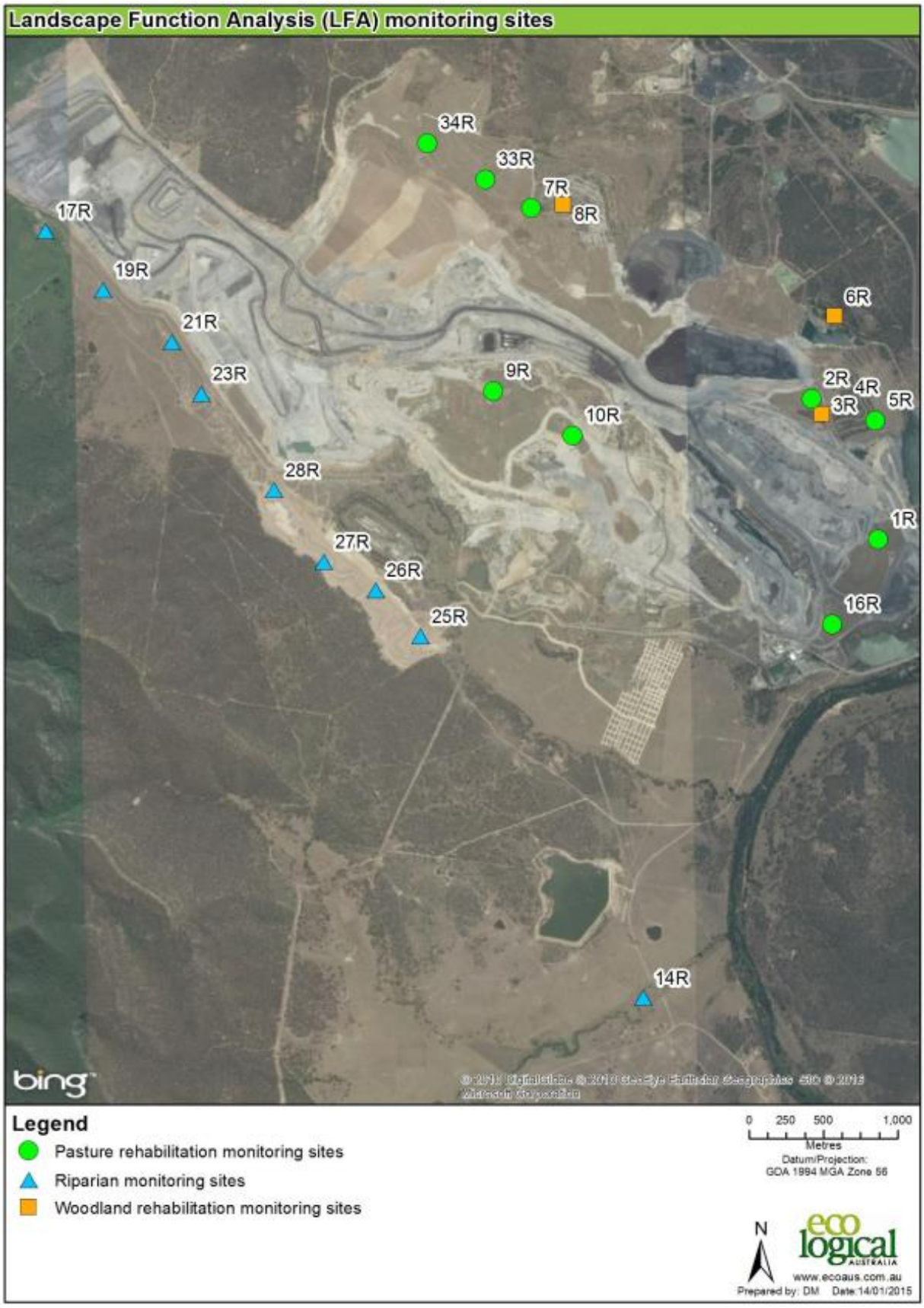


Figure 9 LFA Monitoring Sites



8.2.3 Visual Monitoring

Visual monitoring of revegetation will be undertaken to ensure vegetation is establishing and to determine the need for any maintenance and/or contingency measures (such as the requirement for supplementary plantings, erosion control and weed and animal pest control). Visual assessments allow for the rapid application of remedial actions where necessary.

8.2.4 Mine Closure Monitoring

WCPL are revising the conceptual Mine Closure Plan (CMCP) to undertake life of mine closure planning for mining operations, although the Mine is not planned for closure until 2039. The revision of the CMCP ~~in 2018~~ will incorporate a review of the constraints and opportunities to identify potential sustainable land-use options, in consultation with relevant stakeholders in order to obtain feedback of any issues that need to be considered as part of the final land use analysis. The revised CMCP will be submitted to the ~~DRG~~ RR and other relevant stakeholders for approval ~~by the end of 2018~~ following the determination of the United Wambo Open Cut Coal Mine Project (SSD 7142).

The CMCP will outline the mine closure goals for Wambo and describe the proposed mine closure concepts and proposed decommissioning management measures. As required by Condition 94, Schedule 4 of the Development Consent (DA 305-7-2003), the CMCP will include measures to minimise the adverse socio-economic effects associated with mine closure.

Mine closure concepts and management measures will be developed in consultation with the ~~DRG~~ RR and other relevant regulatory agencies.

At mine closure, the existing environmental monitoring program will be maintained until all decommissioning and rehabilitation works have been completed in accordance with the relevant rehabilitation criteria and objectives. In consultation with regulatory authorities, there may be the need to remove redundant and/or establish additional monitoring sites to complement existing programs at mine closure, for example establishing water quality monitoring sites at final void locations.

Capped tailings dams will be monitored during the life of the Mine and post mining to determine the success of the capping and rehabilitation process.

Approaching mine closure, contaminated assessments will be carried out to identify areas of potential contamination and develop appropriate remedial measures and monitoring requirements as the mine transfers into the closure phase.

The post closure monitoring and measurement program will be similar to that undertaken during the active mining operation, however the monitoring program may be prioritised to focus on potential environmental aspects that are likely to cause pollution and/or verify the success or failure of the rehabilitated post mining landforms.

Post closure monitoring will be conducted for up to five years after decommissioning and final rehabilitation has been completed, or until such time as monitoring records demonstrate that the site is no longer contributing, nor has the potential to contribute, pollutants to the surrounding environment, and that rehabilitation has achieved in accordance with the relevant rehabilitation criteria. Monitoring and reporting of biodiversity areas post mine closure will continue in accordance with the requirements of the BMP.

8.3 Research and Rehabilitation Trials and Use of Analogue Sites

A number of rehabilitation trials and studies have been conducted at WCPL to date and include:

- Capping studies on the North East Tailings Dam to identify a safe and viable method of capping the tailings dam surface;
- Large scale biosolid application trials to improve soil structure and effectiveness of the soil as plant growth medium (**Plate 1**);
- Trialling the application of tree mulch on the surface of rehabilitation areas to assist with dust suppression and erosion control, as well as providing a source of organic matter in the stripped topsoil;
- Incorporation of Organic Growth Medium (OGM) with topsoil material;
- A trial to assess tree establishment and development on waste rock emplacements;
- Undertake detailed soil characterisation program of waste rock emplacement areas and topsoil;
- Rationalise and improve LFA monitoring program; and
- Revise rehabilitation monitoring program to address knowledge gaps, develop appropriate quantifiable criteria and revise triggers and responses in TARP.

WCPL is committed to researching collaborative opportunities with external research institutions to partner in possible rehabilitation trials and studies conducted at WCPL to enable continued improvements in the rehabilitation practice.

Plate 1 – Biosolid Application on Re-profiled Waste Rock Emplacement

8.4 Grazing Management

WCPL have engaged a specialist agronomist to prepare a grazing management strategy to assist the Mine with a grazing capacity trial of mine rehabilitated pasture species. The grazing trial is expected to commence subject to:

- Mine rehabilitated pasture areas being made available outside mining access areas;

- Agriculture infrastructure in place including fencing and water; and
- Considered by WCPL's agronomist the proposed area of mine rehabilitated pasture is ready to carry livestock.

WCPL have identified two mine rehabilitated areas including The Backfill Project and Montrose East as potential sites for the grazing trial.

A sustainable stocking rate is one which does not degrade the natural resources or permanently reduce pasture productivity as a result of over-grazing, species loss and weed growth. The grazing trial would consider the various methods of grazing management such as rotational grazing, strategic grazing and even cell grazing, use variations in stocking density to manage the pastures. WCPL livestock preference for the grazing trial is beef cattle.

Locally in the Hunter Valley beef cattle grazing is more common than sheep, stocking rates are often expressed as the number of livestock (head) per hectare. In an 'average' year the rehabilitated pastures on mine sites have an estimated carrying capacity of 3 dry sheep equivalent per ha. This is equivalent to 1 breeding cattle unit per 4.7 ha or 1 dry growing beast (e.g. steer) to 3.0 ha. The aim of the grazing trial will determine if WCPL's mine rehabilitated land can achieve a similar carrying capacity. The results of the grazing trial (when commenced) will be provided in the Annual Review.

9.0 Intervention and Adaptive Management

9.1 Threats to Rehabilitation

Table 35 outlines potential risks and consequences associated with rehabilitation activities. A Trigger Action Response Plan (TARP) has been developed (**Section 9.2**) to identify appropriate response measures to manage any potential rehabilitation risk.

Table 36 Rehabilitation Risks

Rehabilitation Risk	Potential Consequence/Hazard
Topsoil	Insufficient depth/volume, compromise topsoil stockpile Soil chemistry limits plant growth Loss of topsoil material from erosion
Spoil	Soils not within the preferred pH, sodicity, salinity ranges Hostile waste rock material in final landform
Surface	Insufficient depth of inert material, large rocks on surface Land contamination
Landform and Land Use	Excessive slope length, slope gradient not consistent with pre-mining topography Subsidence impacts
Vegetation	Poor establishment, excessive weeds, low species composition, mono-culture Native tree and shrub seed resource not available to complete revegetation Native pasture seed not available to complete revegetation
Erosion & sediment control	Landform not stable, failure of water management structures and ability to freely drain.
Bushfire	Risk of fire within establishing ecosystems.
Tailings Dam	Current technologies unable to provide effective capping solutions for NETD
Performance Criteria	Current rehabilitation monitoring program and available data (to date) insufficient to develop quantifiable criteria for mine closure and relinquishment

The processes outlined in this MOP will be implemented to control or eliminate these rehabilitation risks. Where necessary, rehabilitation procedures will be amended accordingly during the MOP term with the aim of continually improving rehabilitation standards.

9.2 Trigger Action Response Plan

WCPL have prepared a Trigger Action Response Plan (TARP) for rehabilitation to identify appropriate response measures in the event rehabilitation outcomes are not achieved.

Table 36 illustrates how the various rehabilitation risks, management measures and responsibilities are structured to achieve compliance with the relevant statutory requirements, and the framework for management and contingency actions.

A revision of the TARP will be undertaken as a result of the revised rehabilitation monitoring program and capping trials proposed to allow for the development of appropriate criteria and triggers. A revised TARP will be provided in consecutive MOP amendments as soon as the data is available from the respective programs.

A separate TARP has been provide in Section 15 of the Kharlibe Subsidence remediation Plan – Appendix 4.

Table 37 Rehabilitation Trigger Action Response Plan

Ref# No.	Rehabilitation Risk	Consequence/ Hazard	TARP Code	Contingency Reponses
1.	Topsoil	Insufficient topsoil depths Topsoil ripping not effective	**Trigger**	• Monitoring confirms average topsoil replacement at depths <100mm. • Monitoring confirms topsoil has not been ripped appropriately.
			Action	• Topsoil is to be re-applied at a minimum of 100mm. • Topsoil ripped to a depth of 300mm to 500mm. • Review topsoil application procedure and topsoil balance. • Review topsoil stripping methods. • Increase application of topsoil (and/or application with appropriate humus material) to achieve average minimum depth of 100mm.
			Responsible Persons	E&C Manager
2.		Loss of topsoil due to erosion, poor vegetation establishment and interaction with vehicles.	**Trigger**	• Monitoring of topsoil stockpiles identifies significant erosion and loss of topsoil resource. • Establishment of stabilising cover crop has failed. • No signage to identify topsoil stockpiles. • Evidence of unauthorised removal of material or access of topsoil material.
			Action	• Remediate affected areas, fertilise and re-seed to stabilise as necessary. • Install/repair silt fencing as required. • Installation of signage. • Continue to monitor. • Reshape stockpile with a rough surface to reduce erosion hazard, improve drainage and promote vegetation. • Re-seed and fertiliser as necessary.
			Responsible Persons	E&C Manager
3.		Topsoil characterisation determines soil parameters not within preferred range	**Trigger**	• Topsoil characterisation confirms: - Soil pH (H_2O) range is outside the preferred range of pH 5.5 – pH 7.8; - Soil EC (H_2O) is greater than 1200 µS/cm; - Soil Phosphorus: Colwell Method (Pasture: 20-40 mg/kg) (Native: 10-20 mg/kg) Bray Method (Pasture: 12-22 mg/kg) (Native: 6-12 mg/kg) - Soil Organic Matter <3%
			Action	• Application of appropriate soil ameliorants at rates per hectare as specified by laboratory results. • Undertake further investigations to determine potential factors contributing to conditions. • Consider removing unsuitable material and replace with suitable material and retest to determine soil within preferred ranges.

Ref# No.	Rehabilitation Risk	Consequence/ Hazard	TARP Code	Contingency Reponses
			Responsible Persons	E&C Manager
4.	Waste rock	Waste rock characterisation determines soil parameters not within preferred range	**Trigger**	• Representative sampling of final surface material characterisation confirms: - Soil pH (H_2O) range is outside pH 5.5 – pH 7.8; - Soil EC (H_2O) is greater than 1200 µS/cm.
			Action	• Application of appropriate soil ameliorants at rates per hectare as specified by laboratory results. • Undertake further investigations to determine potential factors contributing to conditions. • Consider removing unsuitable material and replace with suitable material and retest to determine soil within preferred ranges.
			Responsible Persons	E&C Manager and Open Cut Mine Manager
5.	Tailings capping layer	Insufficient inert material cover of tailings emplacement areas	**Trigger**	• Monitoring confirms inert material of >2m coverage over tailings is not being achieved. • Final landform slope grades are >1%. • Capping layer final landform shape is not compatible with surrounding landscape.
			Action	• Increase volume of compacted inert minimum coverage of 2m when creating final landform (or greater if required by final capping design specifications). • Continue monitoring to confirm compacted inert material coverage of 2m (or greater) is being achieved. • Re-profile final landform to achieve drainage grades of <1% and compatibility with surrounding landscape. • Review tailings capping application procedure.
			Responsible Persons	E&C Manager, Project Capital Engineer and Open Cut Mine Manager
6.	Final landform surface	Insufficient inert material cover of coarse reject emplacements Spontaneous combustion Landform slumping Acid mine drainage (AMD) Drainage	**Trigger**	• Monitoring confirms compacted inert material over coarse reject emplacement areas is not achieving minimum coverage of 2m in some areas when creating final landform. • Monitoring confirms spontaneous combustion evidence. • Monitoring confirms slumping has occurred in the final landform. • Monitoring confirms possible AMD issues. • Drainage with >3% fall are not appropriately armoured to prevent scouring.
			Action	• Increase volume of compacted inert minimum coverage of 2m over carbonaceous material when creating final landform. • Continue monitoring to confirm compacted inert material coverage of 2m is being achieved. • Review inert material application procedure to ensure sufficient inert material is available to achieve the minimum coverage of 2m. • Remove material with spontaneous combustion propensity, replace with inert material, compact and re-profile to final land form. • Repair slumped area with additional material, compact and re-profile to final land form.

Ref# No.	Rehabilitation Risk	Consequence/ Hazard	TARP Code	Contingency Reponses
				• If testing identifies AMD issues, remove potential AMD material with acid generating propensity, and replace with inert material, compact and re-profile to final land form. • Seek further advice from WCPL rehabilitation specialist to design appropriate drainage structures and install /construct as required.
			Responsible Persons	E&C Manager and Open Cut Mine Manager
7	Final landform surface	Excessive slope lengths	**Trigger**	• Slope lengths >80m limit at slope angles of 10^0.
			Action	• If possible, undertake rectification works to reduce average slope lengths to approximately 50m to 70m when slope angles of 10^0. • Seek further advice from WCPL rehabilitation specialist to: - Review final landform design and stability performance; and - Determine if additional measures are necessary to manage surface water flows to ensure slope stability can be maintained.
			Responsible Persons	E&C Manager and Open Cut Mine Manager
8		Steep slope gradients Maximum height of final landforms no greater than RL160 AHD.	**Trigger**	• Final slope angle above >10^0 and may be considered inconsistent with pre-mining topography. • Final dump height survey greater than RL 160 AHD.
			Action	• Regrade slopes to achieve <10^0. • Reduce dump height to RL 160 AHD. • Resurvey to confirm correct slope angle and dump height. • Seek further advice from WCPL rehabilitation specialist to review final landform design and performance if slope grades cannot be achieved; and • Seek consultation with ~~DRG~~ RR if landform is at risk of not achieving pre-mining topography as identified within the EIS.
			Responsible Persons	E&C Manager and Open Cut Mine Manager
9.	Woodland rehabilitation Pasture rehabilitation Riparian rehabilitation	Low biometric vegetation scores	**Trigger**	• Score obtained during annual monitoring round is less than Interim Performance Targets
			Action	• Check and validate the data to ensure correct/accurate. • Review site attribute scores to determine which attributes are contributing to the lower than expected score • Review management actions undertaken during previous 12 months (applicable to relevant management period) to determine if actions have contributed to the lower than expected score • Review previous monitoring scores and climatic conditions to establish whether external factors could be contributing to the lower than expected score. • Develop remedial actions to address declining biodiversity values.

Ref# No.	Rehabilitation Risk	Consequence/ Hazard	TARP Code	Contingency Reponses
				• Review LFA monitoring to examine for potential casual factors OR start LFA monitoring if landform instability is detected. • Expand monitoring program to include additional treatment and reference sites.
			Responsible Persons	E&C Manager
10.		Low LFA scores	**Trigger**	• <5% annual improvement or significant decline in LFA Score (from previous monitoring round)
			Action	• Check and validate the data to ensure correct/accurate. • Review individual LFA Index results to determine which index result is contributing to the lower than expected score • Review management actions undertaken during previous 12 months (applicable to relevant Management Period) to determine if actions have contributed to the lower than expected score • Review previous monitoring scores and climatic conditions to establish whether external factors could be contributing to the lower than expected score • Develop remedial actions to address stagnant or declining landscape stability, if stagnant or declining score not caused by external factors. • Maintain monitoring of affected site until first LFA score ≥50 (i.e. stable landform) and • Review monitoring program and consider expanding to include additional treatment and reference sites.
			Responsible Persons	E&C Manager
11.		Ground cover Exotic cover	**Trigger**	• Monitoring identifies vegetative coverage <70% and/or individual bare areas >20m^2 • Biometric monitoring confirms exotic cover <33%.
			Action	• Review seed viability, seasonal conditions and other influences e.g. soil preparation, seed application procedures etc. • Re-test soil chemistry and ameliorate as necessary. • Re-seed affected areas. • Maintain monitoring program for presence of weeds in accordance with the BMP. • Maintain seasonal weed spraying control measures as required by BMP. • Review BMP to determine if existing weed control measures are adequate. • Increase monitoring frequency for presence of weeds.
			Responsible Persons	E&C Manager
12.	Water management		**Trigger**	• Water runoff from rehabilitation areas exceeds EPL water quality limits. • Water quality in the NWCD exceeds SWMP trigger values.

Ref# No.	Rehabilitation Risk	Consequence/ Hazard	TARP Code	Contingency Reponses
		Pollution of downstream watercourses.	**Action**	• Refer to Surface and Groundwater Response Plan (for appropriate actions and responses).
			Responsible Persons	E&C Manager
13.	Erosion/sediment control	Unstable landforms	**Trigger**	• Monitoring indicates gully and tunnel erosion present. • Monitoring identifies rilling erosion approximately >200mm deep and/or >200mm wide. • Groundcover is <60%. • No erosion ad sediment control are in place. • Erosion and sediment controls in place but are no effective.
			Action	• Undertake appropriate remediation works to address erosion. • Install appropriate erosion and sedimentation controls. • Maintain monitoring program to determine effectives of repairs. • Investigate potential causes contributing to erosion. • Review ESCP for adequacy. • Review existing erosion controls for adequacy.
			Responsible Persons	E&C Manager
14.	Subsidence	Presenting an immediate safety, environmental hazard Presents hazard to ling term final land use Creek stability and hydraulic losses.	**Trigger**	• Surface cracking presents either an immediate safety, environmental hazard (e.g. an erosion hazard or hazard to grazing stock) or risk to final land use. • Visual inspections have identified increased cracking, scouring and ponding in NWCD. • Visual inspections have identified cracking with widths >50mm. • Increased leakage into SBU/SBUE mine from NWCD.
			Action	• Repaired and rehabilitated as identified in **Section 3.3.4** • Carry out repairs to NWCD in accordance with the NWCD Rehabilitation and Maintenance Plan, Extraction Plan – South Bates (Whybrow and Wambo Seam) Underground Mine Longwalls LW11 to 16, and Extraction Plan – South Bates Extension (Whybrow Seam) Underground Mine LW17 to LW20. • Creeks affected by subsidence have been repaired and their functionality and stability has been confirmed by a hydrological engineer (or equivalent).
			Responsible Persons	E&C Manager and Project Capital Engineer
15.	Decommissioning	Decommissioning activities is not consistent with Conceptual Mine	**Trigger**	• Removal of all redundant services, infrastructure, carbonaceous material, wastes hazardous materials, sealing of mine and ventilation shafts etc. post mine closures has not been completed as required by the CMCP. • Identification of possible contaminates at mine closures and either removal or treatment has not be carried out as required by the CMP.

Ref# No.	Rehabilitation Risk	Consequence/ Hazard	TARP Code	Contingency Reponses
		Closure Plan (CMCP).		• Dewatering and removal of possible contaminates from selected mine water dams post mine closure has not been carried out as required by CMCP. • Decommissioning activities of tailings emplacement areas has not been carried out as required by the CMCP. • The site at post mine closures presents an immediate risk to the environment and public safety.
			Action	• Undertake a review of the closure strategies to ensure the site at post closure does not present an immediate risk to the environment and public safety. • Complete all mine closure activities as required by the CMCP • Review CMCP for adequacy • Seek consultation with the ~~DRG~~ RR if changes to the CMCP are required.
			Responsible Persons	E&C Manager and Project Capital Engineer
16.	Final Voids		**Trigger**	**Triggers to be revised in accordance with revised Final Void Management Plan (FVMP).**
			Action	**Actions to be revised in accordance with FVMP**
			Responsible Persons	E&C Manager
17.	Terrestrial fauna	Native species diversity Feral animals	**Trigger**	• Fauna monitoring identifies a trend of low native species diversity inhabiting rehabilitated woodland areas. • Fauna monitoring identifies high number of feral animals present within rehabilitation areas.
			Action	• Review biometric scores as identified in TARP Ref. 9 to consider if management actions consider improving biodiversity outcomes. • Seek ecologist advice on improving biodiversity outcomes in rehabilitation areas. • Consider further habitat augmentation with hollow logs etc. to improve biodiversity outcomes. • Review feral animal controls in the BMP. • Continue monitoring as required by BMP
			Responsible Persons	E&C Manager
18.	Bushfire	Fire	**Trigger**	• Bushfire outbreak in rehabilitation areas.
			Action	• Review Bushfire Management Plan. • Implement actions as required by Bushfire Management Plan. • Review affected areas to determine bushfire resilience of species. • Seek ecologist advice and monitor for plant rejuvenation • Re-plant, re-seed affected areas if no plant rejuvenation is evidence (on the advice of ecological specialist). • Monitor re-plantings/seeded areas as required by BMP.
			Responsible Persons	E&C Manager

10.0 Reporting & Review

10.1 Reporting

WCPL is required to prepare and submit an Annual Review, formally known as Annual Environmental Management Report (AEMR), as required under Development Consent DA305-7-2003. The Annual Review also satisfies the *AEMR Guidelines for MOPs Prepared to EDG03 Requirements*.

The Annual Review provides an annual review of monitoring results, performance measures/criteria, relevant predictions in the EAs/EIS, identifies non-compliances and corrective actions, provides rehabilitation progress and disturbance area report, rehabilitated areas and areas undergoing rehabilitation to demonstrate that progressive rehabilitation objectives are being achieved.

The Annual Review also satisfies the reporting requirements for Environment Protection Licence (EPL). **Table 37** provides a summary of the reporting mechanisms applicable to the WCPL, including which stakeholders will receive copies of each report and distribution.

Table 38 Reporting Framework

Report	Frequency	Distribution	Responsibility for Report Preparation
Incident Report	Provide detailed report within 7 days on notification	• DP&E (Manager, Mining Projects) • ~~DRG~~ RR (Director – Environmental Sustainability) • OEH/EPA (General Contact)	Environment and Community Manager
Annual Review	Annually (end of March each year)	• DP&E (Manager, Mining Projects) • ~~DRG~~ RR (Director – Environmental Sustainability) • OEH/EPA (General Contact) • CLWD (Mines Assessment and Planning) • Singleton Shire Council (General Manager) • CCC Members • Online via the Peabody website	Environment and Community Manager

10.2 Review & Implementation

Reviews of the MOP will be undertaken by Environment and Community Manager and Technical Services Manager as required during the MOP term to assess the effectiveness of the procedures against the objectives of MOP. The MOP may also be reviewed, and if necessary amended, for example, to incorporate modifications of DA305-7-2003 and any proposed activities that are not in accordance with the MOP. The MOP may also be reviewed and revised due to changes in environmental requirements, risk assessments, monitoring results, completion criteria, technologies and legislation. Any proposed amendment to the MOP would be completed in accordance with the MOP Guidelines and in consultation with the ~~DRG~~ RR and other relevant stakeholders.

The General Manager and each respective Mine Manager will ensure appropriate resources are provided to implement the MOP. The implementation of this MOP will be the responsibility of the Environment and Community Manager and Technical Services Manager.

11.0 Rehabilitation Plans (A3)

12.0 References

Australian and New Zealand Minerals and Energy Council and Mineral Resources Council of Australia (2000) *Strategic Framework for Mine Closure*.

Department of Mineral Resources (1999) *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales.*

Department of Mineral Resources (2003) *Guideline for Applications for Subsidence Management Plan Approvals.*

Department of Trade and Investment, regional Infrastructure and Services – Mine Safety Operations (2012) *Mine Design Guideline 6001 Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams*.

Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (2013) *ESG3: Mining Operations Plan (MOP) Guidelines*.

Global Soil Systems (2009) *Rehabilitation Standards for Wambo Coal Pty Limited.*

Hansen Bailey (2017) Wambo Coal Pty Ltd *Independent Environmental Audit*.

Wambo Coal Pty Limited (2003) *Wambo Development Project Environmental Impact Statement*.

Wambo Coal Pty Limited (2007) *Topsoil Stockpile Management Procedure.*

Wambo Coal Pty Limited (2009) *Restoration Procedure*.

Wambo Coal Pty Limited (2013) *North Wambo Creek Diversion Plan*.

Wambo Coal Pty Limited (2017) *Biodiversity Management Plan.*

Wambo Coal Pty Limited (2014b) *Extraction Plan for North Wambo Underground Mine Longwalls 7 to 10*.

Wambo Coal Pty Limited (2014b) *Extraction Plan for North Wambo Underground Mine Longwalls 7 to 10*a.

Secondary Flocculation Capping Assessment for Wambo Tailings Storages (May 2017), Fitton Tailings Consultants Pty Ltd.

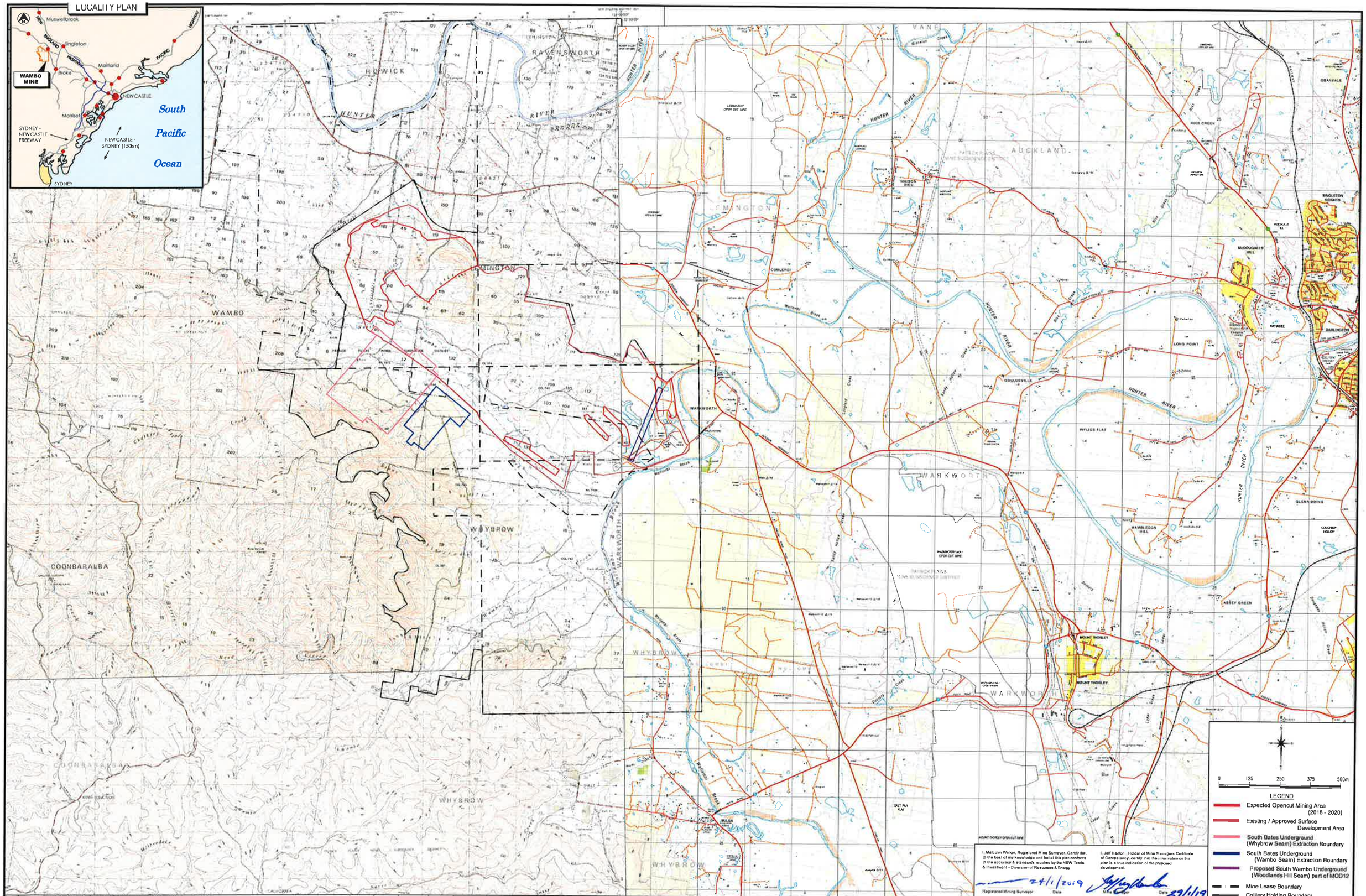
13.0 Abbreviations

BMP	Biodiversity Management Plan
BMgtP	Blasting Management Plan
CCC	Community Consultative Committee
CCL	Consolidated Coal Lease
CL	Coal Lease
CLWD	Crown Lands and Water Division, Department of Industry
DMR	NSW Department of Mineral Resources (now DRG)
DP&E	NSW Department of Planning & Environment
DPI	NSW Department of Primary Industries
DRG	Division of Resources and Geoscience (now RR)
DSC	NSW Dams Safety Committee
EEC	Endangered ecological community
Project EIS	*Wambo Coal Project Environmental Impact Statement 2003*
EPA	NSW Environment Protection Authority
EP&A Act	NSW *Environmental Planning and Assessment Act, 1979*
EPL	Environment Protection Licence
FFMP	Flora and Fauna Management Plan (now BMP)
MOP	Mining Operations Plan
RMP	Rehabilitation Management Plan
RR	NSW Department of Planning and Environment - Resources Regulator
RWEP	Remnant Woodland Enhancement Program
SDP	Surface Disturbance Protocol
TARP	Trigger Action Response Plan
TWMS	Total Waste Management System
VCP	Vegetation Clearance Protocol
WCPL	Wambo Coal Pty Limited

APPENDIX 1

Rehabilitation Plans

LOCALITY PLAN



I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Diversion of Resources & Energy

Registered Mining Surveyor — Date 24/1/2019

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

Mine Manager — Date 29/1/19

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	1/01/2018	MJW	Wambo MOP 2018–2020						
B	22/01/2019	MJW	Amendment A						

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057
Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330
Phone: 02 65 702200
Fax: 02 65 702290
Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 1A
Project Locality

Date	Scale:	Drawn	Checked	Approved	Sheet Size
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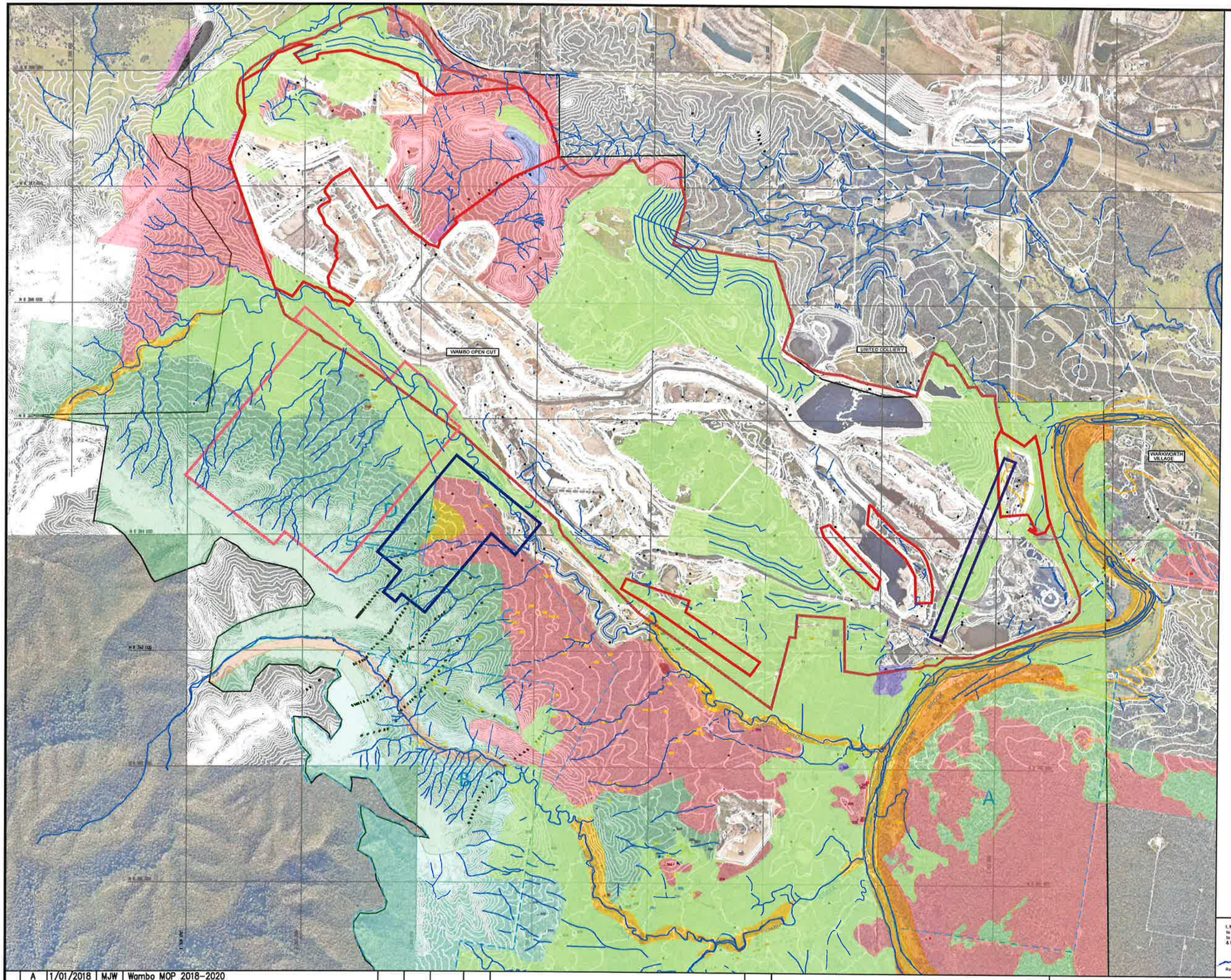
Drawing No. 2341

Revision No. B_22/01/2019



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LEGEND

- Expected Opencut Mining Area
- Existing / Approved Surface Development Area
- South Bates Underground (Whybrow Seam) Extraction Boundary
- South Bates Underground (Wambo Seam) Extraction Boundary
- Proposed South Wambo Underground (SWU) First Workings (Woodlands Hill Seam) part of MOD12 approval area
- Colliery Holding Boundary
- Opencut Rehabilitation Existing
- Existing Natural Pasture
- RWEP Areas
- 1 in 100 Year Flood Level
- Water Course
- 25 Contours (5m)

ARCHAEOLOGICAL SITES

- Extant Site Permit 2222
- Extant Site No Permit
- **United Recorded Site**
- Additional Wambo Recorded Site
- Salvaged Site
- Partially Salvaged Site
- European Heritage Site

VEGETATION COMMUNITIES

- River Oak
- River Red Gum
- Forest Red Gum
- Coast Banksia
- Narrow-leaved Ironbark
- Spotted Gum
- Slaty Gum
- Grey Gum
- White Mahogany
- Weeping Myall

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Diversion of Resources & Energy

Registered Mining Surveyor — Date 24/1/2019

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

Mine Manager — Date 23/1/19

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.
A	1/01/2018	MJW	Wambo MOP 2018-2020	
B	23/01/2019	MJW	Amendment A	

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057

Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330
Phone: 02 65 702200
Fax: 02 65 702290

Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 1B
Pre Mining Environment - Natural Environment

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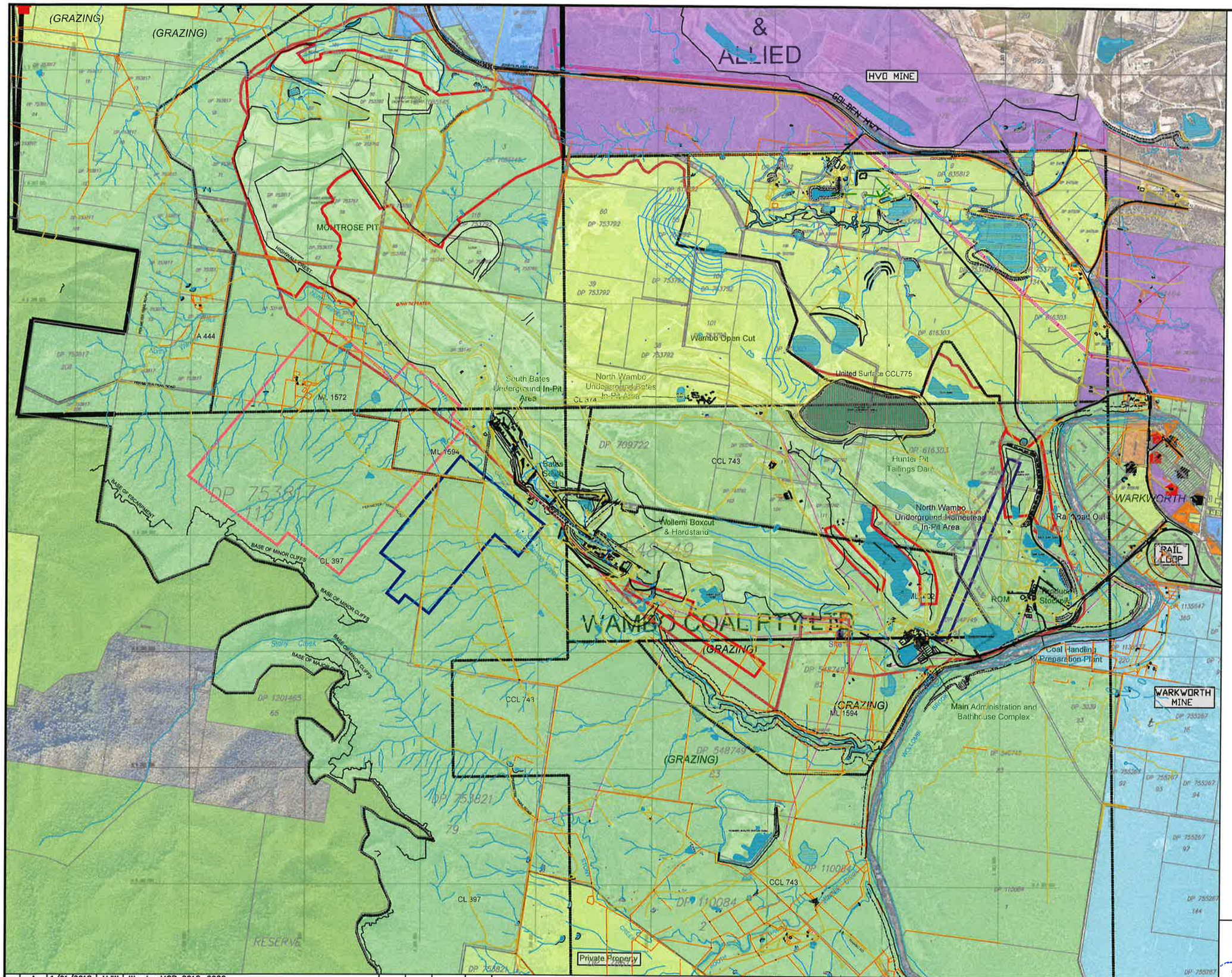

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Division of Resources & Energy

Registered Mining Surveyor — Date 24/1/2019

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

Manager — Date 29/1/19

REVISIONS									
A	1/01/2018	MJW	Wambo MOP 2018-2020						
B	23/01/2019	MJW	Amendment A						
REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057
Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330
Phone: 02 65 702200
Fax: 02 65 702290
Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine

Mining Operations Plan 2018 to 2020 - Plan 1C
Pre Mining Environment - Built Environment

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Drawing No. 2343

Revision No. B_23/01/2019

HVO MINE

GOLDEN HWY

Wambo Open Cut

United Underground

South Bates Underground In Pit Area

South Bates Underground

Parish of Roxburgh
County of Hunter
LGA of Singleton

Parish of Coonbaralba
County of Hunter
LGA of Singleton

Stony Creek

North Wambo Underground

Homestead Underground

Parish of Warkworth
County of Northumberland
LGA of Singleton

Private Property (GRAZING)

Rail Road Out

RAIL LOOP

ROM

Product Stockpile

Coal Handling Preparation Plant

WARKWORTH MINE

Main Administration and Bathhouse Complex

Wollombi Brook

A 444

ML 1572

ML 1594

CCL 743

CCL 744

CL 374

CL 397

CL 492

0 125 250 375 500m

LEGEND

- Expected Opencut Mining Area
- Existing / Approved Surface Development Area
- South Bates Underground (Whybrow Seam) Extraction Boundary
- South Bates Underground (Wambo Seam) Extraction Boundary
- Proposed South Wambo Underground (SWU) First Workings (Woodlands Hill Seam) part of MOD12 approval area
- Mine Lease Boundary
- Colliery Holding Boundary
- Colliery Railway Line
- Tailings Emplacement
- Water Course
- Transmission Lines
- Fences
- Dam
- Wambo Seam Auger Mining
- Whynot Seam Auger Mining
- Old Opencut Voids Whybrow Seam (Abandoned)
- Opencut Voids - Whynot Seam (Active and Abandoned)
- Underground Workings Wambo Seam
- Underground Workings Whybrow Seam
- United Colliery Underground Workings Arrowfield Seam (Abandoned - Sealed)
- Proposed Underground Workings -Whybrow Seam

STRATIGRAPHIC SECTION

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Diversion of Resources & Energy

24/1/2019
Registered Mining Surveyor Date

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

29/1/19
Mine Manager Date

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.
A	1/01/2018	MJW	Wambo MOP 2018-2020	
B	23/01/2019	MJW	Amendment A	

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057

Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330

Phone: 02 65 702200
Fax: 02 65 702290

Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 1C (2)
Pre Mining Environment (Historical Mine Workings)

Date	Scale:	Drawn	Checked	Approved
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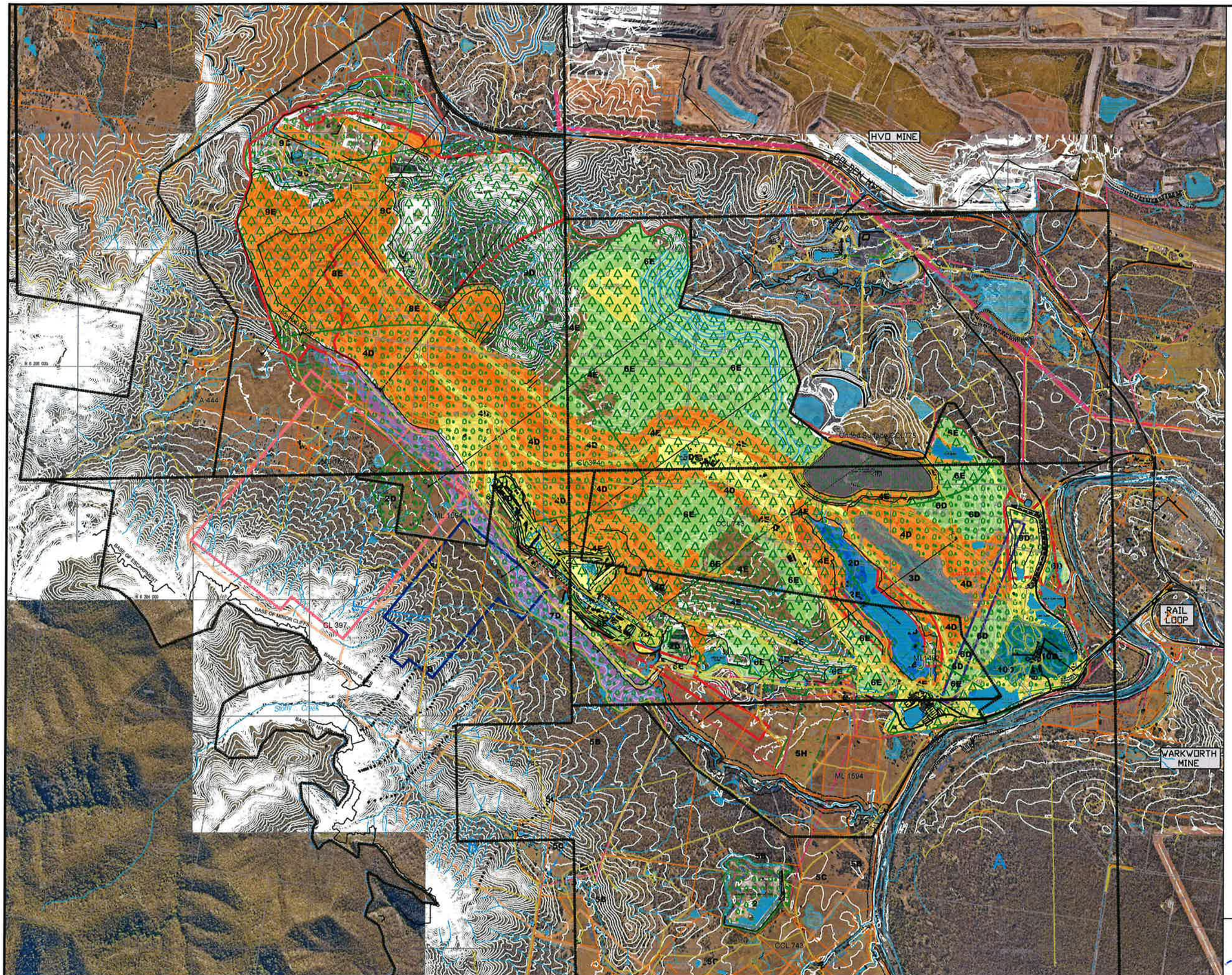

LEGEND

- Expected Opencut mining Area
- Existing / Approved Surface Development Area
- South Bates Underground (Whybrow Seam) Extraction Boundary
- South Bates Underground (Wambo Seam) Extraction Boundary
- Proposed South Wambo Underground (SWU) First Workings (Woodlands Hill Seam) part of MOD12 approval area
- Mine Lease Boundary
- Colliery Holding Boundary
- Railway Line
- Water Course
- Existing Power Line
- Fences
- A A' Section Line
- 25 Contours (5m)
- RWEP Areas

PRIMARY DOMAINS

- 1 Mine Infrastructure Areas
- 2 Water Management
- 3 Tailings Emplacement Areas
- 4 Waste Rock Emplacement Areas
- 5 Subsidence Area
- 6 Rehabilitation (Pre MOP)
- 7 Creek Deviation
- 8 Active Mining Area (Opencut)
- 9 Future Mining (Opencut)
- 10 Coal Handling Preparation Plant

SECONDARY DOMAINS

- B Existing Native Vegetation
- C Existing Pasture
- D Rehabilitation Mixed Pasture / Woodland
- E Rehabilitation (Woodland Corridors)
- H Rehabilitation (Pasture)

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Division of Resources & Energy

Registered Mining Surveyor — Date 29/1/2019

I, Jeff Harlen, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development

Mine Manager — 29/1/19

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	1/01/2018	MJW	Wambo MOP 2018-2020						
H	21/01/2019	MJW	Amendment A						

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057

Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330

Phone: 02 65 702200
Fax: 02 65 702290

Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine

Mining Operations Plan 2018 to 2020 - Plan 2
Mine Domains - At Commencement of MOP

Date	Scale:	Drawn	Checked	Approved
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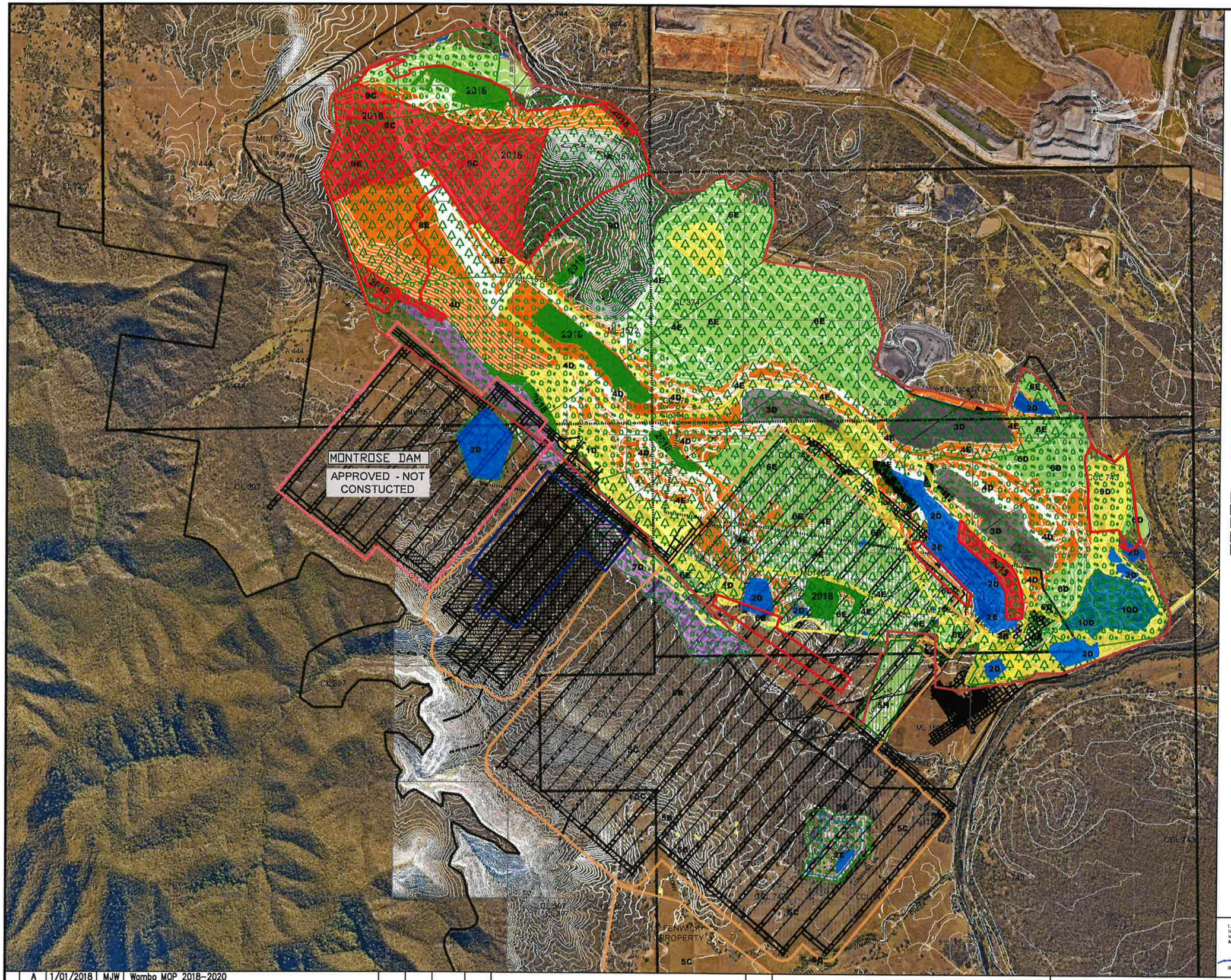

LEGEND

- Expected Opencut Mining Area
- Existing / Approved Surface Development Area
- South Bates Underground (Whybrow Seam) Extraction Boundary
- South Bates Underground (Wambo Seam) Extraction Boundary
- Mine Lease Boundary
- Colliery Holding Boundary
- A A' Section Line
- Previous 1st Workings
- Previous 2nd Workings - Whybrow Seam
- Previous 2nd Workings - Wambo Seam

PRIMARY DOMAINS

1. Mine Infrastructure Areas
2. Water Management
3. Tailings Emplacement Areas
4. Waste Rock Emplacement Areas
5. Subsidence Area
6. Rehabilitation (Pre MOP)
7. Creek Deviation
8. Active Mining Area 2018 (Opencut)
9. Future Mining
10. Coal Handling Preparation Plant
2018. Future Rehabilitation 2018

SECONDARY DOMAINS

- B Existing Native Vegetation
- C Existing Pasture
- D Rehabilitation Mixed Pasture / Woodland
- E Rehabilitation (Woodland Corridors)
- H Rehabilitation (Pasture)

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief the plan conforms to the accuracy & standards required by the NSW Trade & Investment - Diversion of Resources & Energy

Registered Mining Surveyor — Date 29/1/2019

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

Manager — Date 29/1/19

REVISIONS	REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
	A	1/01/2018	MJW	Wambo MOP 2018–2020						
	B	23/01/2019	MJW	Amendment A						

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057
Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330
Phone: 02 65 702200
Fax: 02 65 702290
Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 3A
Mining & Rehabilitation 2018

Date	Scale:	Drawn	Checked	Approved	Drawing No.	Revision No.	Sheet Size
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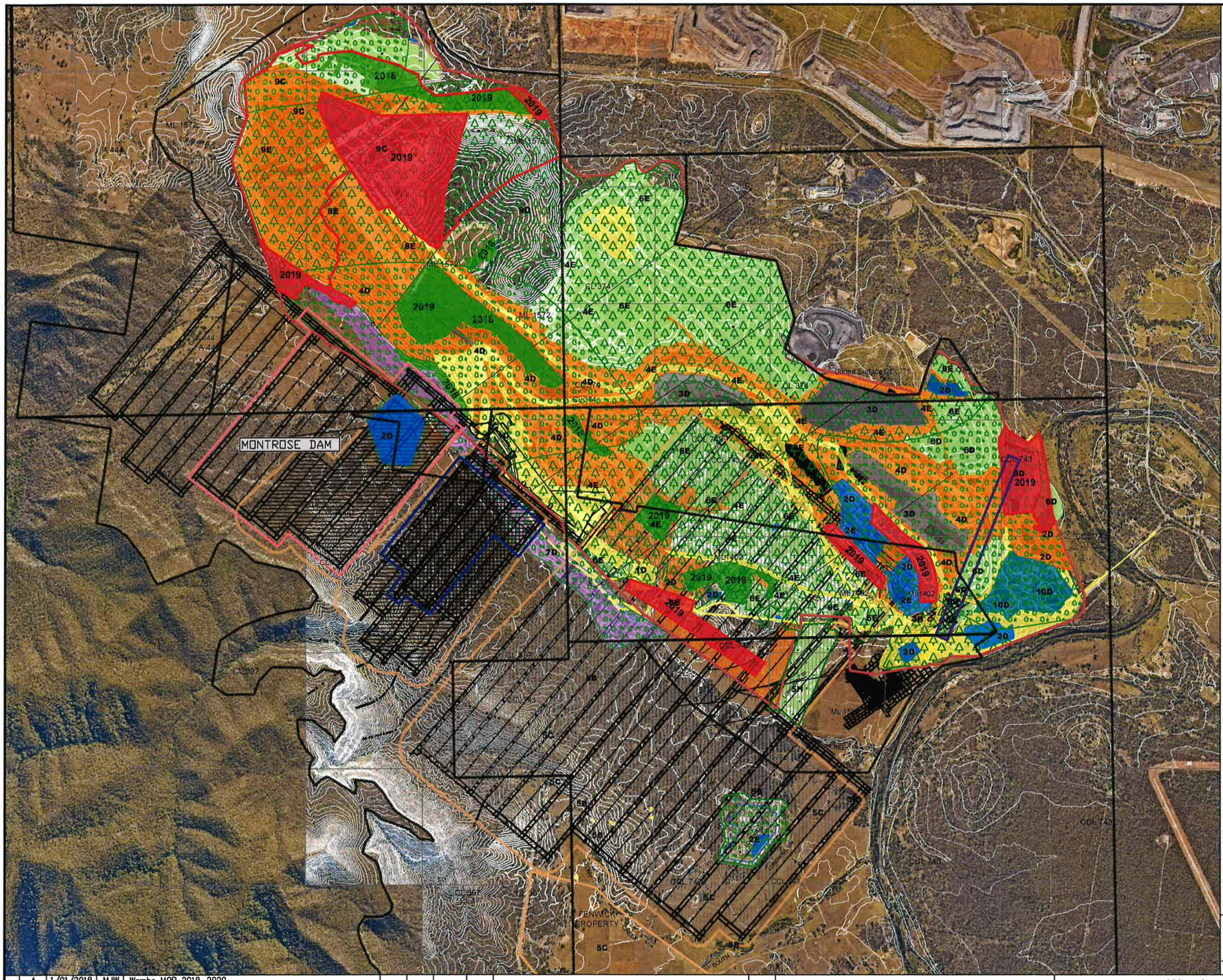

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LEGEND

- Expected Opencut Mining Area
- Existing / Approved Surface Development Area
- South Bates Underground (Whybrow Seam) Extraction Boundary
- South Bates Underground (Wambo Seam) Extraction Boundary
- Mine Lease Boundary
- Colliery Holding Boundary

A A' Section Line

- Previous 1st Workings
- Previous 2nd Workings - Whybrow Seam
- Previous 2nd Workings - Wambo Seam

PRIMARY DOMAINS

1. Mine Infrastructure Areas
2. Water Management
3. Tailings Emplacement Areas
4. Waste Rock Emplacement Areas
5. Subsidence Area
6. Rehabilitation (Pre MOP)
7. Creek Deviation
8. Active Mining Area 2019 (Opencut)
9. Future Mining
10. Coal Handling Preparation Plant
2019. Future Rehabilitation 2019

SECONDARY DOMAINS

B. Existing Native Vegetation
C. Existing Pasture
D. Rehabilitation Mixed Pasture / Woodland
E. Rehabilitation (Woodland Corridors)
H. Rehabilitation (Pasture)

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Diversion of Resources & Energy

Registered Mining Surveyor — Date 24/1/2019

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

Mine Manager — Date 29/1/19

REVISIONS	REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
	A	1/01/2018	MJW	Wambo MOP 2018–2020						
	B	23/01/2019	MJW	Amendment A						

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057
Jerry's Plains Rd, Warkworth Via Singleton, NSW, 2330
Phone: 02 65 702200 Fax: 02 65 702290
Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 3B
Mining & Rehabilitation 2019

Date	Scale:	Drawn	Checked	Approved	Sheet Size
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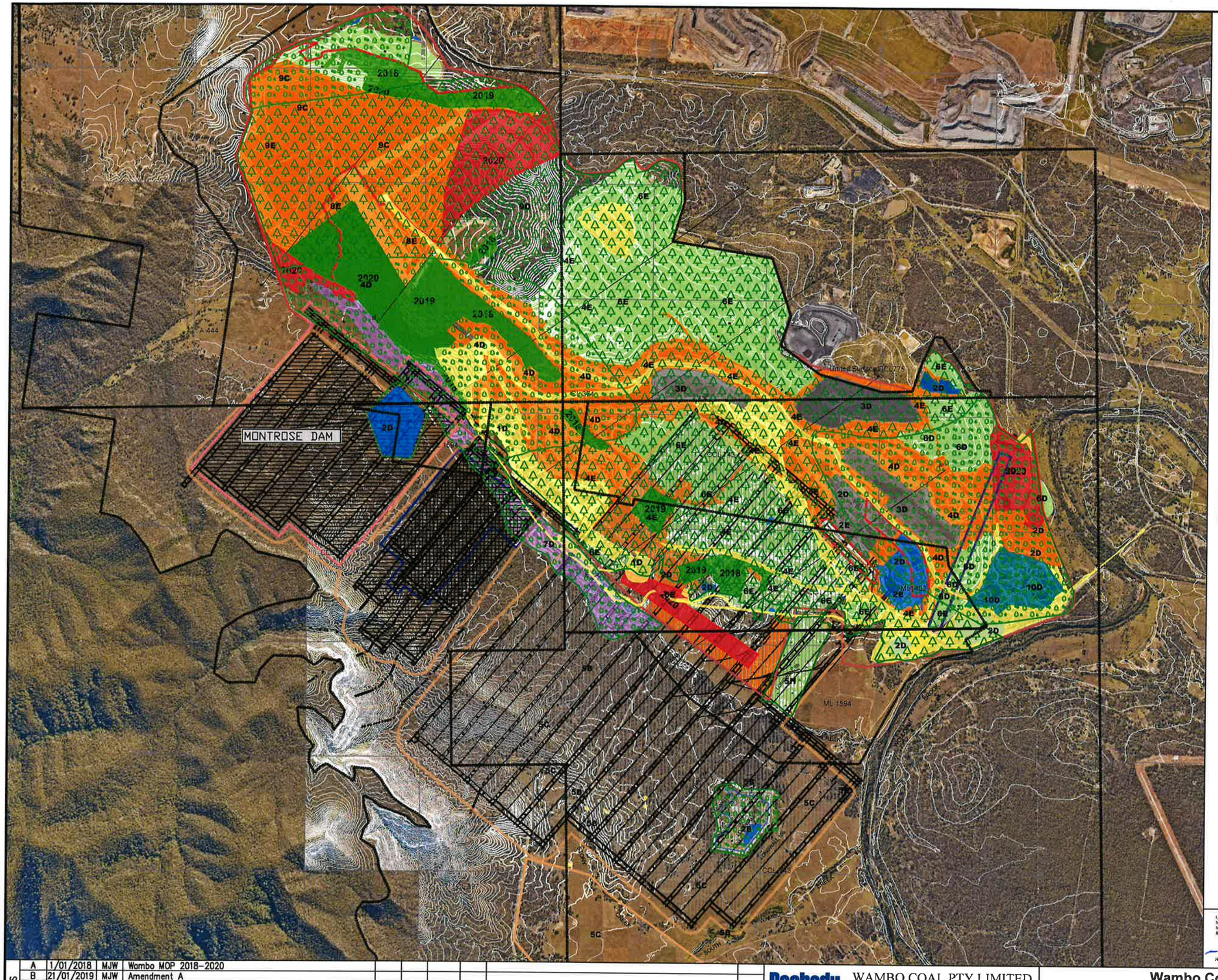

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LEGEND

- Expected Opencut Mining Area
- Existing / Approved Surface Development Area
- South Bates Underground (Whybrow Seam) Extraction Boundary
- South Bates Underground (Wambo Seam) Extraction Boundary
- Mine Lease Boundary
- Colliery Holding Boundary
- Proposed South Wambo Underground (SWU) First Workings (Woodlands Hill Seam) part of MOD12 approval area
- A A' Section Line
- Previous 1st Workings
- Previous 2nd Workings - Whybrow Seam
- Previous 2nd Workings - Wambo Seam

PRIMARY DOMAINS

- 1 Mine Infrastructure Areas
- 2 Water Management
- 3 Tailings Emplacement Areas
- 4 Waste Rock Emplacement Areas
- 5 Subsidence Area
- 6 Rehabilitation (Pre MOP)
- 7 Creek Deviation
- 8 Active Mining Area 2020 (Opencut)
- 9 Future Mining
- 10 Coal Handling Preparation Plant
- 2020 Future Rehabilitation 2020

SECONDARY DOMAINS

- B Existing Native Vegetation
- C Existing Pasture
- D Rehabilitation Mixed Pasture / Woodland
- E Rehabilitation (Woodland Corridors)
- H Rehabilitation (Pasture)

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Diversion of Resources & Energy

24/1/2019
Registered Mining Surveyor Date

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

29/1/19
Mine Manager Date

REVISIONS	REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
	A	1/01/2018	MJW	Wambo MOP 2018-2020						
	B	21/01/2019	MJW	Amendment A						

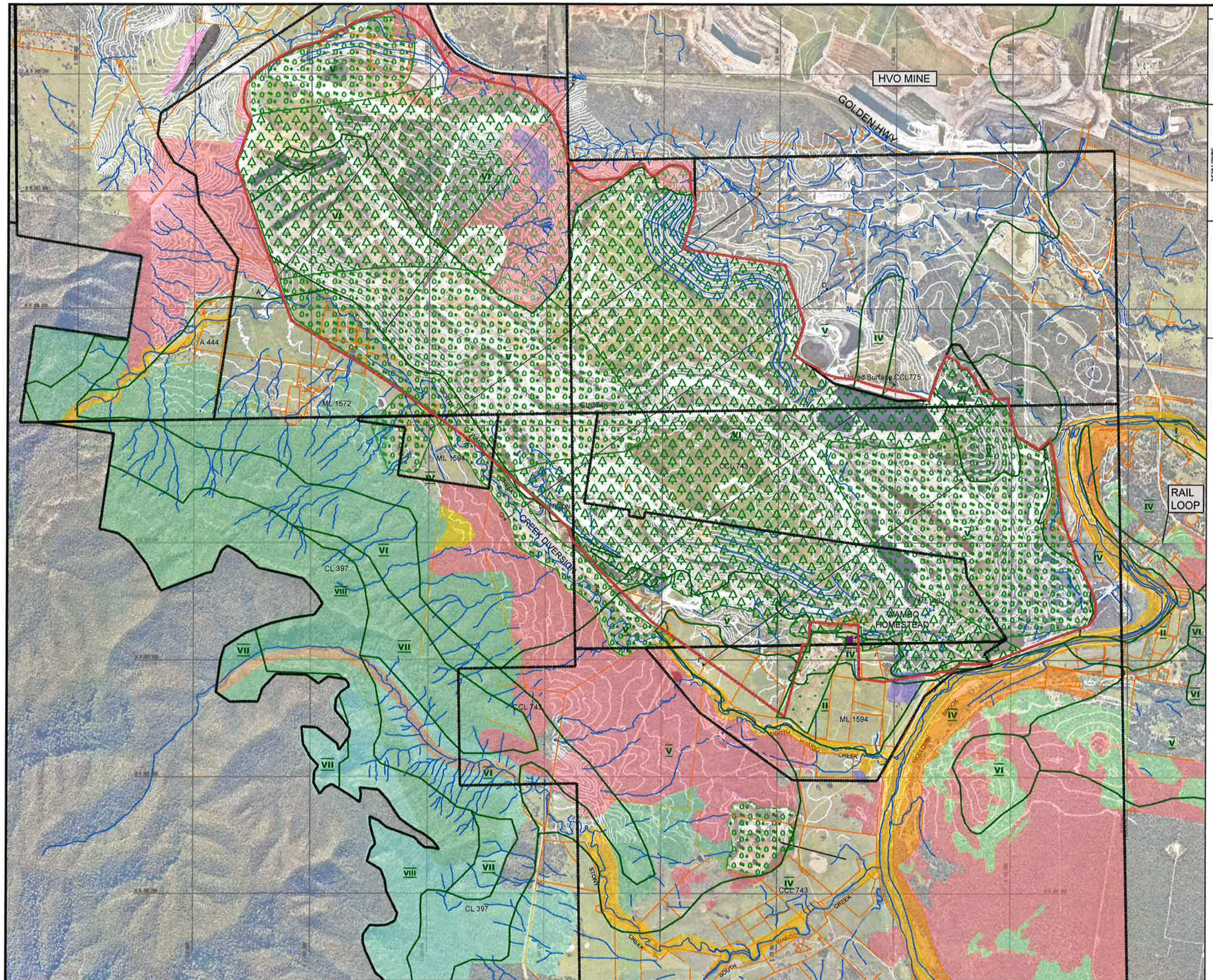
Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057
Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330
Phone: 02 65 702200
Fax: 02 65 702290
Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 3C
Mining & Rehabilitation 2020

Date	Scale:	Drawn	Checked	Approved
1/01/2018	1:11000	MJW	PJ	JH, DG

Drawing No. 2348
Revision No. B_21/01/2019
Sheet Size A0



LAND CLASSIFICATION AND SOIL CONSERVATION PRACTICES			INTERPRETATIONS AND IMPLICATIONS	
SUITABLE FOR REGULAR CULTIVATION	I	No Special soil conservation works or practices	Land suitable for a wide variety of users. Where soils are lands. It is land with the highest potential for agriculture and may be cultivated for vegetable and fruit production, cereal and other grain crops, energy crops, fodder and forage crops and sustainable on specific areas. Includes Prime agricultural land.	
	II	Soil conservation practices such as strip cropping, conservation tillage and adequate crop rotation	Use only gently sloping land suitable for a wide variety of agricultural uses. Has a high potential for production of crops on fertile soils similar to Class I but increasing limitations to production due to the erosion hazard and reduce the total yield over time. Soil erosion problems are often severe. Generally fair to good agricultural land.	
	III	Structural soil conservation works such as gully banks, waterways and diversion banks, together with soil conservation practices such as conservation tillage and adequate crop rotation	Use is right to suitable for cropping on a rotational basis. Generally used for the production of the same type of crops as listed for Class I although productivity will vary depending upon soil fertility. However yield may be the same as for Classes I and II, but increasing restrictions due to the erosion hazard will reduce the total yield over time. Soil erosion problems are often severe. Generally fair to good agricultural land.	
SUITABLE GRAZING Occasional Cultivation	IV	Soil conservation practices such as pasture improvement, stock control, application of fertilizer and minimal cultivation for the establishment or re-establishment of permanent pasture	Land not suitable for cultivation on a regular basis owing to limitations of slope gradient, soil erosion, shallowness or rockiness, climate, or a combination of these factors. Can be used for a wide range of grazing land of the arable and can be cultivated for an occasional crop, particularly a fodder crop or for pasture renewal. Not suited to the range of agricultural uses listed for Classes I to III. If used for "hobby farms" extensive provision must be made for water supply, effluent disposal and selection of safe building sites and access roads.	
	V	Structural soil conservation works such as interception banks, diversion banks and surface roughening together with the practices as in Class IV	Land not suitable for cultivation on a regular basis owing to considerable limitations of slope gradient, soil erosion, shallowness or rockiness, climate or a combination of these factors. Soil erosion problems are often severe. Production is generally lower than for grazing lands in Class IV. Can be cultivated for an occasional crop, particularly a fodder crop or for pasture renewal. Not suited to the range of agricultural uses listed for Classes I to III. If used for "hobby farms" extensive provision must be made for water supply, effluent disposal and selection of safe building sites and access roads.	
No Cultivation	VI	Soil conservation practices including limitation of stock, protection of seed and fertilizer, prevention of fire and construction of vermin. May include some isolated structural works.	Productivity will vary due to the soil depth and the soil fertility. Generates the best grazing lands. If used as "hobby farms" adequate provision should be made for water supply, effluent disposal and selection of safe building sites and access roads.	
OTHER	VII	Land best protected by green timber	Generally comprises areas of steep slopes, shallow soils and/or rock outcrop. Adequate ground protection must be maintained by limiting grazing and minimizing damage by fire. Destruction of trees is not generally recommended but partial clearing for grazing purposes is permitted if management controls can be placed on which will ensure the retention of adequate. Where clearing of these lands has occurred in the past, unstable soil and remain sites should be returned to timber cover.	
	VIII	Cliffs, lakes or swamps and other lands unsuitable for agricultural and pastoral production	Land unsuitable for agricultural or pastoral uses. Recommended uses are those compatible with the preservation of the natural vegetation, namely water supply catchments, wildlife refuges, national and water parks and scenic areas.	
	U	Urban areas	CLASS SUBSCRIPTS	SPECIAL USES
			s	Terrain developed for a specific crop (capability class range IV to VII) as a result of the combination of particular soil, terrain, climatic and economic conditions. This class includes such crops as grapes, bananas, avocados and pineapples.
	M	Mining and quarrying areas	a	Terrain developed for intensive agricultural production and associated with flood irrigation. The class includes land developed for cotton and rice production.

0 125 250 375 500m

LEGEND

- Existing / Approved Surface Development Area
- Mine Lease Boundary
- Colliery Holding Boundary
- Water Course
- Fences
- A A' Section Line
- European Heritage Site
- Contours (5m)

SECONDARY DOMAINS

- B Existing Native Vegetation
- C Existing Pasture
- D Rehabilitation Mixed Pasture / Woodland
- E Rehabilitation (Woodland Corridors)
- H Rehabilitation (Pasture)

VEGETATION COMMUNITIES

- River Oak
- River Red Gum
- Forest Red Gum
- Coast Banksia
- Narrow-leaved Ironbark
- Spotted Gum
- Slaty Gum
- Grey Gum
- White Mahogany
- Weeping Myall

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the accuracy & standards required by the NSW Trade & Investment - Division of Resources & Energy

Registered Mining Surveyor — Date 24/1/2019

I, Jeff Harlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

Mine Manager — Date 29/1/19

REVISIONS	REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
	A	1/01/2018	MJW	Wambo MOP 2018-2020						
	B	25/01/2018	MJW	Final Landform contour returned to approved EIS version						
	C	30/01/2018	MJW	Extraction boundaries for MOP Period removed						
	E	21/01/2019	MJW	Amendment A						

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057

Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330

Phone: 02 65 702200
Fax: 02 65 702290

Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine

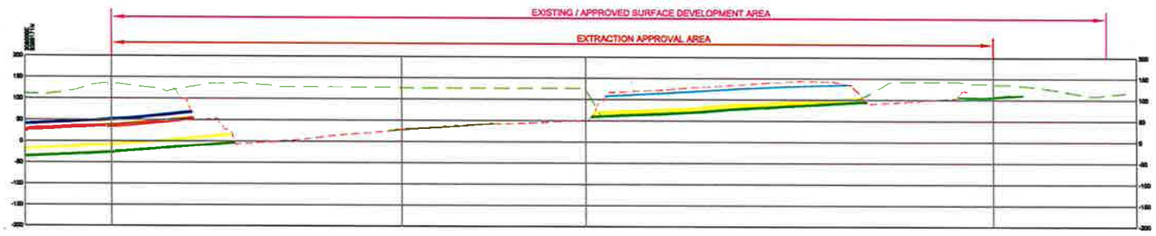
Mining Operations Plan 2018 to 2020 - Plan 4
Final Rehabilitation and Post Mining Land Use

Date	Scale:	Drawn	Checked	Approved
30/01/2018	1:7500	MJW	PJ	JH, DG

Drawing No. 2349

Revision No. E_21/01/2019

Sheet Size A0



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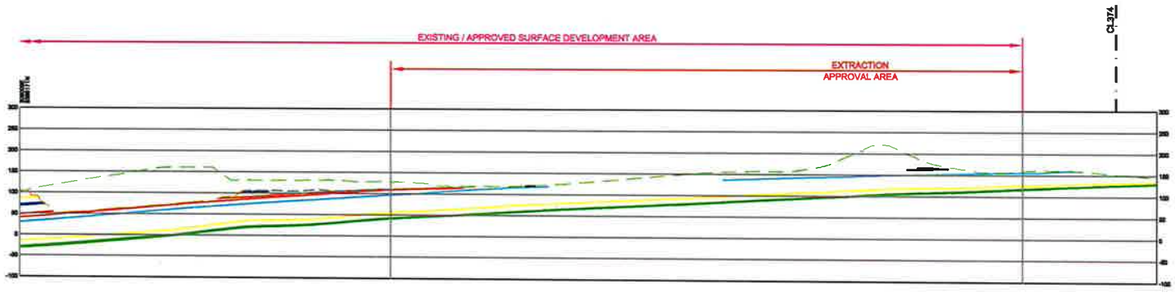

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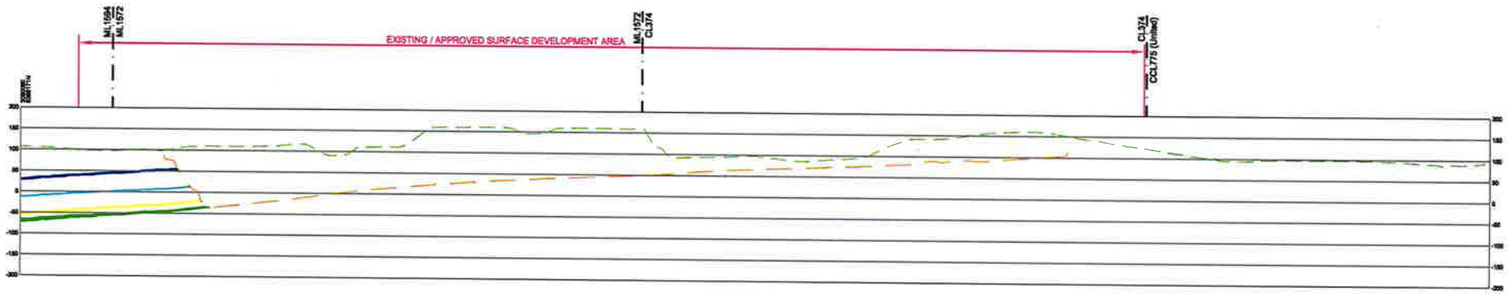

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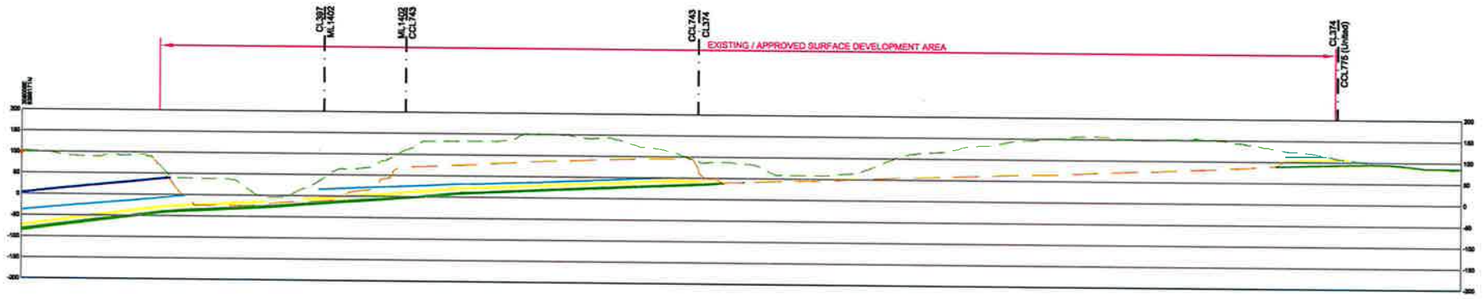
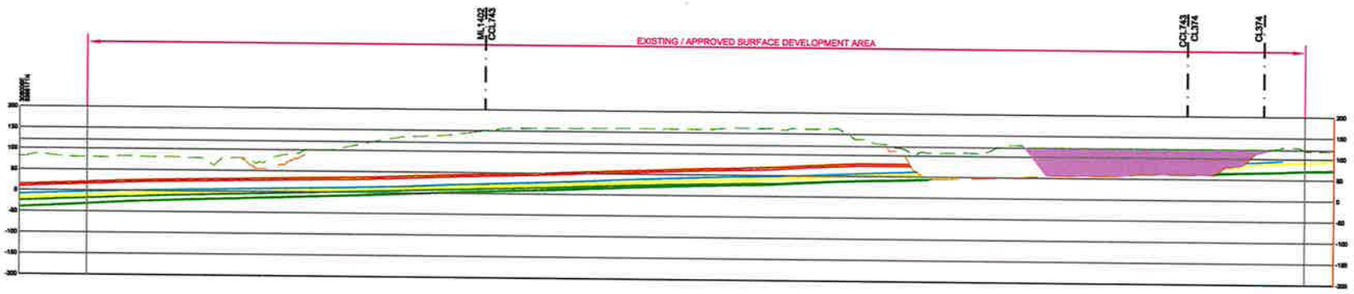


SECTION D - D'



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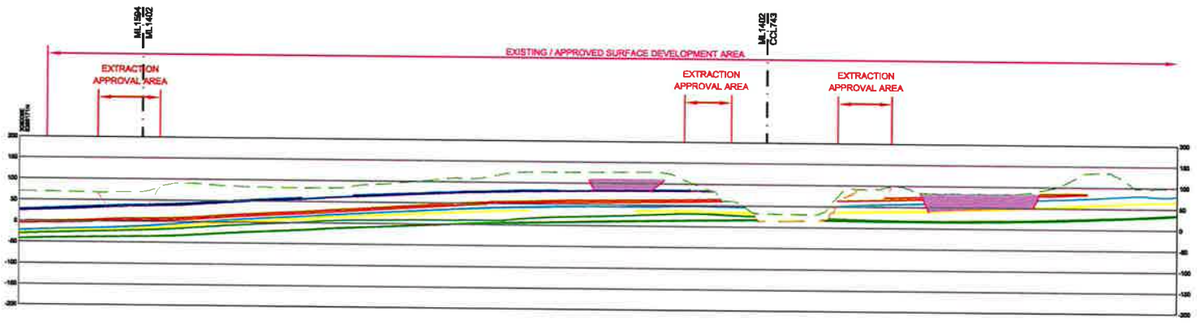

SECTION F - F'

I, Malcolm Walker, Registered Mine Surveyor, Certify that to the best of my knowledge and belief this plan conforms to the assurance & standards required by the NSW Trade & Investment - Diversion of Resources & Energy

24/1/2019
Registered Mining Surveyor Date

I, Jeff Hanlon, Holder of Mine Managers Certificate of Competency, certify that the information on this plan is a true indication of the proposed development.

Mine Manager 29/1/19

Rev.	Drawn	By	Description	Approved
A	1/01/2018	MJW	Wambo MOP 2018-2020	
B	22/1/2019	MJW	Amendment A	

Peabody

WAMBO COAL PTY LIMITED
ABN 13 000 668 057
Jerry's Plains Rd, Warkworth Via Singleton, NSW, 2330
Phone: 02 65 702200 Fax: 02 65 702290
Prepared by NWU Survey Ph: 02 65 702318

Wambo Coal Mine
Mining Operations Plan 2018 to 2020 - Plan 5
Rehabilitation and Post Mining Land Use - Cross Sections

Date	Scale:	Drawn	Checked	Approved
1/01/2018	1:5000	MJW	PJ	JH, DG

Drawing No. 2349b
Revision No. B_22/1/2019
Sheet Size A0

APPENDIX 2

DA305-7-2003

Development Consent

Section 80 of the *Environmental Planning & Assessment Act 1979*

I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), approve the Development Application referred to in schedule 1, subject to the conditions in schedules 3 to 6.

These conditions are required to:

- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the on-going environmental management of the development.

SIGNED

Diane Beamer MP
Minister Assisting the
Minister for Infrastructure and Planning
(Planning Administration)

Sydney 4 February 2004 File No: S02/02197

Blue type represents 2004 modification
Red type represents May 2005 modification
Green represents January 2006 modification
Pink represents April 2006 Modification
Orange represents October 2006 Modification
Violet represents January 2007 Modification
Brown represents June 2009 Modification
Lime represents August 2009 Modification
Blue with yellow background represents February 2011 Modification
Taupe represents January 2013 Modification
Light Blue represents July 2013 Modification
Blue with grey background represents April 2015 Modification
Purple represents October 2015 Modification
Maroon represents December 2016 Modification
Green background represents December 2017 Modification

SCHEDULE 1

Development Application:	DA 305-7-2003
Applicant	Wambo Coal Pty Limited;
Consent Authority:	Minister for Infrastructure and Planning;
Land:	See Appendix 1;
Proposed Development:	The development of open cut and underground mining operations at the Wambo coal mine, which includes: • continued development of open cut and underground mining operations within existing Wambo Coal Pty Limited (WCPL) mining and coal leases and into new mining lease application area; • selective auger mining of the Whybrow, Redbank Creek, Wambo and Whynot seams up to 200 m beyond the open cut limits within WCPL owned land; • continued placement of waste rock and coarse rejects within mine waste rock emplacements;

- continued placement of tailings within open cut voids and capping with waste rock and coarse rejects;
- longwall mining of the Whybrow Seam via the open cut highwall;
- longwall mining of the Wambo Seam via the open cut highwall;
- construction of a portal access to facilitate longwall mining of the Arrowfield and Woodlands Hill Seams;
- an upgrade of the existing Coal Handling and Preparation Plant (CHPP) to facilitate increased coal production;
- development of a water control structure across North Wambo Creek at the north-western limit of the open cut operation, and a channel to allow the passage of flows to the lower reaches of North Wambo Creek around the open cut development;
- degazettal and physical closure of Pinegrove Road;
- development of new access roads and internal haul roads;
- relocation of the existing explosives magazine and construction of additional hydrocarbon storage facilities;
- relocation of the administration area and site offices;
- extraction of up to 14.7 million tonnes of run-of-mine (ROM) coal a year;
- operation of the mine 24 hours a day, 7 days a week;
- continued haulage of coal by road from Wambo Coal Mine to Mt Thorley Coal Loader prior to the commissioning of the Wambo "Rail and Train Loading Infrastructure" (which is the subject of a separate development application: DA 177-8-2004); and
- haulage of coal by the Wambo "Rail and Train Loading Infrastructure".

State Significant Development:

The proposal is classified as State significant development, under section 76A(7) of the *Environmental Planning & Assessment Act 1979*, because it involves coal-mining related development that requires a new mining lease under section 63 of the *Mining Act 1992*.

Integrated Development:

The proposal is classified as integrated development, under section 91 of the *Environmental Planning & Assessment Act 1979*, because it requires additional approvals under the:

- *Protection of the Environment Operations Act 1997;*
- *National Parks & Wildlife Act 1974*;
- *Water Act 1912;*
- *Fisheries Management Act 1994*;
- *Heritage Act 1977*;
- *Roads Act 1993*; and
- *Mine Subsidence Compensation Act 1961*.

Designated Development:

The proposal is classified as designated development, under section 77A of the *Environmental Planning & Assessment Act 1979*, because it is for a coal mine that would "produce or process more than 500 tonnes of coal a day", and consequently meets the criteria for designated development in schedule 3 of the *Environmental Planning & Assessment Regulation 2000*.

BCA Classification:

Class 5:	Office upgrade
Class 9b:	Bathhouse
Class 10a:	Car park
	Heavy vehicle wash station
	Gas drainage bores
	De-watering bores
Class 10b:	Coal conveyor

Note:

1) *To find out when this consent becomes effective, see section 83 of the Environmental Planning & Assessment Act 1979 (EP&A Act);*
2) *To find out when this consent is liable to lapse, see section 95 of the EP&A Act; and*
3) *To find out about appeal rights, see section 97 of the EP&A Act.*

SCHEDULE 2
DEFINITIONS

Adaptive management	Adaptive management includes monitoring subsidence impacts and subsidence effects and, based on the results, modifying the mining plan as mining proceeds to ensure that the effects, impacts and/or associated environmental consequences remain within predicted and designated ranges and in compliance with the conditions of this consent
Annual Review	The review required by Condition 5 of Schedule 6
Applicant	Wambo Coal Pty Limited
Associated surface development	Includes ventilation shafts, gas drainage and gas flaring infrastructure, pit top facilities, access road, offices, car park, electrical sub-station, and associated services and easements such as powerlines, water supply, fire control, communications and waste water
BCA	Building Code of Australia
Bore	Any bore or well or excavation or other work connected or proposed to be connected with sources of sub-surface water, and used or proposed to be used or capable of being used to obtain supplies of such water whether the water flows naturally at all times or has to be raised whether wholly or at times by pumping or other artificial means
Built features	Includes any building or work erected or constructed on land, and includes dwellings and infrastructure such as any formed road, street, path, walk, or driveway; any pipeline, water, sewer, telephone, gas or other service main
CCC	Community Consultative Committee
Conditions of this consent	Conditions contained in schedules 2 to 6 inclusive
Construction	The demolition of buildings or works, carrying out of works and erection of buildings covered by this consent
Council	Singleton Shire Council
CLWD	Crown Lands and Water Division within Department of Primary Industry
DA	Development Application
Day	Day is defined as the period from 7am to 6pm on Monday to Saturday, and 8am to 6pm on Sundays and Public Holidays
Department	Department of Planning and Environment
DRG	Division of Resources and Geoscience within the Department
DSC	Dams Safety Committee
EA	Environmental Assessment
EIS	Environmental Impact Statement
Environmental consequences	The environmental consequences of subsidence impacts, including: damage to infrastructure, buildings and residential dwellings; loss of surface flows to the subsurface; loss of standing pools; adverse water quality impacts; development of iron bacterial mats; cliff falls; rock falls; damage to Aboriginal heritage sites; impacts on aquatic ecology; ponding
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979*
EP&A Regulation	*Environmental Planning and Assessment Regulation 2000*
EPL	Environment Protection Licence issued under the POEO Act
Evening	Evening is defined as the period from 6pm to 10pm
Feasible	Feasible relates to engineering considerations and what is practical to build or to implement
First Workings	Underground workings which establish access to the coal resource area
GTA	General Term of Approval
Heritage item	An item as defined under the *Heritage Act 1977* and/or an Aboriginal object or Aboriginal place as defined under the *National Parks and Wildlife Act 1974*
Incident	A set of circumstances that: • causes or threatens to cause material harm to the environment; and/or • breaches or exceeds the limits or performance measures/criteria in this consent
Land	Land means the whole of a lot in a current plan registered at the Land Titles Office at the date of this consent
Longwall Domains	Areas 1, 2, 3 and 4 as identified in Figure 9 of the document titled *South Wambo Underground Mine Modification Environmental Assessment* (see condition 2(q) of Schedule 3)
Low level cliffs	Low level cliffs as defined in the Subsidence Assessment (Appendix A) of the EA described in condition 2(r) of Schedule 3
Material harm to the environment	Actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial

Mining operations	Includes the removal of overburden and extraction, processing, handling, storage and transportation of coal at the Wambo Mining Complex
Minister	Minister for Planning, or delegate
Minor	Not very large, important or serious
Mitigation	Activities associated with reducing the impacts of the development prior to or during those impacts occurring
MOP	Mining Operations Plan
MSB	Mine Subsidence Board
Negligible	Small and unimportant, such as to be not worth considering
Night	Night is defined as the period from 10pm to 7am on Monday to Saturday, and 10pm to 8am on Sundays and Public Holidays
OEH	Office of Environment and Heritage
Offset Strategy	The revegetation and enhancement program described in the EIS for the Wambo Development Project, dated July 2003
PCA	Principal Certifying Authority appointed under Section 109E of the Act
POEO Act	*Protection of the Environment Operations Act 1997*
Privately-owned land	Land excluding land owned by a mining company, where: • A private agreement does not exist between the Applicant and the land owner; and • There are no land acquisition provisions requiring the Applicant to purchase the land upon request from the land owner.
Reasonable	Reasonable relates to the application of judgement in arriving at a decision, taking into account: mitigation benefits, cost of mitigation versus benefits provided, community views and the nature and extent of potential improvements
Reasonable costs	The costs agreed between the Department and the Applicant for obtaining independent experts to review the adequacy of any aspects of the extraction plan, or where such costs cannot be agreed, the costs determined by a dispute resolution process
Rehabilitation	The treatment or management of land disturbed by the development for the purpose of establishing a safe, stable and non-polluting environment, including the remediation of impacts
Remediation	Activities associated with partially or fully repairing or rehabilitating the impacts of the development or controlling the environmental consequences of this impact
ROM Coal	Run-of-mine coal
RMS	Roads and Maritime Services
Secretary	Secretary of the Department, or nominee
SEE	Statement of Environmental Effects
Safe, serviceable & repairable	Safe means no danger to users who are present, serviceable means available for its intended use, and repairable means damaged components can be repaired economically
South Bates Extension Area	The longwall mining domain described in the documents listed in condition 2(r) of Schedule 3
Southern Area	See Figure HA-5 in Appendix HA of Volume 4 of the EIS for the Wambo Development Project
Second workings	Extraction of coal from longwall panels, mini-wall panels or pillar extraction
Site	Land to which the DA applies (see schedule 1 and Appendix 1)
SMP	Subsidence Management Plan
Subsidence	The totality of subsidence effects, subsidence impacts and environmental consequences of subsidence impacts
Subsidence effects	Deformation of the ground mass due to mining, including all mining-induced ground movements, such as vertical and horizontal displacement, tilt, strain and curvature
Subsidence impacts	Physical changes to the ground and its surface caused by subsidence effects, including tensile and shear cracking of the rock mass, localised buckling of strata caused by valley closure and upsidence and surface depressions or troughs
Vacant land	Vacant land is defined as the whole of the lot in a current plan registered at the Land Titles Office that does not have a dwelling situated on the lot and is permitted to have a dwelling on that lot at the date of this consent.
Wambo Mining Complex	The development approved under this consent, together with the development approved under the consent for the Wambo rail and coal loading infrastructure (177-8-2004) considered collectively

TABLE OF CONTENTS

SCHEDULE 3
ADMINISTRATIVE CONDITIONS

Obligation to Minimise Harm to the Environment

1. The Applicant must implement all practicable measures to prevent and/or minimise any harm to the environment that may result from the construction, operation, or rehabilitation of the development.

Terms of Approval

2. The Applicant must carry out the development generally in accordance with the:
   (a) DA 305-7-2003;
   (b) EIS titled *Wambo Development Project*, volumes 1-5, dated July 2003, and prepared by Resource Strategies Pty. Ltd.;
   (c) letter from Holmes Air Sciences to the Department, dated 3 September 2003, and titled *Wambo Development Project - Response Air Quality Assessment*;
   (d) letter from Wambo Coal Pty. Ltd. to the Department, dated 24 October 2003, and titled *Wambo Development Project – Development Application Amendment (DA 305-7-2003-i)*;
   (e) Statement of Environmental Effects titled *Wambo Development project – Wambo Seam Underground Mine Modification*, dated January 2005, and prepared by Wambo Coal Pty Ltd;
   (f) document titled *Wambo Development Project – Modification of DA 305-7-2003-I*, dated 24 October 2005;
   (g) document titled *Wambo Development Project – Modification of DA 305-7-2003-I;* dated 23 January 2006;
   (h) document titled *Wambo Development Project – Modification of DA 305-7-2003-I;* dated 27 July 2006;
   (i) document titled *Wambo Coal Mine Modification Statement of Environmental Effects*; dated September 2006;
   (j) document titled *Wambo Coal Mine Statement of Environmental Effects on Proposed Modification*, dated March 2009;
   (k) document titled *Wambo Coal Mine Modification Statement of Environmental Effects*, dated June 2009 and the response to submissions dated July 2009;
   (l) the modification application DA 305-7-2003 MOD 9 and accompanying letter prepared by Wambo Coal Pty Ltd;
   (m) the modification application DA 305-7-2003 MOD 11 and accompanying documents titled *Wambo Montrose Water Storage Modification Environmental Assessment* dated June 2012 and *Wambo Montrose Water Storage Modification Response to Submissions* dated 4 September 2012;
   (n) the modification application DA 305-7-2003 MOD 13 and accompanying documents entitled *North Wambo Mine Modification Environmental Assessment - The addition of North Wambo Underground Mine Longwalls 9 and 10* dated December 2012 and *North Wambo Underground Mine Modification - Response to Submissions* dated April 2013;
   (o) the modification application DA 305-7-2003 MOD 14 and accompanying documents entitled North Wambo Underground Mine Longwall 10A Modification Environmental Assessment - The addition of North Wambo Underground Mine Longwall 10A, dated September 2014, and associated Response to Submissions dated December 2014;
   (p) the modification application DA 305-7-2003 MOD 15 and accompanying documents entitled South Bates (Wambo Seam) Underground Mine Modification Environmental Assessment – The addition of South Bates (Wambo Seam) Underground Mine Longwalls 14 to 16, dated August 2015, and associated Response to Submissions dated September 2015 and letter from Peabody Energy to the Department titled Modification 15 to DA 305-7-2003 – Supplementary Request to Include Revised Portal Location, dated 2 November 2015;
   (q) the modification application DA 305-7-2003 MOD 12 and accompanying documents entitled *South Wambo Underground Mine Modification Environmental Assessment*, dated April 2016, associated Response to Submissions dated June 2016 and letter from Peabody Energy to the Department titled *Modification 12 to DA 305-7-2003 – Request to Revise First Workings Layout*, dated 13 July 2016;
   (r) the modification application DA 305-7-2003 MOD 17 and accompanying documents entitled South Bates Extension Modification Environmental Assessment, dated March 2017, associated Response to Submissions (Parts A and B) dated June and September 2017; and
   (s) Approved Layout, shown in Appendix 5.

   Note: With the approval of the Secretary, longwall panels may be shortened or narrowed, providing that the proposed variations do not result in increased subsidence impacts or environmental consequences.

2A. The Applicant must carry out the development in accordance with the conditions of this consent.

3. If there is any inconsistency between the documents listed in condition 2, the most recent document shall prevail to the extent of the inconsistency. The conditions of this consent shall prevail over the documents in condition 2 to the extent of any inconsistency.

4. The Applicant must comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of:
   (a) any strategies, plans, programs, reviews, audits, reports or correspondence that are submitted in accordance with this consent (including any stages of these documents);
   (b) any reviews, reports or audits commissioned by the Department regarding compliance with this consent; and
   (c) the implementation of any actions or measures contained in these documents.

Deferred Commencement

5. This consent shall only commence when the Applicant has surrendered all previous development consents for the Wambo coal mine, excluding DA No. 108/91 issued by Singleton Shire Council, to the satisfaction of the Secretary.

Limits on Approval

6. The Applicant may carry out mining operations at the Wambo Mining Complex until 31 December 2039, except for open cut coal extraction, which may only be undertaken until 31 December 2020.

Note: Under this consent, the Applicant is required to rehabilitate the site and carry out additional undertakings to the satisfaction of both the Secretary and DRG. Consequently, this consent will continue to apply in all other respects other than the right to conduct mining operations until the rehabilitation of the site and those additional undertakings have been carried out satisfactorily.

7. The Applicant must not extract more than:
   (a) 8 million tonnes of ROM coal a year from the open cut mining operations;
   (b) 9.75 million tonnes of ROM coal a year from the underground mining operations; and
   (c) 14.7 million tonnes of ROM coal a year from the development, in total.

Staged Submission of any Strategy, Plan or Program

7A. With the approval of the Secretary, the Applicant may:
   (a) submit any strategy, plan or program required by this consent on a progressive basis; and
   (b) combine any strategy, plan or program required by this consent with any similar strategy, plan or program required under DA 177-8-2004.

Notes:
- *While any strategy, plan or program may be submitted on a progressive basis, the Applicant will need to ensure that the existing operations on site are covered by suitable strategies, plans or programs at all times; and*
- *If the submission of any strategy, plan or program is to be staged, then the relevant strategy, plan or program must clearly describe the specific stage to which the strategy, plan or program applies, the relationship of this stage to any future stages, and the trigger for updating the strategy, plan or program.*

7B. With the agreement of the Secretary, the Applicant may prepare a revision of a stage of a strategy, plan or program without undertaking consultation with all parties nominated under the applicable condition of consent.

Structural Adequacy

8. The Applicant must ensure that all new buildings and structures, and any alterations or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.

Notes:
- *Under Part 4A of the EP&A Act, the Applicant is required to obtain construction and occupation certificates for the proposed building works.*
- *Part 8 of the EP&A Regulation sets out the requirements for the certification of development.*
- *The development is located in the Patrick Plains Mine Subsidence District. Under section 15 of the Mine Subsidence Compensation Act 1961, the Applicant is required to obtain the Mine Subsidence Board's approval before constructing or relocating any improvements on the site.*

Demolition

9. The Applicant must ensure that all demolition work is carried out in accordance with *AS 2601-2001: The Demolition of Structures*, or its latest version.

Operation of Plant and Equipment

10. The Applicant must ensure that all plant and equipment used at the site, or to transport coal off-site, are:
    (a) maintained in a proper and efficient condition; and
    (b) operated in a proper and efficient manner.

11. *Deleted*

12. *Deleted*

Evidence of Consultation

13. Where consultation with any stakeholder identified in the conditions of this approval is required by any conditions of this approval, the Applicant must:
    (a) consult with the relevant stakeholder prior to submitting the required document to the Secretary for approval;
    (b) submit evidence of such consultation as part of the relevant document;
    (c) describe how matters raised by the stakeholder have been addressed and identify any matters that have not been resolved; and
    (d) include details of any outstanding issues raised by the stakeholder and an explanation of disagreement between any stakeholder and the Applicant.

Compliance

14. The Applicant must ensure that all employees, contractors and sub-contractors are aware of, and comply with, the conditions of this approval relevant to their respective activities.

SCHEDULE 4
SPECIFIC ENVIRONMENTAL CONDITIONS

ACQUISITION UPON REQUEST

1. Upon receiving a written request for acquisition from the landowner of the land listed in Table 1, the Applicant must acquire the land in accordance with the procedures in conditions 9-11 of schedule 5:

Table 1: Land subject to acquisition upon request

2 – Lambkin	23A & B - Kannar
13C - Skinner	31A,B,C & D - Fisher
19A & B – Kelly	51 – Hawkes
22 – Henderson	56 - Haynes

Note: For more information on the numbering and identification of properties used in this consent, see Attachment 1 of the EIS for the Wambo Development Project. Lands titled 23A & B – Kannar, 31A,B,C & D – Fisher, 51 – Hawkes and 56 – Haynes have been acquired and are now mine-owned.

AIR QUALITY

Odour

2. The Applicant must ensure that no offensive odours, as defined under the POEO Act, are emitted from the Wambo Mining Complex.

Greenhouse Gas Emissions

3. The Applicant must implement all reasonable and feasible measures to minimise the release of greenhouse gas emissions from the Wambo Mining Complex to the satisfaction of the Secretary.

3A. The Applicant must reduce visible emissions from methane flares as far as reasonable and feasible.

Air Quality Criteria

4. Except for the air quality affected land in Table 1, the Applicant must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that particulate matter emissions generated by the Wambo Mining Complex do not exceed the criteria listed in Tables 2, 3 and 4 at any residence on privately owned land, or on more than 25 percent of any privately owned land.

Table 2: Long term impact assessment criteria for particulate matter

Pollutant	***Averaging period***	***[d] Criterion***
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 3: Short term impact assessment criterion for particulate matter

Pollutant	***Averaging period***	***[d]Criterion***
Particulate matter < 10 µm (PM_{10})	24 hour	50 µg/m^3

Table 4: Long term impact assessment criteria for deposited dust

Pollutant	***Averaging period***	***Maximum increase[2] in deposited dust level***	***Maximum total[1] deposited dust level***
[c]Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables 2-4

[a] Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the development on its own);

[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and

[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.

Air Quality Acquisition Criteria

5. If particulate matter emissions generated by the Wambo Mining Complex exceed the criteria in Tables 5, 6, and 7 at any residence on privately-owned land, or on more than 25 percent of any privately owned land, then upon written request for acquisition from the landowner, the Applicant must acquire the land in accordance with the procedures in conditions 9 - 11 of schedule 5.

Table 5: Long term land acquisition criteria for particulate matter

Pollutant	Averaging period	[d] Criterion
Total suspended particulate (TSP) matter	Annual	[a] 90 µg/m^3
Particulate matter < 10 µm (PM_{10})	Annual	[a] 30 µg/m^3

Table 6: Short term land acquisition criteria for particulate matter

Pollutant	Averaging period	[da] Criterion
Particulate matter < 10 µm (PM_{10})	24 hour	[a] 150 µg/m^3
Particulate matter < 10 µm (PM_{10})	24 hour	[b] 50 µg/m^3

Table 7: Long term land acquisition criteria for deposited dust

Pollutant	Averaging period	Maximum increase[2] in deposited dust level	Maximum total[1] deposited dust level
[c] Deposited dust	Annual	[b] 2 g/m^2/month	[a] 4 g/m^2/month

Notes to Tables 5-7

[a] Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources);

[b] Incremental impact (i.e. incremental increase in concentrations due to the development on its own);

[c] Deposited dust is to be assessed as insoluble solids as defined by Standards Australia, AS/NZS 3580.10.1:2003: Methods for Sampling and Analysis of Ambient Air - Determination of Particulate Matter - Deposited Matter - Gravimetric Method; and

[d] Excludes extraordinary events such as bushfires, prescribed burning, dust storms, sea fog, fire incidents or any other activity agreed by the Secretary.

Mine-owned Land

5A. The Applicant must ensure that particulate matter emissions generated by the Wambo Mining Complex do not exceed the criteria listed in Tables 2, 3 and 4 at any occupied residence on any mine-owned land (including land owned by adjacent mines) unless:

(a) the tenant and landowner has been notified of health risks in accordance with the notification requirements under schedule 5 of this consent;

(b) the tenant on land owned by the Applicant can terminate their tenancy agreement without penalty, subject to giving reasonable notice, and the Applicant uses its best endeavours to provide assistance with relocation and sourcing of alternative accommodation;

(c) air mitigation measures (such as air filters, a first flush roof water drainage system and/or air conditioning) are installed at the residence, if requested by the tenant and landowner (where owned by another mine other than the Applicant);

(d) particulate matter air quality monitoring is undertaken to inform the tenant and landowner of potential health risks; and

(e) monitoring data is presented to the tenant in an appropriate format, for a medical practitioner to assist the tenant in making an informed decision on the health risks associated with occupying the property,

to the satisfaction of the Secretary.

Air Quality Operating Conditions

5B. The Applicant must:

(a) implement best management practice to minimise the off-site odour, fume and dust emissions from the Wambo Mining Complex, including best practice coal loading and profiling and other measures to minimise dust emissions from coal transportation by rail;

(b) operate a comprehensive air quality management system at the Wambo Mining Complex that uses a combination of predictive meteorological forecasting, predictive and real time air dispersion modelling and real-time air quality monitoring data to guide the day to day planning of mining operations and implementation of both proactive and reactive air quality mitigation measures to ensure compliance with the relevant conditions of this consent;

(c) manage PM2.5 levels in accordance with any requirements of any EPL;

(d) minimise the air quality impacts of the Wambo Mining Complex during adverse meteorological conditions and extraordinary events (see note d above under Tables 5-7);

(e) minimise any visible off-site air pollution;

(f) minimise the surface disturbance of the site generated by the Wambo Mining Complex; and

(g) co-ordinate air quality management at the Wambo Mining Complex with the air quality management at nearby mines (HVO South, HVO North and Mount Thorley Warkworth mines) to minimise the cumulative air quality impacts of these mines and the Wambo Mining Complex,

to the satisfaction of the Secretary.

Air Quality and Greenhouse Gas Management Plan

5C. The Applicant must prepare a detailed Air Quality & Greenhouse Gas Management Plan for the Wambo Mining Complex to the satisfaction of the Secretary. This plan must:

(a) be prepared in consultation with the EPA, and submitted to the Secretary for approval by the end of June 2013;

(b) describe the measures that would be implemented to ensure:
- best management practice is being employed;
- the air quality impacts of the Wambo Mining Complex are minimised during adverse meteorological conditions and extraordinary events; and
- compliance with the relevant conditions of this consent.

(c) describe the proposed air quality management system;

(d) include a risk/response matrix to codify mine operational responses to varying levels of risk resulting from weather conditions and specific mining activities;

(e) include commitments to provide summary reports and specific briefings at CCC meetings on issues arising from air quality monitoring;

(f) include an air quality monitoring program that:
- uses a combination of real-time monitors and supplementary monitors to evaluate the performance of the development;
- adequately supports the proactive and reactive air quality management system;
- includes PM2.5 monitoring;
- includes monitoring of occupied development-related residences and residences on air quality-affected land listed in Table 1, subject to the agreement of the tenant;
- evaluates and reports on the effectiveness of the air quality management system; and
- includes a protocol for determining any exceedances of the relevant conditions in this consent; and

(g) include a protocol that has been prepared in consultation with the owners of nearby mines (HVO South, HVO North and Mount Thorley Warkworth mines) to minimise the cumulative air quality impacts of these mines and the Wambo Mining Complex.

The Applicant must implement the approved management plan as approved from time to time by the Secretary.

[1]NOISE

Noise Impact Assessment Criteria

6. The Applicant must ensure that the noise generated by the Wambo Mining Complex does not exceed the noise impact assessment criteria presented in Table 9.

Table 9: Noise impact assessment criteria dB(A))

Day $L_{Aeq(15\ minute)}$	***Evening/Night*** $L_{Aeq(15\ minute)}$	***Night*** $L_{A1(1\ minute)}$	***Land Number***
35	*41*	*50*	*94 – Curlewis*
			3 – Birrell

[1] Incorporates EPA GTAs

Day $L_{Aeq(15\ minute)}$	Evening/Night $L_{Aeq(15\ minute)}$	Night $L_{A1(1\ minute)}$	Land Number
35	40	50	4B – Circosta
			15B - McGowen/Caslick
			16 – Cooper
			23C – Kannar
			25 – Fenwick
			28A & B – Garland
			33 -Thelander/O'Neill
			39 – Northcote
			40 – Muller
			254A – Algie
35	39	50	5 – Strachan
			6 - Merrick
			7 - Maizey
			37 - Lawry
			48 - Ponder
35	38	50	1 - Brosi
			17 - Carter
			18 - Denney
			38 - Williams
			49 - Oliver
			63 - Abrocuff
			75 - Barnes
			91 - Bailey
35	37	50	27 - Birralee
			43 - Carmody
			137 - Woodruff
			163 - Rodger/Williams
			246 - Bailey
35	36	50	13B - Skinner
			178 - Smith
			188 - Fuller
			262A, B & C - Moses
35	35	50	All other residential or sensitive receptors, excluding the receptors listed in condition 1 above

Notes:

- *Noise generated by the Wambo Mining Complex is to be measured in accordance with the relevant requirements, and exemptions (including certain meteorological conditions), of the NSW Industrial Noise Policy*

Land Acquisition Criteria

7. If the noise generated by the Wambo Mining Complex exceeds the criteria in Table 10, the Applicant must, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions 9-11 of schedule 5.

Table 10: Land acquisition criteria dB(A)

Day/Evening/Night $L_{Aeq(15\ minute)}$	Property
43	94 - Curlewis
	23C – Kannar
	254A - Algie
40	All other residential or sensitive receptor, excluding the receptors listed in condition 1 above

Note: Noise generated by the Wambo Mining Complex is to be measured in accordance with the notes presented below Table 9 above. Property 23C – Kannar has been acquired and is now mine-owned.

Operating Conditions

8. The Applicant must:
   (a) implement best management practice to minimise the operational, low frequency and traffic noise of the Wambo Mining Complex;

(b) operate a comprehensive noise management system for the Wambo Mining Complex that uses a combination of predictive meteorological forecasting and real-time noise monitoring data to guide the day to day planning of mining operations and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent;
(c) maintain the effectiveness of noise suppression equipment (if fitted) on plant at all times and ensure defective plant is not used operationally until fully repaired;
(d) ensure that noise attenuated plant (if used) is deployed preferentially in locations relevant to sensitive receivers;
(e) minimise the noise impacts of the Wambo Mining Complex during meteorological conditions when the noise limits in this consent do not apply;
(f) co-ordinate the noise management for the Wambo Mining Complex with the noise management at nearby mines (including HVO South, HVO North and Mt Thorley Warkworth mines) to minimise the cumulative noise impacts of these mines and the Wambo Mining Complex,

to the satisfaction of the Secretary.

Noise Management Plan

9. The Applicant must prepare a Noise Management Plan for the Wambo Mining Complex to the satisfaction of the Secretary. This plan must:
(a) be prepared in consultation with the EPA, and submitted to the Secretary for approval by the end of June 2013;
(b) describe the measures that would be implemented to ensure:
- best management practice is being employed;
- the noise impacts of the Wambo Mining Complex are minimised during meteorological conditions when the noise limits in this consent do not apply; and
- compliance with the relevant conditions of this consent;

(c) describe the proposed noise management system in detail;
(d) include a monitoring program that:
- uses a combination of real-time and supplementary attended monitoring measures to evaluate the performance of the Wambo Mining Complex;
- adequately supports the proactive and reactive noise management system for the Wambo Mining Complex;
- includes a protocol for determining exceedances of the relevant conditions in this consent;
- evaluates and reports on the effectiveness of the noise management system for the Wambo Mining Complex;
- provides for the annual validation of the noise model for the Wambo Mining Complex; and

(e) include a protocol that has been prepared in consultation with the owners of nearby mines (including HVO South, HVO North and Mount Thorley Warkworth mines) to minimise the cumulative noise impacts of these mines and the Wambo Mining Complex.

The Applicant must implement the approved management plan as approved from time to time by the Secretary.

[2]METEOROLOGICAL MONITORING

10. The Applicant must establish a permanent meteorological station at a location approved by the EPA, and to the satisfaction of the Secretary, to monitor the parameters specified in Table 11, using the specified units of measure, averaging period, frequency, and sampling method in the table.

Table 11: Meteorological monitoring

Parameter	*Units of measure*	*Averaging period*	Frequency	*Sampling method[1]*
Lapse rate	*^{o}C/100m*	*1 hour*	Continuous	*Note[2]*
Rainfall	*mm/hr*	*1 hour*	Continuous	*AM-4*
Sigma Theta @ 10 m	*°*	*1 hour*	*Continuous*	*AM-2*
Siting	*-*	*-*	*-*	*AM-1*
Temperature @ 10 m	*K*	*1 hour*	*Continuous*	*AM-4*
Temperature @ 2 m	*K*	*1 hour*	*Continuous*	*AM-4*
Total Solar Radiation @ 10m	*W/m^2*	*1 hour*	*Continuous*	*AM-4*
Wind Direction @ 10 m	*°*	*1 hour*	*Continuous*	*AM-2*
Wind Speed @ 10 m	*m/s*	*1 hour*	Continuous	*AM-2*

[1] NSW EPA, 2001, Approved Methods for the Sampling and Analysis of Air Pollutants in NSW.

[2] Incorporates EPA GTA

[2]*The Applicant must calculate lapse rate from measurements made at 2m and 10m.*

[3]BLASTING & VIBRATION

Airblast Overpressure Limits

11. The Applicant must ensure that the airblast overpressure level from blasting at the Wambo Mining Complex does not exceed the criteria in Table 12 at any residence on privately-owned land with the exception of property 13C (Skinner) (see condition 20 below).

Table 12: Airblast overpressure impact assessment criteria

Airblast overpressure level (dB(Lin Peak))	Allowable exceedance
115	5% of the total number of blasts over a period of 12 months
120	0%

Ground Vibration Impact Assessment Criteria

12. The Applicant must ensure that the ground vibration level from blasting at the Wambo Mining Complex does not exceed the criteria in Table 13 at any residence on privately-owned land with the exception of property 13C (Skinner) (see condition 20 below).

Table 13: Ground vibration impact assessment criteria

Peak particle velocity (mm/s)	Allowable exceedance
5	5% of the total number of blasts over a period of 12 months
10	0%

Blasting Hours

13. The Applicant **must** only carry out blasting at the Wambo Mining Complex between 9 am and 5 pm Monday to Saturday inclusive. No blasting is allowed on Sundays, public holidays or any other time without the written approval of EPA.

Blasting Frequency

13A. The Applicant may carry out a maximum of:
(a) 3 blasts a day, unless an additional blast is required following a blast misfire; and
(b) 15 blasts a week,
for all operations at the Wambo Mining Complex.

This condition does not apply to blasts that generate ground vibration of 0.5 mm/s or less at any residence on privately-owned land, or blasts required to ensure the safety of the mine or its workers.

Note: For the purposes of this condition, a blast refers to a single blast event, which may involve a number of individual blasts fired in quick succession in a discrete area of the mine.

Public Notice

14. During the life of the Wambo Mining Complex, the Applicant must:
(a) operate a Blasting Hotline, or alternate system agreed to by the Secretary, to enable the public to get up-to-date information on blasting operations at the Wambo Mining Complex; and
(a) notify the occupants of any land within 2 km of the site about this hotline or system on an annual basis.

Property Inspection

15. Before carrying out any blasting, the Applicant must advise all landowners within 2 km of the site that they are entitled to a property inspection.

[3] Incorporates EPA GTA

16. If the Applicant receives a written request for a property inspection from any landowner within 2 km of the site, the Applicant must:
    (a) within 28 days of receiving the request, commission a suitably qualified person, whose appointment has been approved by the Secretary, to inspect the condition of any building or structure on the land, and recommend measures to mitigate any potential blasting impacts; and
    (b) give the landowner a copy of this property inspection report within 14 days of receiving the report.

Cumulative Impacts

17. The Applicant must undertake all reasonable steps to co-ordinate blasting at the Wambo Mining Complex with the blasting at surrounding mines – such as Bulga, Mount Thorley, Warkworth, and Hunter Valley Operations – to minimise the cumulative impacts of blasting in the region.

Operating Conditions

18. During mining operations at the Wambo Mining Complex, the Applicant must:
    (a) implement best management practice to:
        - protect the safety of people and livestock in the surrounding area;
        - protect public or private infrastructure/property in the surrounding area from any damage; and
        - minimise the dust and fume emissions of any blasting;
    (b) minimise the frequency and duration of any road closures, and avoid road closures during peak traffic periods;
    (c) co-ordinate the timing of blasting at the Wambo Mining Complex with the timing of blasting at nearby mines (including HVO South, HVO North and Mt Thorley Warkworth mines) to minimise the cumulative blasting impacts of these mines and the Wambo Mining Complex; and
    (d) operate a suitable system to enable the public to get up-to-date information on the proposed blasting schedule at the Wambo Mining Complex,
    to the satisfaction of the Secretary.

19. The Applicant must not undertake blasting within 500 metres of:
    (a) any public road without the approval of the appropriate road authority; or
    (b) any land outside the site that is not owned by the Applicant, unless:
        - the Applicant has a written agreement with the relevant landowner to allow blasting to be carried out closer to the land, and the Applicant has advised the Department in writing of the terms of this agreement, or
        - the Applicant has:
            - demonstrated to the satisfaction of the Secretary that the blasting can be carried out closer to the land without compromising the safety of the people or livestock on the land, or damaging the buildings and/or structures on the land; and
            - updated the Blast Management Plan to include the specific measures that would be implemented while blasting is being carried out within 500 metres of the land.

Blast Management Plan

20. The Applicant must prepare a Blast Management Plan for the Wambo Mining Complex to the satisfaction of the Secretary. This plan must:
    (a) be submitted to the Secretary for approval by the end of June 2013;
    (b) propose and justify any alternative ground vibration limits for any public infrastructure in the vicinity of the Wambo Mining Complex;
    (c) describe the measures that would be implemented to ensure:
        - best management practice is being employed;
        - compliance with the relevant conditions of this consent;
    (d) include a road closure management plan for blasting within 500 metres of a public road, that has been prepared in consultation with the RMS and Council;
    (e) include measures to minimise, mitigate, and if necessary remediate the blasting impacts on property 13C (Skinner);
    (f) address the requirements of conditions 63 – 68 of schedule 4;
    (g) include a monitoring program for evaluating the performance of the Wambo Mining Complex, including:
        - compliance with the applicable criteria; and
        - minimising the fume emissions from the Wambo Mining Complex; and
    (h) include a protocol that has been prepared in consultation with the owners of nearby mines (including HVO South, HVO North and Mt Thorley Warkworth mines) to minimise the cumulative blasting impacts of these mines and the Wambo Mining Complex.

The Applicant must implement the approved management plan as approved from time to time by the Secretary.

20A. The Applicant must not carry out more than 1 blast a day within 500 metres of Wallaby Scrub Road or the Golden Highway.

Property Investigations

21. If any landowner within a 2 km radius of the site claims that his/her property has been damaged as a result of blasting at the development, the Applicant must:
    (a) within 28 days of receiving this claim in writing, commission a suitably qualified person whose appointment has been approved by the Secretary to investigate the claim; and
    (b) give the landowner a copy of the property investigation report within 14 days of receiving the report.

If this independent investigation confirms the landowner's claim, and both parties agree with these findings, then the Applicant must repair the damages to the satisfaction of the Secretary.

If the Applicant or landowner disagrees with the findings of the independent property investigation, then either party may refer the matter to the Secretary for resolution.

If the matter cannot be resolved within 21 days, the Secretary shall refer the matter to an Independent Dispute Resolution Process (See Appendix 2).

SUBSIDENCE

Performance Measures – Natural and Heritage Features, etc

22. The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 14A, to the satisfaction of the Secretary.

Table 14A: Subsidence Impact Performance Measures

Water	
Wollombi Brook	Negligible subsidence impacts. Negligible environmental consequences. Controlled release of excess site water only in accordance with EPL requirements
Cliffs	
Low level cliffs	Minor environmental consequences (that is occasional rockfalls, displacement or dislodgement of boulders or slabs, or fracturing that in total do not impact more than 5% of the total face area of such features within the South Bates Extension Area)
Biodiversity	
Wollemi National Park	Negligible subsidence impacts. Negligible environmental consequences.
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences
White Box, Yellow Box, Blakely's Red Gum Woodland/Grassy White Box Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences
Central Hunter Valley Eucalypt Forest and Woodland Ecological Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences
Other species, populations or communities listed under the *Biodiversity Conservation Act 2016* or the *Environment Protection* and *Biodiversity Conservation Act 1999*	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences
Heritage	
Wambo Homestead Complex	Negligible impact on heritage values, unless approval has been granted by the Heritage Branch and/or the Minister

Notes:
1) The Applicant will be required to define more detailed performance indicators for each of these performance measures in the various management plans that are required under this consent (see condition 22C below).

2) The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of approval of modification 9.

If the Applicant exceeds the performance measures in Table 14A and the Secretary determines that:
(a) it is not reasonable or feasible to remediate the impact or environmental consequences; or
(b) remediation measures implemented by the Applicant have failed to satisfactorily remediate the impact or environmental consequence,
then the Applicant must provide a suitable offset to compensate for the impact or environmental consequence, to the satisfaction of the Secretary.

Note: An offset required under this condition must be proportionate with the significance of the impact or environmental consequence.

Performance Measures – Built Features

22A. The Applicant must ensure that the development does not cause any exceedances of the performance measures in Table 14B, to the satisfaction of DRG.

Table 14B: Subsidence Impact Performance Measures

Built Features	
All built features	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.
Public Safety	
Public Safety	No additional risk

Notes:
1) The Applicant will be required to define more detailed performance indicators for each of these performance measures in Built Features Management Plans or Public Safety Management Plan (see condition 22C below).
2) The requirements of this condition only apply to the impacts and consequences of mining operations undertaken following the date of modification 9.
3) Requirements regarding safety or serviceability do not prevent preventative or mitigatory actions being taken prior to or during mining in order to achieve or maintain these outcomes.
4) Compensation required under this condition includes any compensation payable under the Mine Subsidence Compensation Act 1961 and/or the Mining Act 1992.

22B. Any dispute between the Applicant and the owner of any built feature over the interpretation, application or implementation of the performance measures in Table 14B is to be settled by DRG. DRG may seek the advice of the MSB on the matter. Any decision by DRG shall be final and not subject to further dispute resolution under this consent.

Extraction Plan

22C. The Applicant must prepare an Extraction Plan for the second workings within each seam to be mined to the satisfaction of the Secretary. Each Extraction Plan must:
(a) be prepared by a team of suitably qualified and experienced persons whose appointment has been endorsed by the Secretary;
(b) be approved by the Secretary before the Applicant carries out any of the second workings covered by the plan;
(c) include detailed plans of the proposed first and second workings and any associated surface development;
(d) include detailed performance indicators for each of the performance measures in Tables 14A and 14B;
(e) provide revised predictions of the potential subsidence effects, subsidence impacts and environmental consequences of the proposed second workings, incorporating any relevant information obtained since this consent;
(f) describe the measures that would be implemented to ensure compliance with the performance measures in Tables 14A and 14B, and manage or remediate any impacts and/or environmental consequences;
(g) include the following to the satisfaction of DRG:
- a coal resource recovery plan that demonstrates effective recovery of the available resource;
- a subsidence monitoring program to:
  - provide data to assist with the management of the risks associated with subsidence;
  - validate the subsidence predictions; and
  - analyse the relationship between the subsidence effects and impacts under the plan and any ensuing environmental consequences;

- a Built Features Management Plan to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which:
  - addresses in appropriate detail all items of public infrastructure and all classes of other built features; and
  - has been prepared following appropriate consultation with the owner/s of potentially affected feature/s;
- a Public Safety Management Plan to ensure public safety in the mining area; and
- appropriate revisions to the Rehabilitation Management Plan required under condition 94C; and

(h) include a:

- Water Management Plan, which has been prepared in consultation with EPA and CLWD, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on surface water resources, groundwater resources and flooding, and which includes:
  - surface and groundwater impact assessment criteria, including trigger levels for investigating any potentially adverse impacts on water resources or water quality;
  - a program to monitor and report groundwater inflows to underground workings; and
  - a program to manage and monitor impacts on groundwater bores on privately-owned land;
- Biodiversity Management Plan, which has been prepared in consultation with the OEH, which provides for the management of the potential impacts and/or environmental consequences of the proposed second workings on flora and fauna;
- Land Management Plan, which has been prepared in consultation with any affected public authorities, to manage the potential impacts and/or environmental consequences of the proposed second workings on land in general;
- Heritage Management Plan, which has been prepared in consultation with OEH and relevant stakeholders for Aboriginal and non-Aboriginal heritage, to manage the potential environmental consequences of the proposed second workings on heritage sites or values; and

(i) include a program to collect sufficient baseline data for future Extraction Plans.

The Applicant must implement the approved management plan as approved from time to time by the Secretary.

Notes:

1) An SMP approved by DRG prior to 30 July 2011 is taken to satisfy the requirements of this condition for the workings covered by this plan.

2) Management plans prepared under condition 22C(h) should address all potential impacts of proposed underground coal extraction on the relevant features. Other similar management plans required under this consent (eg under conditions 30 - 35 and 44 - 48) are not required to duplicate these plans or to otherwise address the impacts associated with underground coal extraction.

22D. The Applicant must ensure that the management plans required under condition 22C(h) above include:

(a) an assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this consent;

(b) a detailed description of the measures that would be implemented to remediate predicted impacts; and

(c) a contingency plan that expressly provides for adaptive management.

First Workings

22E. The Applicant may carry out first workings within the underground mining area, other than in accordance with an approved extraction plan, provided that DRG is satisfied that the first workings are designed to remain stable and non-subsiding in the long term, except insofar as they may be impacted by approved second workings.

Note: The intent of this condition is not to require an additional approval for first workings, but to ensure that first workings are built to geotechnical and engineering standards sufficient to ensure long term stability, with negligible resulting direct subsidence impacts.

Payment of Reasonable Costs

22F. The Applicant must pay all reasonable costs incurred by the Department to engage independent experts to review the adequacy of any aspect of an Extraction Plan.

REJECTS EMPLACEMENT STRATEGY

22G. Within 6 months of this consent commencing, the Applicant must prepare a Life of Mine Rejects Emplacement Strategy for the development, to the satisfaction of DRG.

[4]SURFACE & GROUND WATER

Water Supply

23. The Applicant must ensure that it has sufficient water during each stage of the development, and if necessary, adjust the scale of mining operations to match its available water supply.

Note: The Applicant is required to obtain necessary licences for the development under the Water Act 1912 and Water Management Act 2000.

Pollution of Waters

23A. Except as may be expressly provided by an EPA licence, the Applicant must comply with section 120 of the *Protection of the Environment Operations Act 1997* during the carrying out of the development.

Discharge Limits

24. Except as may be expressly provided by a EPA licence or the *Protection of the Environment Operations (Hunter River Salinity Trading Scheme) Regulation 2002*, the Applicant must:
(a) not discharge more than 250 ML/day from the licenced discharge point/s at the development;
(b) ensure that the discharges from any licenced discharge point comply with the limits in Table 15:

Table 15: Discharge Limits

Pollutant	Units of measure	100 percentile concentration limit
pH	pH	6.5 to 9.5
Total suspended solids	mg/litre	120

Note: This condition does not authorise the pollution of waters by any other pollutants.

Site Water Balance

25. [5]Each year, the Applicant must:
(a) review the site water balance for the development against the predictions in the EIS;
(b) re-calculate the site water balance for the development;
(c) assess current and forecast compliance with the rules of the Hunter River Salinity Trading Scheme; and
(d) report the results in the Annual Review.

North Wambo Creek Diversion

26. The Applicant must design, construct, maintain, and rehabilitate the temporary North Wambo Creek Bypass, the temporary North Wambo Creek Pipeline, and the North Wambo Creek Diversion in consultation with DRG, CLWD and to the satisfaction of the Secretary.

Note: The Department accepts that the Applicant is not required to "rehabilitate" the temporary North Wambo Creek Bypass.

27. Within one month of completing the construction of the temporary North Wambo Creek Bypass, the temporary North Wambo Creek Pipeline, and the North Wambo Creek Diversion, the Applicant must submit an as-executed report, certified by a practising registered engineer, to the Secretary.

28. Prior to destroying the original creek line by open cut mining, the Applicant must demonstrate that the relevant stage of the North Wambo Creek Diversion is operating successfully from a hydrological and biological point of view to the satisfaction of DRG and the Secretary.

Note: This condition does not apply to the temporary North Wambo Creek Bypass.

28A. *Deleted*

South Wambo Dam

[4] Incorporates EPA GTA
[5] These calculations must exclude the clean water system, including any sediment control structures, and any dams in the mine lease area which fall under the Maximum Harvestable Right Dam Capacity; include any dams that are licensable under Section 205 of the Water Act 1912, and water harvested from any non-harvestable rights dam on the mine lease area; address balances of inflows, licenced water extractions, and transfers of water from the site to other sites; include an accounting system for water budgets; and include a salt budget.

28B. The Applicant must design, construct and operate the South Wambo Dam to the satisfaction of the DSC and DRG. The design of the dam must be accompanied by a detailed assessment of the potential operational and environmental risks associated with the dam, particularly in relation to potential subsidence-related impacts.

28C. The South Wambo Dam must be drained prior to the commencement of mining in the underlying longwalls to the satisfaction of DSC to minimise the risk of operational or environmental impacts from subsidence.

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Monitoring

29. The Applicant must:
(a) measure:
- the volume of water discharged from the site;
- water use on the site;
- dam and water structure storage levels,
- water transfers across the site; and
- water transfers between the site and surrounding mines;

(b) monitor the quality of the surface water:
- discharged from the licenced discharge point/s at the development; and
- upstream and downstream of the development;

(c) monitor flows in the Wollombi Brook; and North Wambo, South Wambo, and Stony Creeks;
(d) monitor the volume and quality of water inflows from each separate source to the underground and open cut workings; and
(e) monitor regional ground water levels and quality in the alluvial and overburden aquifers during the development and at least 10 years after mining; and
(f) periodically assess groundwater pressure response in the coal measures;
to the satisfaction of EPA, CLWD and the Secretary.

Site Water Management Plan

30. Before carrying out any development, the Applicant must prepare a Site Water Management Plan for the development in consultation with DRG and CLWD, and to the satisfaction of the Secretary. This plan must include:
(a) the predicted site water balance;
(b) the predicted salt balance for the site;
(c) the North Wambo Creek Diversion Plan;
(d) an Erosion and Sediment Control Plan;
(e) a Surface Water Monitoring Program;
(f) a Ground Water Monitoring Program;
(g) a Surface and Ground Water Response Plan; and
(h) a strategy for the decommissioning water management structures on the site.

By the end of October 2009, the Applicant must revise the Site Water Management Plan in consultation with DRG, EPA and CLWD, and to the satisfaction of the Secretary.

The Applicant must implement the approved management plan as approved from time to time by the Secretary.

Note: The North Wambo Creek Diversion Plan must also be prepared in consultation with NSW Fisheries.

30A. The predicted salt balance for the site must:
(a) include details of:
- the sources of saline material on the site;
- saline material and saline water management on site;
- reporting procedures, including the preparation of an annual salt balance; and

(b) describe the measures that would be implemented to minimise short term and long term discharge of saline water from the site.

31. The North Wambo Creek Diversion Plan must include:
(a) the detailed design and specifications of the creek diversion, including the flow control bund, cut off wall, and channel;
(b) a revegetation program for the channel using a range of suitable native riparian and floodplain species;
(c) the detailed design of the system that would return intercepted ground water to the alluvial aquifer downstream of the open cut;
(d) a construction program for the creek diversion, describing how the work would be staged, and

progressively integrated with the mining operations and the mine waste emplacement drainage system;

(e) water quality, ecological and geomorphic performance criteria for the creek diversion;

(f) a program to monitor water quality, ecological, and geomorphic integrity of the creek diversion; and

(g) a program to inspect and maintain the creek diversion and revegetation works during the development.

Note: The Applicant may prepare and submit the North Wambo Diversion Plan on a progressive basis to reflect the relevant stages of the proposed diversion.

32. The Erosion and Sediment Control Plan must:

(a) be consistent with the requirements of the Department of Housing's *Managing Urban Stormwater: Soils and Construction* manual;

(b) identify activities that could cause soil erosion and generate sediment;

(c) describe the location, function, and capacity of erosion and sediment control structures; and

(d) describe measures to minimise soil erosion and the potential for the migration of sediments to downstream waters.

33. [6]The Surface Water Monitoring Program must include:

(a) detailed baseline data on surface water flows and quality in the Wollombi Brook, and North Wambo, South Wambo, and Stony Creeks;

(b) surface water impact assessment criteria;

(c) a detailed program to monitor surface water flows and quality in the Wollombi Brook; and North Wambo, South Wambo, and Stony Creeks;

(d) a detailed program to monitor bank and bed stability in North Wambo, South Wambo, and Stony Creeks;

(e) a detailed program to monitor the quantity and quality of the vegetation in the riparian zones adjacent to North Wambo, South Wambo, and Stony Creeks;

(f) a program to monitor the effectiveness of the Erosion and Sediment Control Plan; and

(g) a program to monitor the water quality of dam discharges from the site.

33A. Within 3 months of the approval of Modification 17, or as otherwise agreed with the Secretary, the Applicant must, in consultation with CLWD, revise the Surface Water Monitoring Program to:

(a) include installation of an up-stream flow gauge site on North Wambo Creek;

(b) complete a geomorphic context statement for North Wambo Creek; and

(c) undertake a pre-subsidence survey and energy profile analysis, and develop pre-subsidence channel profiles for both cross sectional and long profiles.

The Applicant must complete the installation of the flow gauge and the other actions required under this condition and implement a program to regularly monitor flows in North Wambo Creek within 12 months of the Secretary's approval of the revised Surface Water Monitoring Program.

34. The Ground Water Monitoring Program must include:

(a) detailed baseline data on ground water levels and quality, based on statistical analysis, to benchmark the pre-mining natural variation in groundwater levels and quality;

(b) ground water impact assessment criteria;

(c) a comprehensive and detailed program to monitor the volume and quality of ground water seeping into the open cut and underground mining workings;

(d) a detailed program to monitor regional ground water levels and quality in the alluvial and overburden aquifers; and

(e) a program to investigate and monitor potential water loss from the Chitter Dump Dam and South Wambo Dam, and Montrose East Dam, including potential migration of stored water toward Wollombi Brook.

34A Prior to submitting the first Extraction Plan for the Longwall Domains, the Applicant must revise the Groundwater Monitoring Program to:

(a) include the installation of paired monitoring bores for the South Wambo Underground Mine, in consultation with CLWD, to assess potential fracture interconnections between surface water resources, alluvial and hardrock aquifers; and

(b) provide detailed information on the groundwater levels within the alluvial and hardrock aquifers within the Longwall Domains.

34B. Within 3 months of the approval of Modification 17, or as otherwise agreed with the Secretary, the Applicant must revise the Ground Water Monitoring Program, in consultation with CLWD, to include the installation of:

[6] Incorporates EPA GTA

(a) clustered monitoring bores for the South Bates Extension Area, located in proximity to the Hunter Lowland Redgum Forest along North Wambo Creek, and characterise the geological and hydrological systems in the vicinity of this vegetation community, including an assessment of the presence and extent of any shallow groundwater; and

(b) monitoring vibrating wire piezometers, located above the South Bates Extension Area, both within and beyond the areas with potential for connective cracking.

The Applicant must complete the installation of the bores and piezometers required under this condition and establish a program to continually monitor them within 12 months of the Secretary's approval of the revised Ground Water Monitoring Program.

35. The Surface and Ground Water Response Plan must include:

(a) measures to mitigate any adverse impacts on existing water supply bores or wells, including trigger levels for the provision of suitable compensatory water supplies;

(b) measures to mitigate the loss of surface water flows in the surface water streams or channel on the site;

(c) deleted;

(d) measures to mitigate the long term direct hydraulic connection between the backfilled open cut and the North Wambo Creek alluvium if the potential for an downstream adverse impact is detected;

(e) measures to address the decrease in throughflow rates caused by the development within the Wollombi Brook alluvium downstream of the open cut;

(f) measures to address any reduction in the stability or ecological quality of the North Wambo Creek Diversion, Wambo Creek and Stony Creek below the established performance criteria;

(g) measures to minimise and/or offset potential groundwater leakage from Wollombi Brook and associated alluvial aquifers; and

(h) measures to mitigate adverse impacts on groundwater dependent ecosystems or riparian vegetation and offset any impacts above the predicted impacts;

(i) trigger levels for the relinquishment of water extraction rights to compensate for surface and groundwater losses from streams, channels or alluvials to open cut and underground mining workings;

(j) the procedures that would be followed if any unforeseen impacts are detected during the development; and

(k) response times for undertaking the above measures.

35A. The Applicant must take into account the results of data collected pursuant to the implementation of condition 29 and conditions 33 to 35 in any Extraction Plan for the South Bates Extension Area or the Longwall Domains.

Surface & Sub-surface Investigation Program

36. Deleted

Groundwater Dependent Ecosystem Study

36A. Within 12 months of the approval of Modification 17, or as otherwise agreed with the Secretary, the Applicant must commission and provide to the Secretary for approval, a Groundwater Dependent Ecosystem Study report. This study must:

(a) be prepared by suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;

(b) be developed in consultation with CLWD;

(c) adopt any available data collected from the revised Ground Water Monitoring Program;

(d) provide advice on the likely level of groundwater dependence of the vegetation in the South Bates Extension Area given current groundwater levels and expert knowledge of the vegetation communities in the region;

(e) in the event it is considered that vegetation communities in the vicinity of the South Bates Extension Area are groundwater dependent (either entirely or partially), provide advice on the likelihood that subsidence associated with the South Bates Extension Area could cause adverse impacts and how any such impacts would manifest;

(f) consider to what degree the cumulative impacts of adjacent mining operations may have already impacted groundwater dependent vegetation across the South Bates Extension Area;

(g) provide any recommendations regarding the revised Ground Water Monitoring Program required under condition 34B, and in particular provide any recommendations that would assist in assessing the potential fracture interconnections between surface water resources and hard rock aquifers that may impact on groundwater dependent vegetation; and

(h) include a management and/or remediation program that describes measures that could be implemented to ensure compliance with the performance measures in Table 14A for any groundwater dependent endangered ecological community.

36B. The Applicant must take into account the findings of the Groundwater Dependent Ecosystem Study and not less than 2 years of monitoring results obtained under condition 34B in the preparation of any Extraction Plan for Longwalls 23 – 25.

Independent Audit

37. Prior to seeking approval from the Department for an extraction plan in any coal seam not previously subject to second workings within the relevant longwall domain, unless the Secretary directs otherwise, the Applicant must commission a suitably qualified person, whose appointment has been approved by the Secretary, to conduct an independent audit of the subsidence, surface water, and ground water impacts of the development. This audit must:
    (a) review the monitoring data for the development;
    (b) identify any trends in the monitoring data;
    (c) examine the subsidence, surface water, and ground water impacts of the development;
    (d) compare these impacts against the relevant impact assessment criteria and predictions in the EIS; and, if necessary;
    (e) recommend measures to reduce, mitigate, or remediate these impacts.

38. If the independent audit determines that the subsidence, surface water, and/or ground water impacts resulting from the underground mining operations are greater than those predicted in the EIS, the Applicant must:
    (a) assess the significance of these impacts;
    (b) investigate measures to minimise these impacts, including modifying subsequent mine plans;
    (c) describe what measures would be implemented to reduce, minimise, mitigate or remediate these impacts in the future; and
    (d) implement the measures as described in (c);
    to the satisfaction of the Secretary.

Final Void Strategy

39. At the end of Year 7 of the development, or as directed otherwise by the Secretary, the Applicant must prepare a Final Void Management Plan for the development, in consultation with the DRG, the Secretary and Council, and to the satisfaction of the Secretary. This Plan must:
    (a) investigate options for the future use of the final void;
    (b) re-assess the potential groundwater impacts of the development; 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 over time.

    The Applicant must implement the approved management plan as approved from time to time by the Secretary.

FAUNA & FLORA

Offset Strategy

40. Within the limits of current technology and best practice flora and fauna management, the Applicant must implement the biodiversity offset strategy summarised in Table 16 (including any subsequent revisions approved in writing by the Secretary), to the satisfaction of the Secretary.

Table 16: Biodiversity Offset Strategy

Area	Size
Remnant Woodland Enhancement Area A	424 ha
Remnant Woodland Enhancement Area B	454 ha
Remnant Woodland Enhancement Area C	211 ha
Open Cut Woodland Revegetation	1,570ha
Remnant Woodland Enhancement Area D	46 ha
Remnant Woodland Enhancement Area D Extension	2 ha
Remnant Woodland Enhancement Area E	41.6 ha
Remnant Woodland Enhancement Area for the Wambo Coal Terminal	As shown in Appendix 4
Other Areas	As identified under Condition 47(b) and/or as required under Condition 22

Notes:
(a) The areas specified in table 16 are shown in Appendix 4.

(b) The area of Open Cut Woodland Revegetation in Table 16 is based on the establishment of 50% woodland within the mixed woodland/pasture areas shown in the EIS, and with the agreement of the Secretary, may vary depending on the shape of the final landform and the approved mine closure plan.

(c) Should the Secretary determine that an additional offset is required under Condition 22, the Applicant will be required to provide this offset in addition to the specified offsets in Table 16. The size of any additional offset required must be determined in consultation with OEH and to the satisfaction of the Secretary.

Conservation Agreement

41. By the end of December 2017, unless otherwise agreed by the Secretary, the Applicant must:
    (a) enter into a conservation agreement/s pursuant to section 69B of the *National Parks and Wildlife Act 1974* covering all offset areas listed in Table 16 (see condition 40) and which records the Applicant's obligations under the conditions of this consent in relation to the management of these areas, and register the agreement/s pursuant to section 69F of the *National Parks and Wildlife Act 1974*; or
    (b) where OEH has advised in writing that it is of the view that any such offset area or part of such an area should not be subject to a conservation agreement for a period of time, then the Applicant must by the same date cause to be registered against the land title(s) of the area/s a public positive covenant and/or restriction on the use of the land, in favour of the Secretary, requiring the Applicant to implement and observe all obligations under the conditions of this consent in relation to the management of these areas.

    The conservation agreement or the public positive covenant and/or restriction on the use of land, as the case may be, must remain in force in perpetuity in relation to the area.

Note: Should the Secretary determine that the specified conservation mechanism is no longer appropriate, the Secretary may approve an alternative conservation mechanism to satisfy this condition, in consultation with OEH.

Offset Conservation

41A. The Applicant must not undertake any mining operations (except approved underground mining operations) or other activities within the offset areas listed in Table 16, other than:
    (a) activities under an approved Biodiversity Management Plan, Flora & Fauna Management Plan or Heritage Management Plan;
    (b) environmental management, environmental monitoring or other monitoring required under this consent or under an approved management plan or monitoring program; and
    (c) rehabilitation activities under an approved Extraction Plan.

42. Deleted.

Strategic Study Contribution

43. If, during the development, the Department commissions a strategic study into the regional vegetation corridor stretching from the Wollemi National park to the Barrington Tops National Park, then the Applicant must contribute a reasonable amount, up to $20,000, towards the completion of this study.

Flora & Fauna Management Plan

44. Before carrying out any development, the Applicant must prepare a Flora and Fauna Management Plan for the development, in consultation with the Hunter Coalfield Flora and Fauna Advisory Committee (when established), and to the satisfaction of the Secretary. This plan must include:
    (a) a Vegetation Clearance Protocol;
    (b) a Threatened Species Management Protocol;
    (c) a Remnant Woodland Enhancement Program;
    (d) a Flora and Fauna Monitoring Program;
    (e) strategies to manage any subsidence impacts in the Remnant Woodland Enhancement Areas;
    (f) strategies to avoid clearing of Warkworth Sands Endangered Ecological Community and minimise the extent of clearing in other ecological communities for gas drainage infrastructure in the Remnant Woodland Enhancement Areas, to the satisfaction of the Secretary;
    (g) strategies for the minimisation of impacts of exploration activity in the Remnant Woodland Enhancement Areas; and
    (h) a description of who would be responsible for monitoring, reviewing, and implementing the plan.

By the end of March 2013, the applicant must revise the Flora and Fauna Management Plan for the development to the satisfaction of the Secretary.

The Applicant must implement the approved management plan as approved from time to time by the Secretary.

45. The Vegetation Clearance Protocol must include:
    (a) the delineation of areas of remnant vegetation to be cleared;
    (b) progressive clearing;
    (c) pre-clearance surveys;
    (d) identification of fauna management strategies;
    (e) collection of seed from the local area;
    (f) salvage and reuse of material from the site; and
    (g) control of weeds during clearing activities.

46. The key components of the Threatened Species Management Protocol must include:
    (a) observations/surveys for threatened species (facilitated by the vegetation clearance surveys and Flora and Fauna Monitoring Program);
    (b) consultation with regulatory authorities; and
    (c) threatened species management strategies and reporting.

47. The Remnant Woodland Enhancement Program must include:
    (a) a habitat assessment of all areas listed in Table 16, to obtain additional information on existing habitat resources and characteristics of each area;
    (b) investigation of other areas to be included in the Program, including the *Acacia anuera* Community (Community 15) and the Southern Area;
    (c) appropriate enhancement strategies to be implemented based on the habitat assessment including:
        - the fencing of remnants to exclude livestock;
        - control measures to minimise the occurrence of weeds;
        - control measures to minimise the occurrence of feral pests;
        - limiting vehicular traffic;
        - selective planting of native vegetation; and
        - the provision of roosting/nesting resources for fauna.

48. The Flora and Fauna Monitoring Program must include:
    (a) a program to monitor revegetation of disturbance areas including:
        - visual monitoring to determine the need for maintenance and/or contingency measures; and
        - monitoring of the quality of rehabilitation using Ecosystem Function Analysis (or a similar systems based approach) through the assessment of landscape function, vegetation dynamics and habitat complexity; and
    (b) a program to monitor the effectiveness of offset strategy in accordance with the description in Table 17.

Table 17: Flora & Fauna Monitoring Program

Monitoring Component	***Monitoring Description***
Flora	*A number of permanent flora survey quadrats (of varying sizes to survey tree, shrubs and ground cover) should be established in woodland enhancement areas to obtain quantitative data on plant species diversity and abundance.*
Habitat Complexity	*Habitat complexity should be monitored using a number of permanent transects established within woodland enhancement areas. Habitat complexity parameters such as canopy cover, shrub cover, ground vegetation cover, the amount of litter, fallen logs and rocks should be surveyed.*
Terrestrial Fauna	*Terrestrial fauna surveys should be conducted to monitor the usage of enhancement areas by vertebrate fauna. Monitoring may include fauna species diversity and abundance or, alternatively, the use of indicator species to measure the effectiveness of enhancement measures.*
Aquatic Fauna	*Freshwater macro-invertebrate monitoring, including an assessment of SIGNAL A values and water quality (e.g. temperature, pH, and salinity).*
Specific Enhancement Initiatives	*Monitoring of specific enhancement initiatives (e.g. the provision of nesting/roosting boxes, weed control or feral animal control).*

Annual Review

49. The Applicant must:
    (a) review the performance of the Flora and Fauna Management Plan annually, in consultation with the Hunter Coalfield Flora & Fauna Advisory Committee (when established); and
    (b) revise the document as necessary to take into account any recommendations from the annual review.

Independent Audit

50. Within 5 years of the date of this consent, and every 5 years thereafter, unless the Secretary directs otherwise, the Applicant must commission, and pay the full cost of, an Independent Audit of the offset strategy. This audit must:
    (a) be conducted by a suitably qualified, experienced, and independent person whose appointment has been endorsed by the Secretary;
    (b) assess the performance of the offset strategy;
    (c) review the adequacy of the Flora & Fauna Management Plan; and, if necessary,
    (d) recommend actions or measures to improve the performance of the offset strategy, and the adequacy of the Flora & Fauna Management Plan.

[7]ABORIGINAL CULTURAL HERITAGE

Note: The Applicant is required to obtain consent from OEH under the National Parks Wildlife Act 1974 to destroy Aboriginal sites and objects on the site.

Aboriginal Cultural Heritage Management Plan

51. The Applicant must develop a management plan to manage Aboriginal cultural heritage in Remnant Woodland Enhancement Area A (referred to in condition 41 above) within 12 months of entering into a conservation agreement over that Area, or as otherwise agreed by the Secretary. The management plan must be:
    (a) prepared by suitably qualified and experienced person/s whose appointment has been endorsed by the Secretary;
    (b) developed in consultation with OEH and the Aboriginal communities; and
    (c) approved by the Secretary.

    The Applicant must implement the management plan as approved by the Secretary.

Salvage

52. Before making application for section 90 consents under *the National Parks & Wildlife Act 1974,* the Applicant must develop a targeted, strategic salvage program for the development in consultation with OEH and the Aboriginal communities.

53. Before the commencement of salvage operations, the Applicant must ensure that a keeping place is established to house objects recovered from the salvage program.

54. The Applicant must house the objects recovered during the salvage program in the keeping place established for the purpose.

Further Investigations

55. The Applicant must:
    (a) investigate the cultural significance of the corridors A – Southern and B – Middle (see map in appendix 3) in consultation with the Aboriginal Communities;
    (b) examine the possible pathways between Remnant Woodland Enhancement Area A (which includes the camp ground associated with the bora) and Wollemi National Park to the east; and

    (c) investigate the feasibility of reserving from future mining operations, those areas identified as being of cultural significance to the Aboriginal Communities in consultation with OEH.

Trust Fund Contribution

[7] Incorporates EPA GTAs

56. Before carrying out the development, or as agreed otherwise by the Secretary, the Applicant must contribute $50,000 to the Hunter Aboriginal Cultural Heritage Trust Fund for further investigations into Aboriginal cultural heritage, as defined by the Trust Deed.

Aboriginal Cultural Heritage Management

56A. The Applicant must continue to consult with and involve all the registered local Aboriginal representatives in the ongoing management of the Aboriginal Cultural Heritage values at the Wambo Mining Complex. Evidence of this consultation must be collated and provided to the Secretary on request.

56B. In the event that surface disturbance reveals a new Aboriginal object(s) at the Wambo Mining Complex, all work must halt in the immediate area to prevent any further impacts to the object(s). The Applicant must contact a suitably qualified archaeologist and the registered Aboriginal representatives to determine the significance of the object(s) and to develop an appropriate management strategy. The management strategy must be developed in accordance with the *National Parks and Wildlife Act 1974.* Management may include avoiding impact, additional investigations and/or submission of an Aboriginal Heritage Impact Permit application. The Applicant must register the site in the Aboriginal Heritage Information Management System (AHIMS) (managed by the OEH). The management outcome for the site must be included in the information provided to the AHIMS.

56C. In the event that surface disturbance reveals human remains at the Wambo Mining Complex, all works must halt in the immediate area to prevent any further impacts to the remains. The Applicant must immediately notify Police. No further work must be undertaken until Police provide written authorisation. If the remains are Aboriginal, the Applicant must also notify the OEH and the registered Aboriginal representatives. In the case of Aboriginal remains, no further work must be undertaken until Police and the OEH provide written authorisation.

56D. The Applicant must prepare and implement an Aboriginal Cultural Education Program in consultation with the registered Aboriginal representatives for the induction of all personnel and contractors involved in construction at the Wambo Mining Complex. The Applicant must keep a register of personnel and contractors that have been inducted according to the program.

[8]WAMBO HOMESTEAD COMPLEX

Section 60 Approval

57. An application under section 60 of the Heritage Act must be submitted to and approved by the Heritage Council prior to the commencement of any development on land within the State Heritage Register listing boundary for the Wambo Homestead Complex. In this regard a mine management plan shall be required to accompany the application which demonstrates that the proposed underground mining shall not have adverse heritage impacts on the WHC due to land subsidence.

Conservation Measures

58. Within 12 months of the commencement of this consent, the Applicant must prepare a conservation management plan for the Wambo Homestead Complex in accordance with Heritage Office guidelines for the consideration of the Heritage Council of NSW.

59. The conservation policies and an interpretation strategy contained in the conservation management plan are to be implemented in accordance with a timetable to be contained in the conservation management plan.

60. A suitably qualified and experienced consultant is to be engaged by the applicant to record an oral history of the Wambo Homestead Complex having regard to the strong associations of members of the local community with the site.

61. In circumstances where safe access to the Wambo Homestead Complex is able to be provided, opportunities are to be offered to the local community to visit the site during and after its conservation.

62. Prior to the commencement of mining operations, and then at yearly intervals prior to the approved structural engineer's inspections, a photographic record is to be prepared of all elevations of all structures within the Wambo Homestead Complex. The photographs are to be of archival quality in accordance with the Heritage Office guidelines, *How to Prepare Archival Records of Heritage Items 1994*, and *Guidelines for Photographic Recording of Heritage Items, 1994*. The photographic record is

[8] Incorporates NSW Heritage Council GTA

to be lodged with NSW Heritage Office, and a copy is to be submitted to the Department and the Council.

62A. Prior to commencing second workings in the South Bates Extension Area, the Applicant must complete an Archival Recording of the Whynot Homestead and Outbuildings, and submit copies of the Archival Recording to Council and relevant local historical societies.

Blasting

63. Ground vibration and air blast levels are to be monitored and recorded at a blast monitoring station to be established within the Wambo Homestead Complex for each blast within 2 km of the Wambo Homestead Complex.

64. A suitably qualified and experienced structural engineer, with expertise in vibration and blast monitoring is to be appointed to examine all monitoring records from the Wambo Homestead Complex blast monitoring station. The appointment of the structural engineer is to be approved in writing by the Director of the NSW Heritage Office.

65. Ground vibration and air blast levels experienced at the Wambo Homestead Complex blast monitoring station are not to exceed the structural damage assessment criteria prescribed by *Australian Standard AS 2187.2-1993 (or its latest version) "Explosives – Storage Transport and Use" for Sensitive and Heritage Structures* to prevent damage to the heritage items.

66. The approved structural engineer is to report to the Applicant on the monitoring results each month for blasting within 2 km of the Wambo Homestead Complex and 6 monthly for the remainder of the open cut mining operation and make recommendations to ensure the conservation and prevention of damage to the significant heritage structures. Copies of these reports are to be forwarded to the NSW Heritage Office.

67. The approved structural engineer is to inspect the Wambo Homestead Complex structures annually and as soon as practical, but no later than 3 days after blasting monitoring which exceeds the structural damage assessment criteria prescribed by AS 2187.2-1993 (or its latest version). During the period between blasting monitoring being recorded which exceeds the criteria in AS 2187.2-1993 (or its latest version) and the engineer's inspection, ground vibration from blasting is to be limited to a level which will prevent further blasting damage. The structural engineer is to advise the applicant and the NSW Heritage Office of any action required to repair the damage.

68. The approved structural engineer is to make an assessment of whether blasting within 2km of the Wambo Homestead Complex is to cease or be managed in order to stabilise or repair the damage, and so advise the applicant and the Director of the NSW Heritage Office. If blasting has been required to cease, it is not to resume until the damage has been stabilised or repaired, and the written approval for resumption has been issued by the Director of the NSW Heritage Office.

Rehabilitation

69. Following the cessation of the use of the coal haulage road which traverses the Wambo Homestead Complex property, the land is to be returned to its former condition (pre1999) and the half palisade fence on the southern alignment of the mounting yard, which was removed, is to be reinstated as required by the approval of the Heritage Council for the construction of the road on 12 February 1999.

Movable Heritage Items

70. The Applicant must liaise with the Power House Museum and Museums and Galleries Foundation regarding the significance of movable heritage which shall be displaced by the proposed open cut mining and suitable repositories for the conservation and storage of any significant items.

TRAFFIC & TRANSPORT

New Access Intersection

Note: The Applicant requires RMS approval under the Roads Act 1993 for the new intersection.

71. [9]The Applicant must design and construct the proposed new access intersection with the Golden Highway to the satisfaction of the RMS.

[10]Road Closure

[9] Incorporates RMS GTA
[10] Incorporates Council GTA

Note: The Applicant requires Council approval under the Roads Act 1993 prior to closing Pinegrove Road.

72. Prior to closing Pinegrove Road, the Applicant must prepare and implement a Road Closure Management Plan in consultation with the affected landowners, and to the satisfaction of Council. This plan must describe the alternate access arrangements for any affected landowners.

Parking

73. The Applicant must provide sufficient parking on-site for all mine-related traffic to the satisfaction of the Secretary.

Coal Haulage

74. *Deleted*

75. The Applicant must ensure that all product coal is transported from the site by rail except in an emergency, and as agreed by the Secretary in consultation with Council.

76. *Deleted*

77. *Deleted*

78. *Deleted*

Monitoring

79. The Applicant must:
    (a) keep records of the
        - amount of coal transported from the site each year; and
        - number of coal haulage truck movements generated each day by the development; and
    (b) include these records in the Annual Review.

Traffic Management Plan

80. The Applicant must prepare and implement a Traffic Management Plan in consultation with Council, and to the satisfaction of the RMS for the proposed blasting activities that require the temporary periodic closure of the Golden Highway. This plan must ensure that adequate warning is given to road users prior to blasting, and that follow up inspections are made to ensure that public roads are safe and clear of debris.

VISUAL IMPACT

Visual Amenity

81. The Applicant must implement measures to mitigate visual impacts including:
    (a) design and construction of development infrastructure in a manner that minimises visual contrasts; and
    (b) progressive rehabilitation of mine waste rock emplacements (particularly outer batters), including partial rehabilitation of temporarily inactive areas.

82. The Applicant must investigate and where feasible implement the following measures at locations assessed in the EIS as having a high potential visual impact:
    (a) implement landscaping works in consultation with affected rural residents (see Condition 83); and/or
    (b) place and maintain visual screens between development infrastructure and the viewing location.

83. If a landowner of any dwelling assessed in the EIS as having a high potential visual impact requests the Applicant in writing to investigate ways to minimise the visual impact of the development on his/her dwelling, the Applicant must:
    (a) within 28 days of receiving this request, commission a suitably qualified person whose appointment has been approved by the Secretary, to investigate ways to minimise the visual impacts of the development on the landowner's dwelling; and
    (b) give the landowner a copy of the visual impact mitigation report within 14 days of receiving this report.

    If both parties agree on the measures that should be implemented to minimise the visual impact of the development, then the Applicant must implement these measures to the satisfaction of the Secretary.

If the Applicant and the landowner disagree on the measures that should be implemented to minimise the visual impact of the development, then either party may refer the matter to the Secretary for resolution.

If the matter cannot be resolved within 21 days, the Secretary shall refer the matter to an Independent Dispute Resolution Process (see Appendix 2).

Overburden Dumps

84. The Applicant must construct the overburden emplacements generally in accordance with the EIS, and to the satisfaction of DRG.

Lighting Emissions

85. The Applicant must take all practicable measures to mitigate off-site lighting impacts from the development.

86. Unless otherwise agreed to by the Secretary, all external lighting associated with the development must comply with *Australian Standard AS4282 (INT)* 1997 – *Control of Obtrusive Effects of Outdoor Lighting* (or its latest version).

GREENHOUSE GAS

87. For the life of the development, the Applicant must:
(a) monitor the greenhouse gas emissions generated by the development;
(b) investigate ways to reduce greenhouse gas emissions generated by the development; and
(c) report on greenhouse gas monitoring and abatement measures in the Annual Review,
to the satisfaction of the Secretary.

WASTE MINIMISATION

88. For the life of the development, the Applicant must:
(a) monitor the amount of waste generated by the development;
(b) investigate ways to minimise waste generated by the development;
(c) implement reasonable and feasible measures to minimise waste generated by the development; and
(d) report on waste management and minimisation in the Annual Review,
to the satisfaction of the Secretary.

HAZARDS MANAGEMENT

Spontaneous Combustion

89. The Applicant must:
(a) take the necessary measures to prevent, as far as is practical, spontaneous combustion on the site; and
(b) manage any spontaneous combustion on-site to the satisfaction of DRG.

Dangerous Goods

90. The Applicant must ensure that the storage, handling, and transport of:
(a) dangerous goods is done in accordance with the relevant *Australian Standards*, particularly *AS1940* and *AS1596*, and the *Dangerous Goods Code*; and
(b) explosives are managed in accordance with the requirements of DRG.

91. Before carrying out any development, the Applicant must update the Safety Management System covering all operations on the site, including the safe storage of ammonium nitrate, to the satisfaction of the Secretary.

BUSHFIRE MANAGEMENT

92. The Applicant must:
(a) ensure that the development is suitably equipped to respond to any fires on-site; and
(b) assist the Rural Fire Service and emergency services as much as possible if there is a fire on-site during the development.

93. Before carrying out any development, the Applicant must prepare a Bushfire Management Plan for the site, to the satisfaction of Council and the Rural Fire Service.

REHABILITATION

Rehabilitation Objectives

94. The Applicant must rehabilitate the Wambo Mining Complex to the satisfaction of DRG. The rehabilitation must be generally in accordance with the proposed rehabilitation strategy described by the documents listed in Condition 2 of Schedule 3 and the objectives in Table 18.

Table 18: Rehabilitation Objectives

Area/Domain	***Rehabilitation Objectives***
Mine site (as a whole), including the final void	Safe, stable & non-polluting
Surface infrastructure	To be decommissioned and removed, unless DRG agrees otherwise
Community	Ensure public safety Minimise the adverse socio-economic effects associated with mine closure
Landforms	Final landforms are consistent with and complement the topography of the surrounding region to minimise the visual prominence of the final landforms in the post mining landscape
All watercourses subject to subsidence impacts	Hydraulically and geomorphologically stable, with riparian vegetation established that is the same or better than prior to commencement of mining

Operating Conditions

94A. The Applicant must:

(a) develop a detailed soil management protocol that identifies procedures for:
- comprehensive soil surveys prior to soil stripping;
- assessment of top-soil and sub-soil suitability for mine rehabilitation; and
- annual soil balances to manage soil handling including direct respreading and stockpiling;

(b) maximise the salvage of suitable top-soils and sub-soils and biodiversity habitat components such as bush rocks, tree hollows and fallen timber for rehabilitation of disturbed areas within Wambo Mining Complex and for enhancement of biodiversity offset areas;

(c) ensure that coal reject or any potentially acid forming interburden materials must not be emplaced at elevations within the pit shell or out of pit emplacement areas where they may promote acid or sulphate species generation and migration beyond the pit shell or out of pit emplacement areas; and

(d) ensure that no dirty water can drain from an out of pit emplacement area to any offsite watercourse or to any land beyond the lease boundary.

Progressive Rehabilitation

94B. The Applicant must rehabilitate the Wambo Mining Complex progressively, that is, as soon as reasonably practicable following disturbance. All reasonable and feasible measures must be taken to minimise the total area exposed for dust generation at any time. Interim rehabilitation strategies must be employed when areas prone to dust generation cannot yet be permanently rehabilitated.

Note: It is accepted that some parts of the site that are progressively rehabilitated may be subject to further disturbance at some later stage of the project.

Rehabilitation Management Plan

94C. The Applicant must prepare and implement a Rehabilitation Management Plan for the Wambo Mining Complex to the satisfaction of DRG. This plan must:

(a) be prepared in consultation with the Department, CLWD, OEH, Council and the CCC;

(b) be submitted to DRG by the end of June 2013;

(c) be prepared in accordance with any relevant DRG guideline;

(d) describe how the rehabilitation of the site would be integrated with the implementation the biodiversity offset strategy;

(e) include detailed performance and completion criteria for evaluating the performance of the rehabilitation of the site, and triggering remedial action (if necessary);

(f) describe the measures that would be implemented to ensure compliance with the relevant conditions of this consent, and address all aspects of rehabilitation including mine closure, final landform, and final land use;

(g) include a detailed tailings management strategy that includes timing for rehabilitation of all tailings storage facilities, in order that final land form and land use objectives can be achieved in a timely manner;
(h) include a plan that describes proposed grazing carrying capacity across the post mining landscape;
(i) include interim rehabilitation where necessary to minimise the area exposed for dust generation;
(j) include a program to monitor, independently audit and report on the effectiveness of the measures, and progress against the detailed performance and completion criteria; and
(k) build to the maximum extent practicable on the other management plans required under this consent.

MINE EXIT STRATEGY

95. The Applicant must work with the Council to investigate the minimisation of adverse socio-economic effects of a significant reduction in local employment levels and closure of the Wambo Mining Complex at the end of its life.

SCHEDULE 5
ADDITIONAL PROCEDURES FOR AIR QUALITY & NOISE MANAGEMENT

Notify Landowners

1. If the air dispersion and/or noise model predictions in the documents listed in condition 2 of schedule 3 identify that the air pollution and/or noise generated by the development are likely to be greater than the air quality and/or noise impact assessment criteria in conditions 2 and 6 of schedule 4, then the Applicant must notify the relevant landowners and/or existing or future tenants (including tenants of mine-owned properties) accordingly before it carries out any development.

2. If the results of the air quality and/or noise monitoring required in schedule 4 identify that the air pollution and/or noise generated by the development are greater than the air quality and/or noise impact assessment criteria in schedule 4, then the Applicant must notify the relevant landowners and/or existing or future tenants (including tenants of mine-owned properties) as soon as practicable after identifying the exceedence.

3. Before carrying out any development, the Applicant must develop a procedure in consultation with EPA and NSW Health and approved by the Secretary, for notifying landowners and tenants referred to in condition 1. This procedure must ensure that:
   (a) all existing and future tenants are advised in writing about:
      - air quality impacts likely to occur at the residence during the operational life of the mine; and
      - likely health and amenity impacts associated with exposure to particulate matter;
   (b) the written advice in (a) is based on current air quality monitoring data, dispersion modelling results, research and literature; and
   (c) there is an ongoing process for providing current air quality monitoring data, dispersion modelling results, research and literature to the tenants.

Independent Review

4. If a landowner considers the development to be exceeding the air quality and/or noise impact assessment criteria listed in schedule 4 at his/her dwelling, or at any proposed dwelling on his/her vacant land, then he/she may ask the Applicant for an independent review of the air pollution and/or noise impacts of the development on his/her dwelling, or proposed dwelling.

   If the Secretary is satisfied that an independent review is warranted, the Applicant must:
   (a) consult with the landowner to determine his/her concerns; and
   (b) commission a suitably qualified person – whose appointment has been approved by the Secretary – to conduct air quality and/or noise monitoring at the relevant dwelling to determine whether the development is complying with the relevant impact assessment criteria, and identify the source(s) and scale of any air quality and/or noise impact at the dwelling, and the development's contribution to this impact.

   Within 14 days of receiving the results of this independent review, the Applicant must give a copy of these results to the Secretary and landowner.

5. If the independent review (referred to in condition 4) determines that the development is complying with the relevant impact assessment criteria listed in schedule 4 at the dwelling, then the Applicant may discontinue the independent review with the approval of the Secretary.

6. If the independent review (referred to in condition 4) determines that the development is not complying with the relevant impact assessment criteria listed in schedule 4 at the dwelling, and that the development is primarily responsible for this non-compliance, then the Applicant must:
   (a) take all practicable measures, in consultation with the landowner, to ensure that the development complies with the relevant impact assessment criteria; and conduct further air quality and/or noise monitoring at the dwelling to determine whether these measures ensure compliance; or
   (b) secure a written agreement with the landowner to allow exceedances of the air quality and/or noise impact assessment criteria listed in schedule 4.

   If the additional monitoring referred to above subsequently determines that the development is complying with the relevant impact assessment criteria listed in schedule 4 at the dwelling, then the Applicant may discontinue the independent review with the approval of the Secretary.

If the measures referred to in (a) do not ensure compliance with the air quality and/or noise land acquisition criteria listed in schedule 4 at the dwelling, and the Applicant must, upon receiving a written request from the landowner, acquire all or part of the landowner's land in accordance with the procedures in conditions 9-11 below.

7. If the independent review determines that the development is not complying with the air quality and/or noise impact assessment criteria listed in schedule 4 at the dwelling, but that several mines are responsible for this non-compliance, then the Applicant must, with the agreement of the landowner and other mine(s) prepare and implement a Cumulative Air Quality and/or Noise Impact Management Plan for the land to the satisfaction of the Secretary. This plan must provide the joint approach to be adopted by the Applicant and other mine(s) to manage cumulative air quality and/or noise impacts at the landowner's dwelling, and the acquisition of any land.

   If the Applicant is unable to finalise an agreement with the landowner and/or other mine(s), and/or prepare a Cumulative Air Quality and Noise Impact Management Plan, then the Applicant or landowner may refer the matter to the Secretary for resolution.

   If the matter cannot be resolved within 21 days, the Secretary shall refer the matter to an Independent Dispute Resolution Process.

   If, following the Independent Dispute Resolution Process, the Secretary decides that the Applicant must acquire all or part of the landowner's land, then the Applicant must acquire this land in accordance with the procedures in conditions 9-11 below.

8. If the landowner disputes the results of the independent review (referred to in condition 4), either the Applicant or the landowner may refer the matter to the Secretary for resolution.

   If the matter cannot be resolved within 21 days, the Secretary shall refer the matter to an Independent Dispute Resolution Process.

Land Acquisition

9. Within 6 months of receiving a written request from the landowner, the Applicant must pay the landowner:
   (a) the current market value of the landowner's interest in the land at the date of this written request, as if the land was unaffected by the development the subject of the DA, having regard to the:
      - existing and permissible use of the land, in accordance with the applicable planning instruments at the date of the written request; and
      - presence of improvements on the land and/or any approved building or structure which has been physically commenced at the date of the landowner's written request, and is due to be completed subsequent to that date;
   (b) the reasonable costs associated with:
      - relocating within the Singleton local government area, or to any other local government area determined by the Secretary;
      - obtaining legal advice and expert advice for determining the acquisition price of the land, and the terms upon which it is required; and
   (c) reasonable compensation for any disturbance caused by the land acquisition process.

   However, if within 6 months of receiving this written request, the Applicant and landowner cannot agree on the acquisition price of the land, and/or the terms upon which the land is to be acquired, then either party may refer the matter to the Secretary for resolution.

   Upon receiving such a request, the Secretary shall request the President of the NSW Division of the Australian Property Institute to appoint a qualified independent valuer or Fellow of the Institute, to consider submissions from both parties, and determine a fair and reasonable acquisition price for the land, and/or terms upon which the land is to be acquired.

   If either party disputes the independent valuer's determination, then the independent valuer must refer the matter back to the Secretary.

   Upon receiving such a referral, the Secretary shall appoint a panel to determine a fair and reasonable acquisition price for the land, and/or the terms upon which the land is to be acquired, comprising the:
   (i) appointed independent valuer,
   (ii) Secretary or nominee, and
   (iii) President of the Law Society of NSW or nominee.

Within 14 days of receiving the panel's determination, the Applicant must make a written offer to purchase the land at a price not less than the panel's determination.

If the landowner refuses to accept this offer within 6 months of the date of the Applicant's offer, the Applicant's obligations to acquire the land shall cease, unless otherwise agreed by the Secretary.

10. The Applicant must bear the costs of any valuation or survey assessment requested by the independent valuer, panel, or the Secretary and the costs of determination referred to in Condition 9.

11. If the Applicant and landowner agree that only part of the land should be acquired, then the Applicant must pay all reasonable costs associated with obtaining Council approval for any plan of subdivision, and registration of the plan at the Office of the Registrar-General.

SCHEDULE 6
ENVIRONMENTAL MANAGEMENT, MONITORING, AUDITING & REPORTING

ENVIRONMENTAL MANAGEMENT STRATEGY

1. Before carrying out any development, the Applicant must prepare an Environmental Management Strategy for the development to the satisfaction of the Secretary. This strategy must:
   (a) provide the strategic context for environmental management of the development;
   (b) identify the statutory requirements that apply to the development;
   (c) describe in general how the environmental performance of the development would be monitored and managed during the development;
   (d) describe the procedures that would be implemented to:
   - keep the local community and relevant agencies informed about the operation and environmental performance of the development;
   - receive, handle, respond to, and record complaints;
   - resolve any disputes that may arise during the course of the development;
   - respond to any non-compliance;
   - manage cumulative impacts; and
   - respond to emergencies; and

   (e) describe the role, responsibility, authority, and accountability of all the key personnel involved in environmental management of the development.

   The Applicant must implement the approved strategy as approved from time to time by the Secretary.

2. Within 14 days of the Secretary's approval, the Applicant must:
   (a) send copies of the approved strategy to the relevant agencies, Council, and the CCC; and
   (b) ensure the approved strategy is publicly available during the development.

Adaptive Management

3. The Applicant must assess and manage project-related risks to ensure that there are no exceedances of the criteria and/or performance measures in schedule 4. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation.

   Where any exceedance of these criteria and/or performance measures has occurred, the Applicant must, at the earliest opportunity:
   (a) take all reasonable and feasible steps to ensure that the exceedance ceases and does not recur;
   (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and
   (c) implement remediation measures as directed by the Secretary,

   to the satisfaction of the Secretary.

Management Plan Requirements

4. The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include:
   (a) detailed baseline data;
   (b) a description of:
   - the relevant statutory requirements (including any relevant consent, licence or lease conditions);
   - any relevant limits or performance measures/criteria;
   - the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;

   (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;
   (d) a program to monitor and report on the:
   - impacts and environmental performance of the Wambo Mining Complex;
   - effectiveness of any management measures (see c above);

   (e) a contingency plan to manage any unpredicted impacts and their consequences;
   (f) a program to investigate and implement ways to improve the environmental performance of the Wambo Mining Complex over time;
   (g) a protocol for managing and reporting any:
   - incidents;
   - complaints;
   - non-compliances with statutory requirements; and
   - exceedances of the impact assessment criteria and/or performance criteria; and

(h) a protocol for periodic review of the plan.

ANNUAL REVIEW

5. By the end of March each year, the Applicant must submit a report to the Department reviewing the environmental performance of the development to the satisfaction of the Secretary. This review must:
   (a) describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;
   (b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against:
      - the relevant statutory requirements, limits or performance measures/criteria;
      - the monitoring results of previous years; and
      - the relevant predictions in the EIS;
   (c) identify any non-compliance over the previous calendar year, and describe what actions were (or are being) taken to ensure compliance;
   (d) identify any trends in the monitoring data over the life of the development;
   (e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
   (f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development.

REVISION OF STRATEGIES, PLANS AND PROGRAMS

6. Within 3 months of:
   (a) the submission of an annual review under Condition 5 above;
   (b) the submission of an audit report under Condition 7 below;
   (c) the submission of an incident report under Condition 10 below; or
   (d) any modification to the conditions of this consent, (unless the conditions require otherwise),

   the Applicant must review, and if necessary revise, the strategies, plans, and programs required under this consent to the satisfaction of the Secretary.

   Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.

INDEPENDENT ENVIRONMENTAL AUDIT

7. Every 3 years, unless the Secretary directs otherwise, the Applicant must commission and pay the full cost of an Independent Environmental Audit of the development. This audit must:
   (a) be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary;
   (b) include consultation with the relevant agencies;
   (c) assess the environmental performance of the development and assess whether it is complying with the requirements in this consent and any relevant EPL or Mining Lease (including any assessment, plan or program required under these consents/approvals);
   (d) review the adequacy of strategies, plans or programs required under the abovementioned consents/approvals;
   (e) recommend appropriate measures or actions to improve the environmental performance of the development, and/or any assessment, plan or program required under the abovementioned consents; and
   (f) be conducted and reported to the satisfaction of the Secretary.

   Note: This audit team must be led by a suitably qualified auditor and include experts in any field specified by the Secretary.

   Within 12 weeks of commencing this audit, or as otherwise agreed by the Secretary, the Applicant must submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report.

COMMUNITY CONSULTATIVE COMMITTEE

8. Before carrying out any development, the Applicant must establish a new Community Consultative Committee to oversee the environmental performance of the development. This committee must:
   (a) be comprised of:
      - 2 representatives from the Applicant, including the person responsible for environmental management at the mine;
      - 1 representative from Council; and
      - at least 3 representatives from the local community,

whose appointment has been approved by the Secretary in consultation with the Council;

(b) be chaired by the representative from Council or by a third party as approved by the Secretary;

(c) meet at least twice a year; and

(d) review and provide advice on the environmental performance of the development, including any construction or environmental management plans, monitoring results, audit reports, or complaints.

9. The Applicant must, at its own expense:

(a) ensure that 2 of its representatives attend the Committee's meetings;

(b) provide the Committee with regular information on the environmental performance and management of the development;

(c) provide meeting facilities for the Committee;

(d) arrange site inspections for the Committee, if necessary;

(e) take minutes of the Committee's meetings;

(f) make these minutes available to the public for inspection within 14 days of the Committee meeting, or as agreed to by the Committee;

(g) respond to any advice or recommendations the Committee may have in relation to the environmental management or performance of the development;

(h) forward a copy of the minutes of each Committee meeting, and any responses to the Committee's recommendations to the Secretary within a month of the Committee meeting.

REPORTING

Incident Reporting

10. The Applicant must notify at the earliest opportunity, the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the project, the Applicant must notify the Secretary and any other relevant agencies as soon as practicable after the Applicant becomes aware of the incident. Within 7 days of the date of the incident, the Applicant must provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.

Regular Reporting

11. The Applicant must provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.

ACCESS TO INFORMATION

12. From the end of June 2011, the Applicant must:

(a) make copies of the following publicly available on its website:

- the documents referred to in Condition 2 of Schedule 3;
- all current statutory consents for the development;
- all approved strategies, plans and programs required under the conditions of this consent;
- a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;
- a complaints register, updated on a monthly basis;
- minutes of CCC meetings;
- the annual reviews of the development;
- any independent environmental audit of the development, and the Applicant's response to the recommendations in any audit;
- any other matter required by the Secretary; and

(b) keep this information up-to-date,

to the satisfaction of the Secretary.

Online Communication of Operational Responses and Noise and Air Quality Monitoring

13. The Applicant must, by the end of June 2013:

(a) make the following information for the Wambo Mining Complex publicly available on its website, on a daily basis and in a clearly understandable form:

- daily weather forecasts for the coming week;
- proposed operational responses to these weather forecasts;
- real-time noise and air quality monitoring data (subject to any necessary caveats); and
- any operational responses that were taken in response to the noise and air quality monitoring data, and

(b) make provision on its website for the provision of on-line and/or email comments by members of the community regarding this information,

to the satisfaction of the Secretary.

APPENDIX 1
SCHEDULE OF LAND

Lot Number	Deposited Plan Number	Tenure Type
1	DP110084	Freehold
1	DP1089682	Freehold
1	DP114970	Freehold
1	DP709722	Freehold
1	DP720705	Freehold
1	DP241316	Freehold
1	DP616303	Freehold
1	DP1177768	Freehold
1	DP1174490	Local Government Authority
100	DP753792	Freehold
101	DP753792	Freehold
103	DP753792	Freehold
104	DP753792	Freehold
109	DP753792	Freehold
110	DP753792	Freehold
111	DP753792	Freehold
112	DP753792	Freehold
113	DP753817	Freehold
118	DP753792	Freehold
129	DP755267	Freehold
131	DP1089157	Freehold
160	DP753817	Freehold
161	DP753817	Freehold
170	DP823775	Crown
175	DP823775	Crown
18	DP753817	Freehold
2	DP1085145	Freehold
2	DP110084	Freehold
2	DP709722	Freehold
2	DP616303	Freehold
2	DP617852	Freehold
2	DP720705	Freehold
2	DP1174490	Freehold
208	DP753817	Freehold
22	DP753817	Freehold
220	DP1135537	Freehold
23	DP3030	Freehold
3	DP720705	Freehold
3	DP1177768	Freehold
3	DP1085145	Freehold
38	DP753792	Freehold
39	DP753792	Freehold
4	DP1085145	Freehold
4	DP542226	Freehold
4	DP720705	Freehold
45	DP753792	Freehold
46	DP753792	Freehold
49	DP753792	Freehold

Lot Number	Deposited Plan Number	Tenure Type
5	DP542226	Freehold
5	DP1085145	Freehold
50	DP753792	Freehold
51	DP753792	Freehold
52	DP753792	Freehold
55	DP753792	Freehold
57	DP1074788	Freehold
58	DP753792	Freehold
60	DP753792	Freehold
61	DP753792	Freehold
62	DP753792	Freehold
63	DP753792	Freehold
64	DP753792	Freehold
66	DP753817	Freehold
67	DP753817	Freehold
7	DP3030	Freehold
71	DP753817	Freehold
79	DP1074787	Freehold
79	DP753821	Freehold
82	DP548749	Freehold
83	DP548749	Freehold
92	DP755267	Freehold
95	DP753792	Freehold
A	DP33149	Freehold
B	DP33149	Freehold
C	DP33149	Freehold
1	DP732501	Freehold
2	DP732501	Freehold
3	DP732501	Freehold
4	DP732501	Freehold
5	DP732501	Freehold
6	DP732501	Freehold
3	DP753817	Freehold
4	DP753817	Freehold
5	DP753817	Freehold
6	DP753817	Freehold
10	DP753817	Freehold
73	DP753817	Freehold

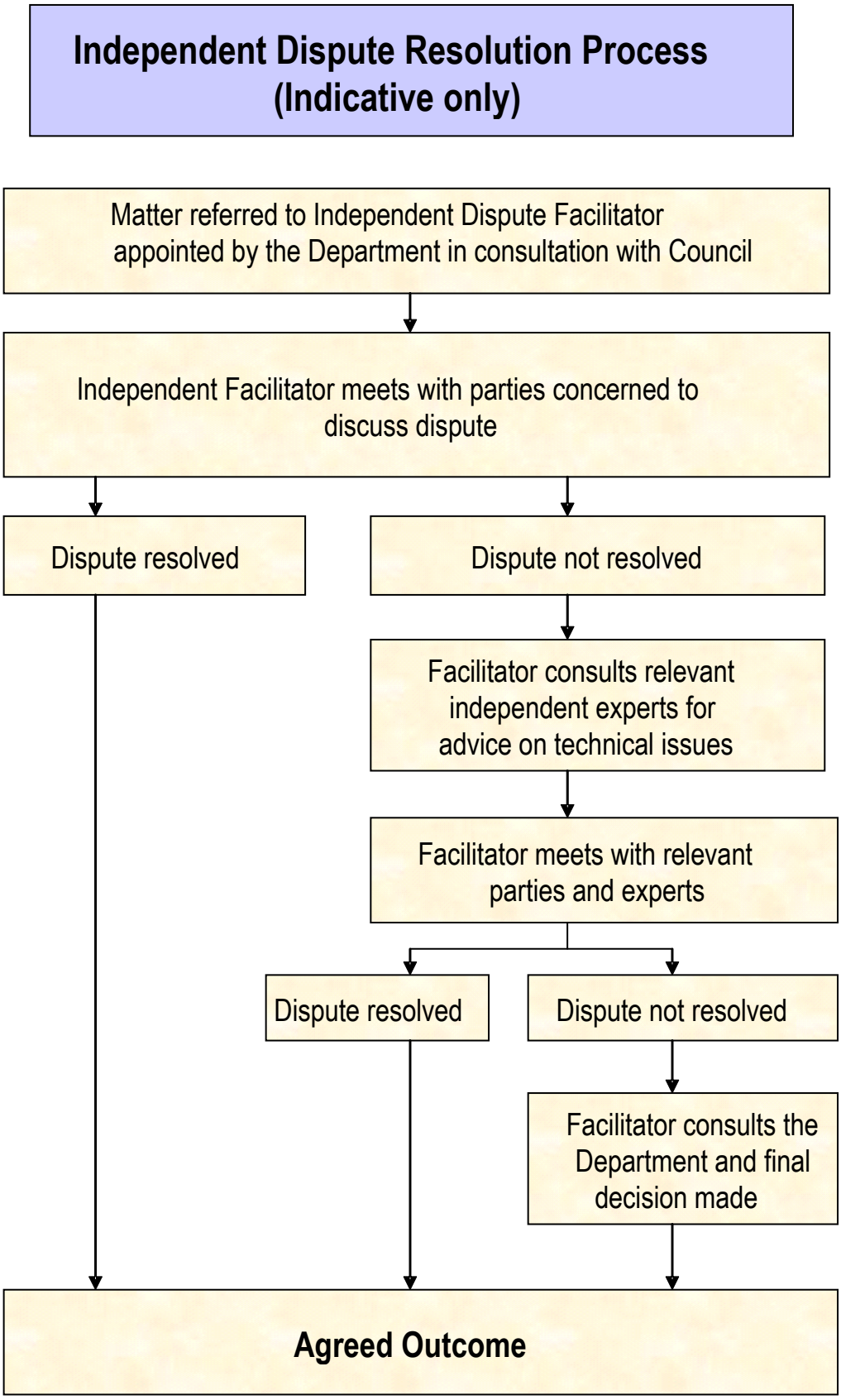
Roads

1. Wambo Mine Road.
2. Road within Lot 1 DP 616303.
3. Road bounded by Lot 220 DP1135537, Lot 83 DP548749, Lot 23 DP3030, Lot 129 DP 755267, Lot 1 DP110084, Lot 1089682 and Lot 1 DP114970.
4. Bounded by Lots 92 & 129 DP 755267.
5. Bounded by Lots 4 & 5 DP542226, Lot 2 DP616303, Lots 2 & 3 DP720705 and Lot 3 1177768.
6. Bounded by Lot 2 DP616303, Lot 5 DP542226, Lot 4 DP720705 and Lots 45 & 46 DP753792.
7. Bounded by Lot 1 DP1174490, Lots 2, 3 & 4 DP1085145 and Lot 175 DP823775.
8. Bounded by Lots 62, 63, 64, 95 & 118 DP753792, Lot 1 DP 1177768 and Lot 2 DP1174490.
9. Bounded by Lot 79 DP1074487, Lot 170 DP823775, Lots 49-51, 58, 118 DP753792, Lot 2 DP1085145 and Lot 2 DP1174490.
10. Bounded by Lot 79 DP1074487, Lots 18, 160 &161 DP753817 and Lots 49, 50 & 52 DP753792.
11. Bounded by Lot A DP33149, Lots 22, 66 & 71 DP753817 and Lot 2 DP 1174490.
12. Adjoining to the East and North of Lot 79 DP753821.
13. Wambo Road.
14. Road within Lot 208 DP753817.
15. Bounded by Lot A DP33149 and Lots 3, 4, 5, 6 & 113 DP753817.
16. Adjoining to the West and South of Lot 22 DP753817.

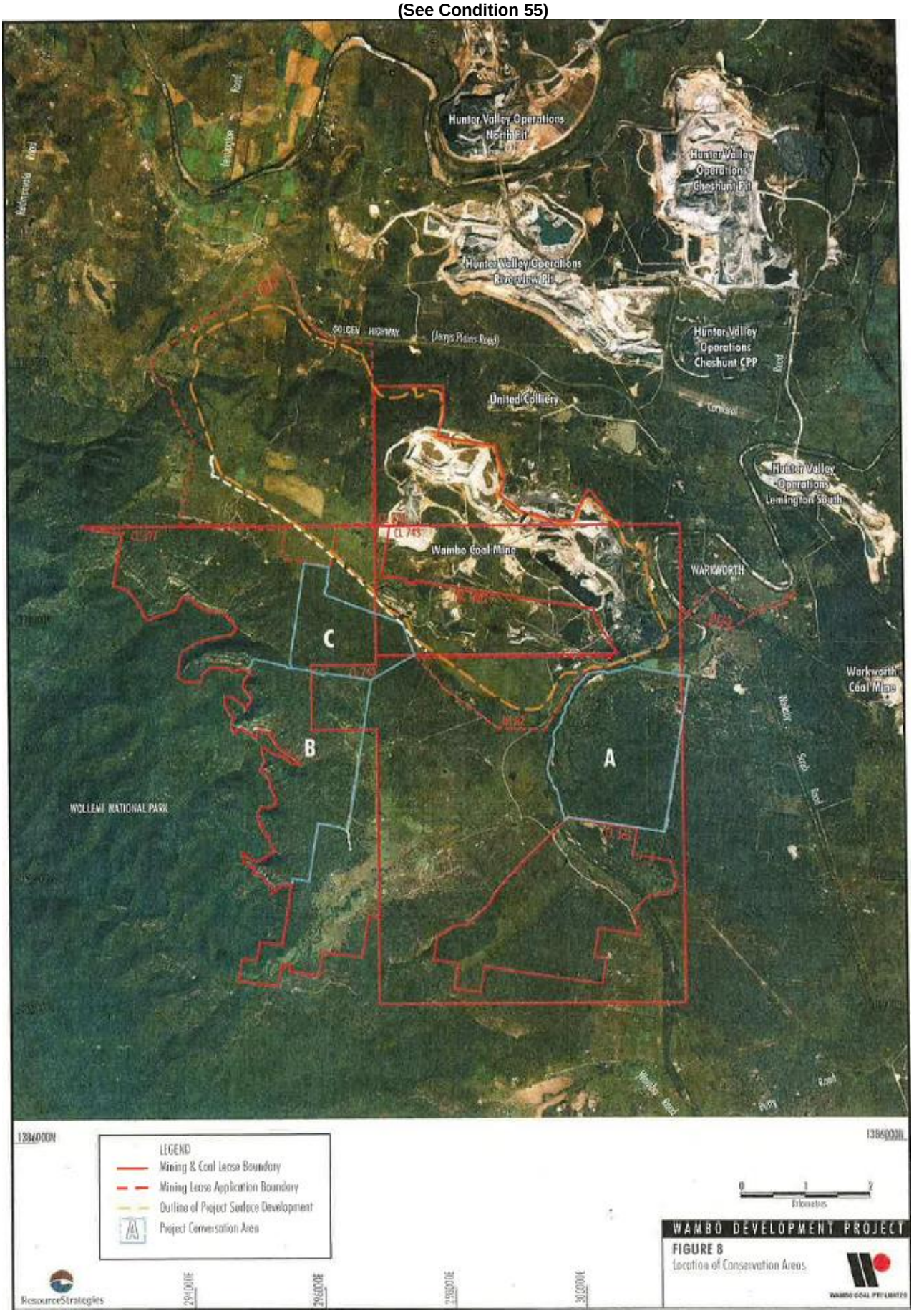
Wollombi Brook

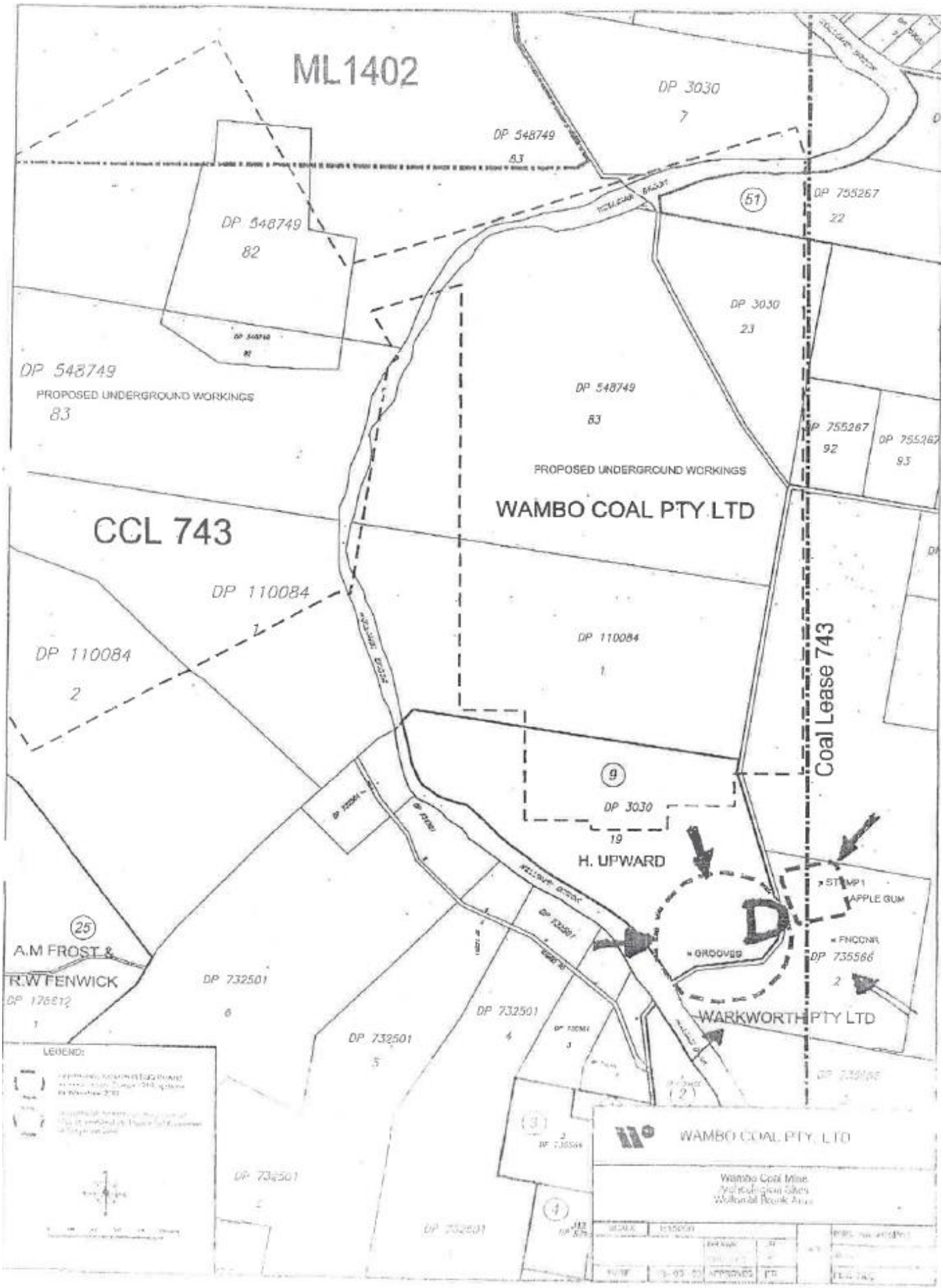
1. Bounded by Lot 220 DP1135537, Lot 83 DP548749, Lot1 DP110084, Lot 1 DP241316 and Lot 7 DP3030.
2. Bounded by Lot 1 DP1089682 and Lots 1, 2, 3, 4, 5 & 6 DP732501.

APPENDIX 2
INDEPENDENT DISPUTE RESOLUTION PROCESS

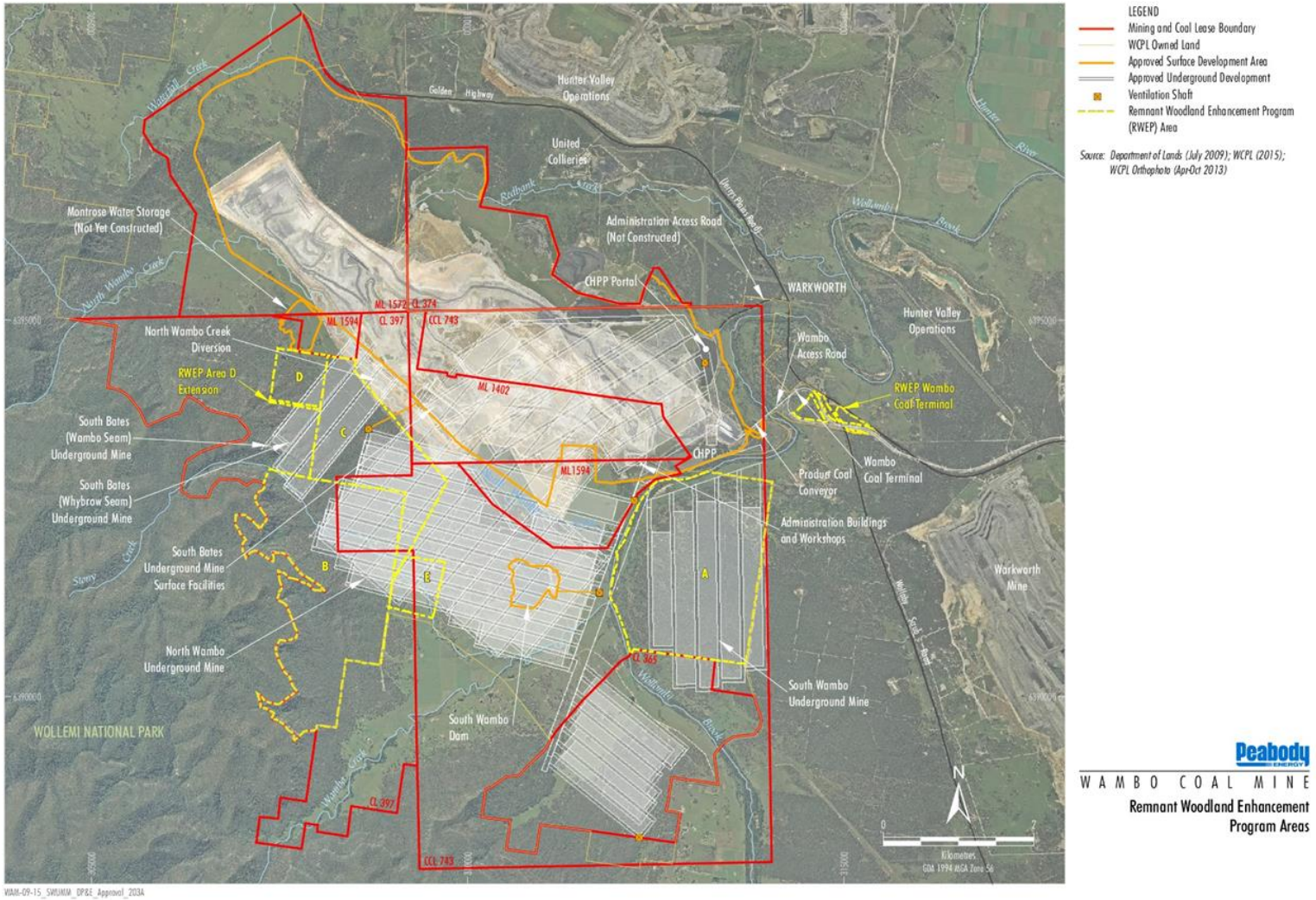


APPENDIX 3
MAP FOR ABORIGINAL CULTURAL HERITAGE INVESTIGATIONS
(See Condition 55)



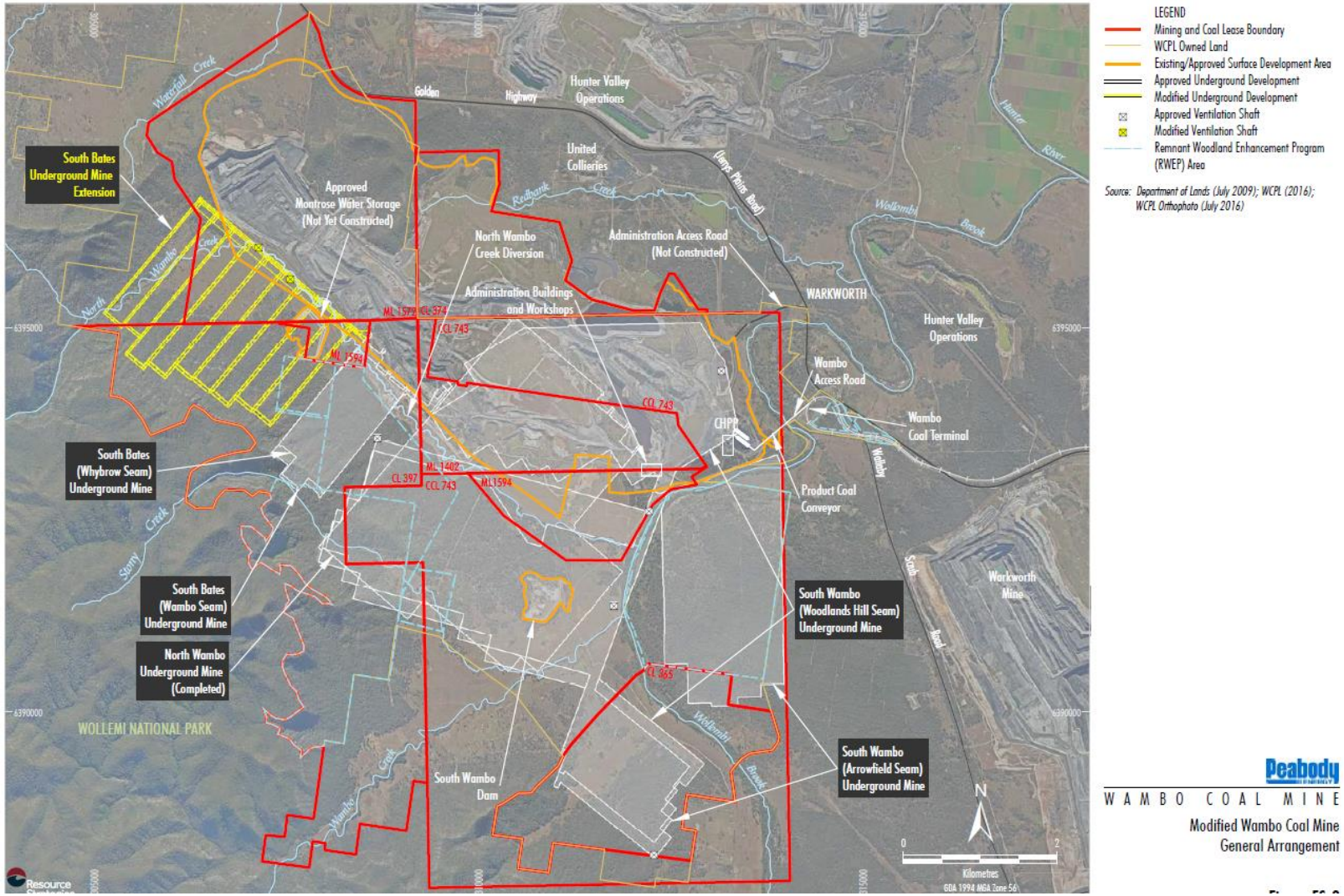

ML1402
DP 548749
83
DP 3030
7
DP 548749
82
51
DP 755267
22
DP 3030
23
DP 548749
PROPOSED UNDERGROUND WORKINGS
83
DP 548749
83
PROPOSED UNDERGROUND WORKINGS
WAMBO COAL PTY LTD
DP 755267
92
DP 755267
93
CCL 743
DP 110084
1
DP 110084
2
DP 110084
1
Coal Lease 743
9
DP 3030
19
H. UPWARD
STUMP 1
APPLE GUM
FNCONR
GROOVED
DP 735566
2
25
A.M FROST &
R.W FENWICK
DP 176812
1
DP 732501
6
DP 732501
5
DP 732501
4
WARKWORTH PTY LTD
LEGEND:
WAMBO COAL PTY. LTD
Wambo Coal Mine
DP 732501
DP 732501

APPENDIX 4
BIODIVERSITY OFFSET AREAS
(See Condition 40)



FLORA AND FAUNA MANAGEMENT PLAN
FIGURE 5
Remnant Woodland Enhancement Programme Areas
Rail Infrastructure
WCTPL Remnant Woodland Enhancement Programme Areas
N
0
500
1000
metres

APPENDIX 5
APPROVED LAYOUT



APPENDIX 3

Surface Disturbance Permit

WA-SAH-PER-305.22 SURFACE DISTURBANCE PERMIT

The Surface Disturbance Permit is to be used when assessing and approving mine related activities requiring ground disturbance within exploration and mining leases

SDP Number:	

Activity:					
Responsible Person:		**Statutory Area Manager:**			
Project Start:		**Project Finish:**			
Disturbance Area (ha):		**Easting:**		**Northing:**	

ALL PERMITS REQUIRE A FIGURE SHOWING RELEVANT: ABORIGINAL ARCHAEOLOGY, THREATENED ECOLOGICAL COMMUNITIES, MONITORING LOCATIONS, DEVELOPMENT CONSENT, MOP, MINING/EXPLORATION LEASE, LAND OWNERSHIP AND EPL BOUNDARIES

Approvals and Constraints	**Y**	**N**	**N/A**	**Boundaries and Conditions**	**Y**	**N**	**N/A**
Regulatory approvals/notifications required?	☐	☐	☐	Is the proposed activity ***inconsistent*** with any of the following boundaries or conditions:			
Landholder notification/access agreement required?	☐	☐	☐	Wambo's land ownership	☐	☐	☐
Flora/fauna or archaeological constraints?	☐	☐	☐	AHIP	☐	☐	☐
Erosion and Sediment Control Implementation Plan (ESCIP) required?	☐	☐	☐	EPL 529	☐	☐	☐
Will any infrastructure be impacted? (e.g. access tracks, pipelines, monitoring)	☐	☐	☐	MOP	☐	☐	☐
Dust, noise, or lighting impacts?	☐	☐	☐	Mining and Exploration Leases	☐	☐	☐
Does the SDP boundary require fencing?	☐	☐	☐	Development Consents	☐	☐	☐
Topsoil resource identification and an appropriate stockpile location required?	☐	☐	☐	Environmental Management Plans	☐	☐	☐
Activity within 40m of a riparian zone?	☐	☐	☐	Relevant regulation and planning policies	☐	☐	☐
Has pit inrush or inundation been considered in project risk assessment	☐	☐	☐				

IF YES WAS ANSWERED TO ANY OF THE ABOVE; FURTHER APPROVALS, CONTROLS OR DUE DILIGENCE ASSESSMENTS MAY BE REQUIRED. ATTACH COPIES OF ALL ADDITIONAL WORKS

Comments and Conditions

SDP Approval			
Role	**Name**	**Signature**	**Date**
Responsible Person			
Environment and Community Manager			

PRIOR TO SDP COMPLETION SIGN OFF THE DISTURBANCE AREA IS TO BE REHABILITATED WITH TOPSOIL REPLACED AND SEEDED. ALL UNECESSARY INFRASTRUCTURE, EQUIPMENT AND MATERIALS ARE TO BE REMOVED WITH THE SITE LEFT IN A CLEAN AND TIDY MANNER.

SDP Completion Sign Off			
Role	**Name**	**Signature**	**Date**
Responsible Person			
Environment and Community Manager			

APPENDIX 4

Kharlibe Subsidence Remediation Plan

KHARLIBE SUBSIDENCE REMEDIATION PLAN

Prepared for:

Wambo Coal Pty Limited
PMB 1 Singleton
NSW 2330

Prepared by:

SLR
global environmental solutions

SCT

SLR Ref: 630.12136-R06
Version No: -v6.0
March 2019

PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
10 Kings Road
New Lambton NSW 2305 Australia
(PO Box 447 New Lambton NSW 2305 Australia)
T: +61 2 4037 3200 F: +61 2 4037 3201
E: newcastleau@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Wambo Coal Pty Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
630.12136-R05-v6.0	15 March 2019	Jessica Coffey, Duncan Barnes	Adam Williams	Adam Williams
630.12136-R05-v5.0	4 March 2019	Jessica Coffey	Adam Williams	Adam Williams
630.12136-R04-v4.0	28 September 2018	Duncan Barnes, Murray Fraser	Adam Williams	Adam Williams
630.12136-R03-v3.0	31 August 2018	Duncan Barnes, Murray Fraser	Adam Williams	Adam Williams
630.12136-R02-v2.0	13 August 2018	Jessica Coffey	Adam Williams	Adam Williams

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DOCUMENT REFERENCES

TABLES

FIGURES

APPENDICES

1 Introduction

This Subsidence Remediation Plan has been developed for 'Kharlibe' located in Bulga, approximately 20 kilometres (km) west-southwest of Singleton in the Upper Hunter Valley of New South Wales (NSW) (refer **Figure 1**).

Between 1991 and 2000, the property was undermined by the former Homestead Mine (owned by Wambo Coal Pty Limited [WCPL], now a subsidiary of Peabody Energy Australia Pty Ltd). The mining occurred within Coal Lease (CL) 397 and Consolidated Coal Lease (CCL) 743 held by WCPL. The longwall mining resulted in the surface of the ground being lowered, and the formation of subsidence cracks– some of which took time to migrate through the alluvium to reach the surface – and associated impacts on water resources. Based upon discussions with the landowners it is understood that repair works have been undertaken across the property by various contractors and consultants since the late 1990's. The success of these works has been mixed and in some instances will also require ongoing remedial works.

In February 2018, the Department of Planning and Environment - Resources Regulator (Resources Regulator) issued a Notice under Section 240 (1)(b) and (c) of the *Mining Act 1992* (Mining Act) that requires WCPL to prepare a Subsidence Remediation Plan for Kharlibe. SLR Consulting (SLR) and SCT Operations Pty Ltd (SCT) have been approved as suitably qualified experts to prepare this Subsidence Remediation Plan in consultation with the landholder and the Resources Regulator.

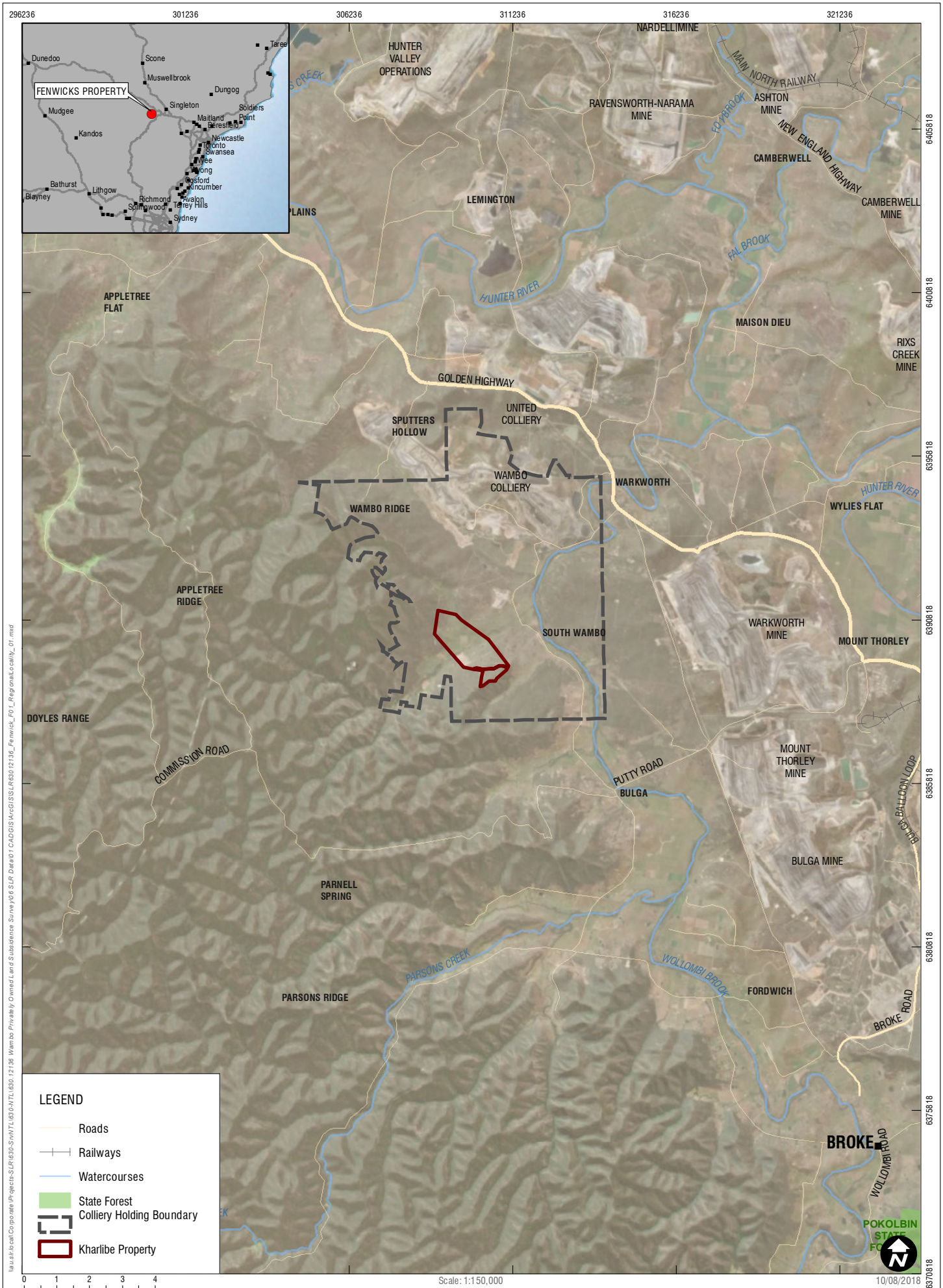
At the request of the Department of Planning and Environment (DPE) surface water flows of South Wambo Creek and groundwater impacts to the property are not addressed by this Subsidence Remediation Plan.

2 Project Area

Kharlibe (Lot 1 in DP 178612) is shown on **Figure 2** and covers an area of 238 hectares (ha). The assessment of direct and indirect subsidence-related impacts, and non-subsidence impacts (e.g. ineffective subsidence remediation, water management measures etc.) across the entire property falls within the scope of this Plan. However, it excludes assessment of impacts upon water resources or recommendations for the remediation of South Wambo Creek.

On 9 September 2004 a Tripartite Agreement was signed between the Fenwick's, WCPL and the NSW Department of Planning and Environment (DPE). The Tripartite Agreement was ratified for the parties to develop a strategy to rehabilitate affected land along South Wambo Creek and within Kharlibe. This strategy is being managed by the DPE in parallel with the development of this Subsidence Remediation Plan. Accordingly, the remediation recommendations specific to South Wambo Creek are excluded from the scope of this Plan. In accordance with the *Water Management Act 2000* (WM Act), South Wambo Creek comprises the creek bed and any land within 40 m of the highest bank of the creek. For the purpose of this report, SLR have digitised an indicative South Wambo Creek boundary using LIDAR data (refer **Figure 2**). This layer is indicative only and should be confirmed by ground-truthing/survey prior to completing any associated works within or adjacent to South Wambo Creek.

Any direct or indirect subsidence related, or non-subsidence impact sites identified within this Subsidence Remediation Plan and the limits of South Wambo Creek, should be addressed by DPE during future works under the Tripartite Agreement.



Ila:s:\slr\local\Corporate\Projects-SLR\630-S\NTL\630-NTL630.12136 Wambo Privately Owned Land Subsidence Survey\06 SLR Data\01 CAD\GIS\ArcGIS\SLR630.12136_Fenwick_F01_RegionalLocality_01.mxd

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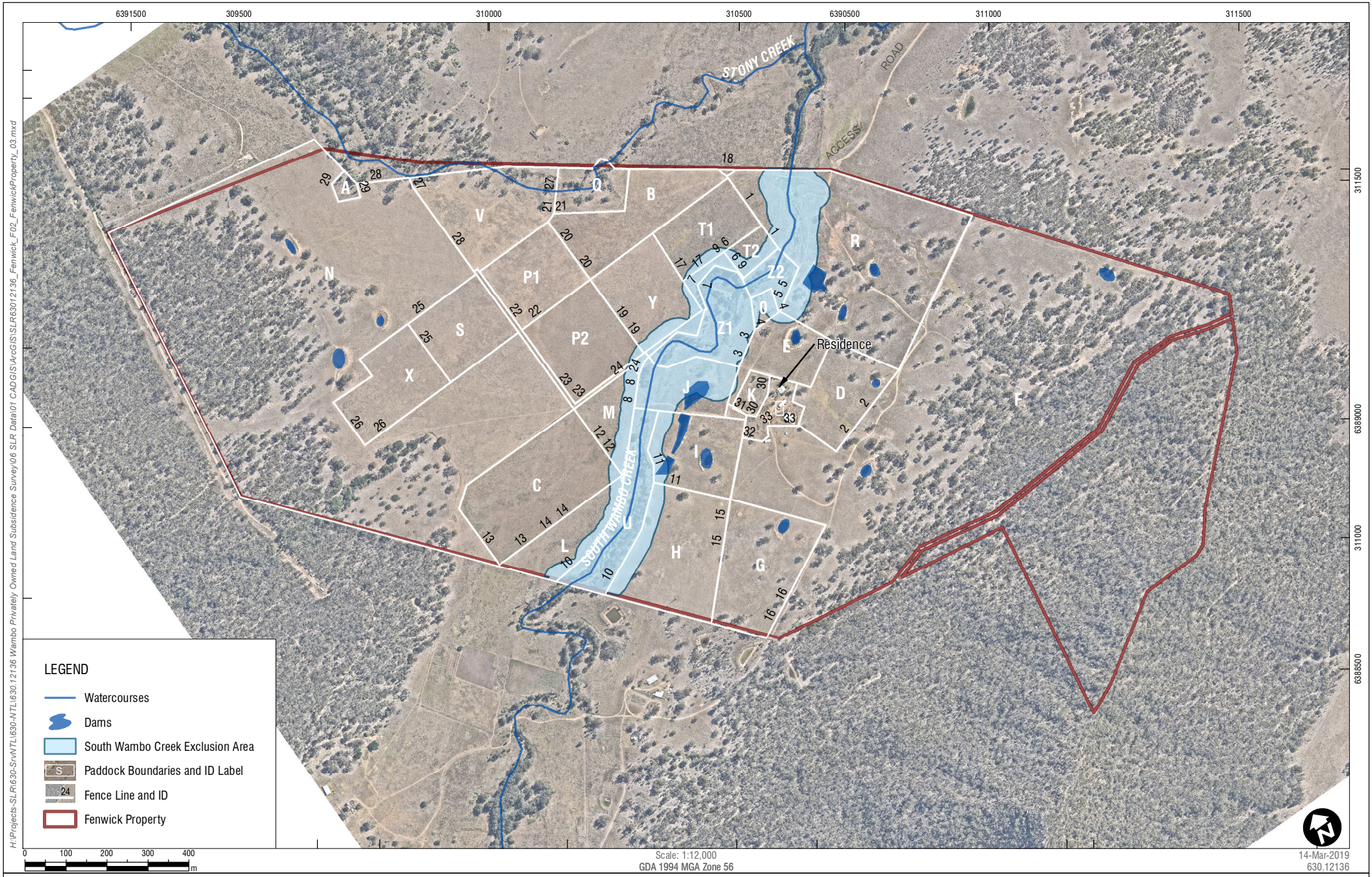
Regional Locality

FIGURE 1



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Fenwick Property

FIGURE 2

3 Existing Environment

3.1 Soils and Topography

The property is located at the foothills of the Wollemi National Park, below Mount Wambo. The terrain generally dips to the north-east, and steepens towards the western and southern boundary lines, drainage gullies and creek banks. Sections of South Wambo Creek and Stoney Creek pass through the property.

Soils have been mapped by the Office of Environment and Heritage (OEH) and are publicly available on the eSpade data portal (OEH, 2017). Soil types within Kharlibe have been classified as Kurosols and Sodosols, both of which are classed as having moderately low inherent fertility with very slow infiltration. Kurosols are soils with a strong texture contrast between the A horizons and a strongly acidic B horizon. Sodosols are soils with a strong texture contrast between the A horizon and a sodic B horizon which is not strongly acidic. The strongly sodic nature of the B horizon in Sodosols leave them prone to dispersion and tunnel erosion if left exposed for prolonged periods to water movement or rainfall. Due to their strong texture contrast (low clay content topsoil) neither soil type is suited to regular cultivation. Field observation of soil exposures and remnant vegetation types during the subsidence impact walkover indicated that Kurosols and Sodosols would most likely comprise the major soil types within Kharlibe.

A small area of Vertosol soil type was found near the south-western property boundary during the field inspection (refer **Section 8**). Vertosols are clay soils with shrink-swell properties that exhibit strong cracking when dry and at depth have slickensides and/or lenticular structural aggregates. Samples were taken and sent for laboratory analysis to confirm the Vertosol soil type. Clay content was greater than 35% and Atterberg Limit activity values were 0.96 (0 cm – 30 cm) and 0.91 (30 cm – 60 cm), giving moderate shrink/swell properties with potential for visible surface cracking.

3.2 Vegetation

The property is predominantly cleared and used for agricultural purposes. Some vegetated areas are located on the foothills and are broadly mapped as Dry Sclerophyll Forests (shrub/grass subformation) (OEH, 2007). The *Wambo Coal Biodiversity Management Plan* (WCPL, 2018a) maps vegetation on the foothills to the north of the property as *Spotted Gum – Narrow Leaved Ironbark – Grey Box Woodland*. Prior to being cleared, the site was likely vegetated with *Central Hunter Grey Box – Ironbark Woodland*. Vegetation is also located along South Wambo Creek and Stoney Creek, which has been mapped further north as *Forest Red Gum Floodplain Forest* in the *Wambo Coal Biodiversity Management Plan* (WCPL, 2018a).

Nelson (2015) noted that the agricultural land contains:

- Native Pastures: these dominate the lower quality soils. They are generally of lower quality than introduced species but do have good drought resilience and enable grazing in dry times.
- Naturalised Pasture Species: includes pasture species that are not native to Australia but invade without sowing. These are generally pastures that are well adapted to the area and spread naturally in grazed paddocks. Many of these species are useful pastures.
- Introduced Species (Grasses and Herbs): introduced (sown) pastures include kikuyu, white clover, lucerne and ryegrass. Exotic species such as kikuyu have been introduced along gullies, drainage lines and wherever higher quality soils occur.

3.3 Land Use and Capability

The property is dissected by South Wambo Creek as shown in **Figure 2**. Adjoining the creek are flood plains which have traditionally been cultivated for lucerne hay production and fodder growth for livestock enterprises, which have included dairying and more recently beef production.

Land capability has been mapped by the OEH and is publicly available on the eSpade data portal (OEH, 2017). Land and Soil Capability (LSC) has been mapped as LSC Class 4 and 5, which is defined as land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, grazing, some horticulture, forestry, nature conservation). Specifically, LSC Class 4 is defined as moderate capability land with moderate to high limitations for high-impact land uses. Land management options are restricted for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology. LSC Class 5 is defined as moderately low capability land with high limitations for high-impact land uses. Land use is largely restricted to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.

Nelson (2015) noted that the carrying capacity of the property is strongly related to the pasture base. The property supports different pasture types on the various soil types/land capabilities on the property. The dominant pasture on the lower quality soils are native and naturalised grasses. A diversity of species occur in these pastures including a mix of native and improved pasture species. This is common in grazed pastures in the Hunter Valley.

Additional exotic species such as kikuyu have been introduced along gullies, drainage lines and wherever higher quality soils occur. Kikuyu is a well-adapted warm season species to the area and provides higher quality feed over a longer growing season than most of the native summer growing species. Paspalum is another exotic species that has become dominant in some of the pasture areas. Kikuyu and paspalum have the capacity to maintain higher stocking rates than many of the native pasture species.

The cleared areas of Kharlibe are suited to cattle grazing, whilst a number of paddocks to the west of South Wambo Creek are suited to occasional cultivation for the sowing of forage crops or improved pastures such as lucerne. Lucerne has previously been sown to increase cattle carrying capacity in these areas. These paddocks can also be utilised for irrigation, noting that flood irrigation would not be achievable.

4 Purpose and Objectives

The purpose of this Subsidence Remediation Plan is to outline the measures to effectively identify and remediate subsidence-related and indirect subsidence-related impacts, and non-subsidence impacts (e.g. ineffective subsidence remediation, water management measures etc.). Remedial works will be undertaken in a timely manner, allowing the ongoing use of the property as a farming enterprise, including associated activities such as horse riding and motorbike use.

The objectives of this Subsidence Remediation Plan are to:

- Identify subsidence-related and indirect subsidence-related impacts.
- Identify non-subsidence impacts (e.g. ineffective subsidence remediation, water management measures etc.).

- Describe proposed remediation measures for subsidence-related, indirect subsidence-related and non-subsidence impacts, as relevant.
- Describe the measures for monitoring the effectiveness of remediation works.
- Allow for identification and management of any future subsidence impacts.
- Fulfil the requirements of a Subsidence Remediation Plan in accordance with the Section 240 Notice from the Resources Regulator.

5 Subsidence Remediation Plan Development

In accordance with the requirements of the Section 240 Notice, the following has been undertaken during development of this Subsidence Remediation Plan:

- The project team from SLR (Adam Williams, Duncan Barnes and Murray Fraser) and SCT (Ken Mills) was accepted by the landowners. The team was subsequently approved by the Resources Regulator as suitably qualified experts to prepare this Subsidence Remediation Plan prior to 30 March 2018.
- A scope of works was prepared in consultation with the Resources Regulator and the landholder in May 2018. Following feedback from stakeholders, the scope of works was approved by the Resources Regulator prior to 25 May 2018.
- A project commencement meeting was held at Wambo Coal Mine on 6 June 2018. This meeting was attended by WCPL representatives (Albert Scheepers, Peter Jaeger and James Benson), the landowners, SCT (Ken Mills), SLR (Adam Williams and Duncan Barnes) and the Resources Regulator (Monique Meyer and Neil McElhinney). This meeting was undertaken to discuss the project including: the timeline; stakeholder expectations; previous studies, reports and investigations; rehabilitation objectives and completion criteria; and safety during fieldwork.
- A site walk-over was undertaken on 13, 14, 20 and 21 June 2018. The project team from SLR (Adam Williams, Duncan Barnes and Murray Fraser) and SCT (Ken Mills) were accompanied by Ron and Janet Fenwick during the survey.
- A risk assessment was held on 4 July 2018 (refer **Section 9**). The risk assessment was attended by WCPL representatives (Peter Jaeger and James Benson), the landowners, SCT (Ken Mills) and SLR (Adam Williams and Duncan Barnes).
- WCPL sent a letter to the Resources Regulator on 5 July 2018 seeking an extension of time to prepare the Subsidence Remediation Plan. An extension to 31 August 2018 was granted by the Resources Regulator on 25 July. Subsequently, a varied Section 240 Notice was also issued on 25 July 2018.
- The draft Subsidence Remediation Plan was provided to the landowner on 13 August 2018 for review. A meeting was subsequently held with the landowner, WCPL, SCT and SLR on 24 August 2018 to discuss landowner comments.
- The draft Subsidence Remediation Plan was provided to the Resources Regulator for review on 21 August 2018.
- A meeting was held with the Resources Regulator on 27 August 2018 to discuss comments regarding the draft Subsidence Remediation Plan.
- A revised draft Subsidence Remediation Plan (incorporating feedback from the landowner and the Resources Regulator) was resubmitted to the landowner and the Resources Regulator on 31 August 2018.

Evidence of consultation associated with these key steps has been provided as **Appendix A.**

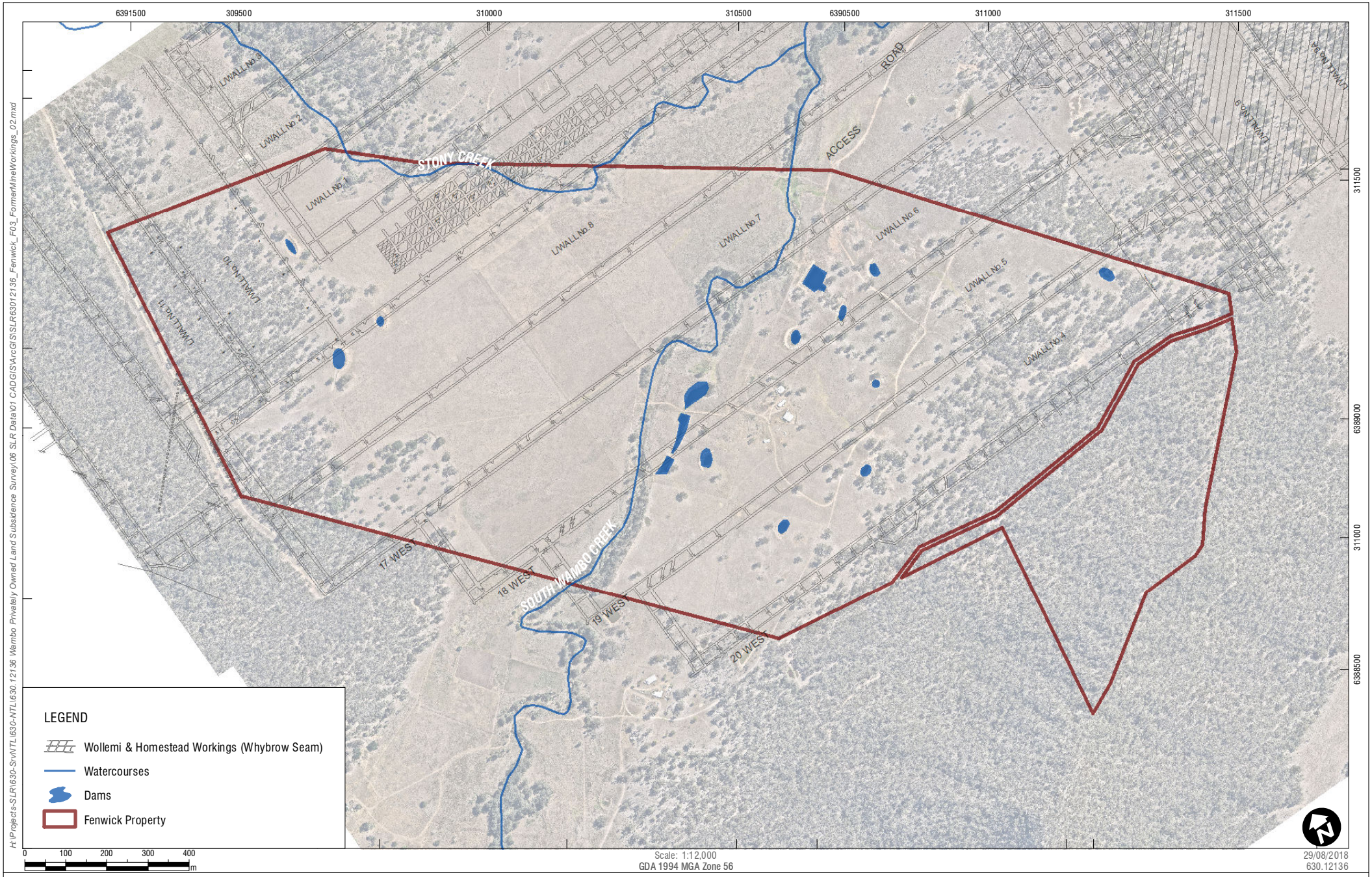
6 Site History and Mining

Mining beneath Kharlibe was conducted between 1991 and 2001, with the extraction of the former Homestead and Wollemi Mines. The Homestead Mine extracted the 14 West pillar extraction panel and Longwalls 1 – 9A, and the Wollemi Mine extracted Longwalls 10A – 13. Longwalls 1, 2, 4 – 8, 10A and 11, and an area of bord and pillar workings (14 West) were located beneath Kharlibe (refer **Figure 3**).

The Homestead Mine extracted coal resources from the Wybrow Seam within the Jerrys Plains Subgroup of the Wittingham Coal Measures. The Jerrys Plains Subgroup is up to 800 m thick and generally consists of relatively coarse clastic sediments. The sedimentary rock layers above and between coal seams are typically lithic sandstone, siltstone and conglomerate, while minor carbonaceous claystone and tuff occurs throughout the sequence (WCPL, 2018b).

The Whybrow Coal seam varies in thickness from 2.4 m to 4.2 m and dips gently to the south-west at approximately 2° to 3°, with minor local variations due to varying thicknesses of inter-seam sediments and fault zones. Faulting usually trends north or north-east to south-west with normal throws of up to 10 m, and some low angle thrusts (i.e. reverse faults) of variable throw (WCPL, 2018b).

The former Homestead and Wollemi Mines extracted coal from the Whybrow Seam at depths ranging from 150 m to 240 m. The panel void widths ranged from 205 m to 210 m and resulted in 'critical' to 'supercritical' panel geometries, with panel width to cover depth ratios of 0.8 to 2.0 (DgS, 2011).



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Former Mine Workings

FIGURE 3

7 Subsidence Effects during Mining

Holt and Clark (1995) indicate that no conventional survey pegs were installed on private property during the period of subsidence development above Longwalls 4 to 8 (circa 1993 to 1998). Instead, the technique required the placement of 700 mm square, white-painted rubber conveyor belt mats that used to provide ground control marks prior to each remote survey. Survey accuracy was found to be range between 20 mm to 40 mm typically. Subsidence was assessed to have ceased within two years after mining was completed.

Subsidence lines were monitored during mining of Longwalls 2 and 3 and Longwalls 10A and 11 adjacent to Kharlibe (refer **Figure 4**).

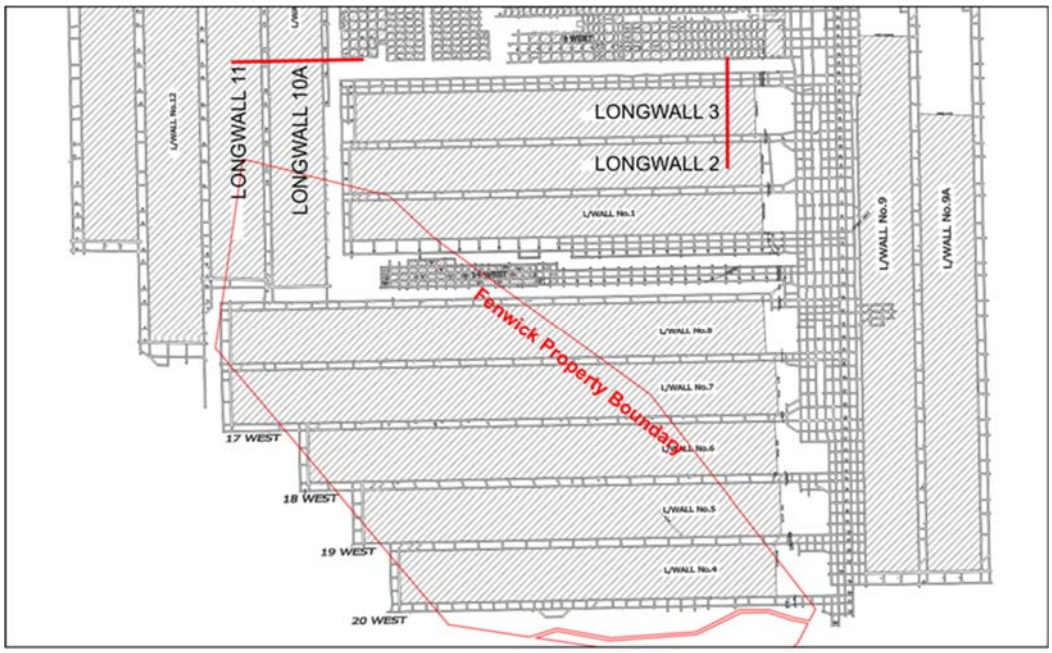


Figure 4 Location of Subsidence Monitoring Lines (SCT, 2018)

SCT (2018) noted that the subsidence behaviour observed on these lines is expected to be similar to and comparable with the subsidence behaviour that occurred on Kharlibe. A summary is provided below, with further detail provided in **Appendix B**.

7.1 Longwalls 2 and 3 Subsidence Profile

Subsidence that was measured above Longwalls 2 and 3 is referred to as supercritical width subsidence where the panels are wide relative to overburden depth. SCT (2018) notes that this behaviour is representative of subsidence behaviour at overburden depths less than about 120 m.

It should be noted that the cover depth over the eastern part of Kharlibe ranges from 150 m to 180 m. There are no conventional subsidence lines located over Kharlibe at the request of the landowners, so the approach taken has been to refer to subsidence lines outside the property boundary and infer the subsidence over Kharlibe.

The overburden depth along the Longwalls 2 and 3 subsidence line ranges from 95 m - 100 m. Longwall 2 is 172 m wide. Longwall 3 is 189 m wide. The subsidence profile has characteristics that are typical of panels that are wide relative to the overburden depth (known as supercritical in subsidence engineering terms).

There is a section in the middle of the panel where maximum subsidence has been reached at approximately 1.2 m. The seam thickness mined is inferred to have been approximately 2.2 m based on general experience in this area of the Hunter Valley of maximum subsidence reaching 55% of seam thickness mined (SCT 2018).

Subsidence over the 20 m wide chain pillars is less than 50 mm in this profile. The ground surface experiences significant stretching (tensile strains) where the profile transitions from the low subsidence that occurs over the chain pillars. In this profile, at an overburden depth of approximately 100 m, the zone of maximum stretching occurs at approximately 10 m – 30 m from the edge of each panel so that cracking is likely in this area.

7.2 Longwall 10A and 11 Subsidence Profile

Subsidence measured above Longwalls 10A and 11 illustrates subsidence behaviour for panels approaching critical width where the panel width is similar in magnitude to the overburden depth. This behaviour is representative of subsidence behaviour at overburden depths greater than about 150 m.

It should be noted that the cover depth over the western part of Kharlibe ranges from 180 m to 230 m. However as noted in **Section 7.1**, subsidence lines are outside the boundary of Kharlibe to the north where the overburden depth is less than about 150 m. There are no conventional subsidence lines located over Kharlibe at the request of the landowners, so the approach taken has been to refer to subsidence lines outside the property boundary and infer the subsidence over Kharlibe.

The overburden depth along the Longwall 10A and 11 subsidence line ranges from 140 m in the east and over most of Longwall 10 to 160 m over Longwall 11. Both Longwall 10A and Longwall 11 are 210 m wide. The chain pillar is 20 m wide. The subsidence profile has characteristics that are typical of panels that are of similar width to the overburden depth (known as critical width panels in subsidence engineering terms).

There is a section in the middle of the panel where maximum subsidence approaches 1.5 m. This maximum subsidence is 55% of the 2.7 m nominal mining height (DgS 2011), which is consistent with general experience in this area of the Hunter Valley (SCT 2018).

Subsidence over the 20 m wide chain pillars is approximately 470 mm in this profile. SCT (2018) notes that at an overburden depth of 150 m, elastic strata compression subsidence is expected to be approximately 200 mm (150 mm - 250 mm), so 470 mm of subsidence observed implies the rock column above the chain pillar has softened as a result of the overburden load concentrated onto it by the adjacent longwall extraction. In this profile, at an overburden depth of 150 m, the zone of maximum stretching occurs in the range 10 m – 30 m from the edge of each panel. This zone is where surface cracking is likely to be most evident (SCT, 2018).

7.3 Previous Studies

DgS (2011) noted that approximately 90 to 95% of the subsidence generally occurs in the first 6 to 8 weeks after a point is undermined by a longwall face and is known as 'primary' subsidence. After primary subsidence is completed, the remaining 5% to 10% of subsidence is due to the on-going compression and re-compaction of the goaf. It was noted that the development of the potholes are considered to be a time dependant process, and the result of dispersive clay soils below the surface gradually being eroded into open subsidence cracks. This process occurs over several years (6 years in clayey sand and 8 years in sandy clay), and depends primarily upon the crack width, soil type and depth and rainfall (DgS, 2011).

DgS (2011) noted that at Kharlibe, this process may have been stalled by drought, and that heavy rains during 2010 and 2011 may have re-started the process, with the sub-surface cavities finally reaching critical width in 2010 before collapsing up to the surface. DgS (2011) also noted that the de-watering of the Homestead and Wollemi Workings that occurred in 2007 may have resulted in the recent additional subsidence at the surface, which re-opened existing near surface cracks and re-activated the subsurface erosion process.

8 Subsidence Impact Field Assessment

A site inspection of Kharlibe was undertaken on 13, 14, 20 and 21 June 2018. The site inspection was attended by SLR (Adam Williams, Duncan Barnes and Murray Fraser), SCT (Ken Mills) and the landowners. The inspection was undertaken to determine direct subsidence-related impacts, indirect subsidence-related impacts and non-subsidence impacts.

For the purposes of this Subsidence Remediation Plan, the following definitions have been applied:

- Subsidence effects: are the deformation of the ground mass caused by mining, including all mining-induced ground movements such as vertical and horizontal displacements and curvature as measured by tilts and strains.
- Direct subsidence impacts: are likely to be caused by the differential lowering and bending of the surface and the development of surface and subsurface cracking. These impacts are principally tensile and shear cracking of the rock mass and localised buckling of strata caused by valley closure and upsidence but also include subsidence depressions or troughs.
- Indirect subsidence-related impacts: are an environmental consequence of the subsidence impact such as groundwater table lowering, on-going erosional/depositional adjustment of watercourses and landscape, piping or pothole development in dispersive soils above unremediated or previously repaired subsidence cracks, ponding and vegetation dieback.
- Non-subsidence impacts which have impacted the property (i.e. soil shrink swell cracking, shallow depressions from rotting tree stump collapse, animal burrows, settlement of exploration drilling sumps, ineffective subsidence remediation works, mining-related surface infrastructure, land management practices, earthworks along water courses above and below dams and/or access tracks for vehicles etc.).

Definitions for subsidence effects, direct and indirect subsidence impacts have been applied as per the 2008 publication by the former NSW Department of Planning titled *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield: Strategic Review*.

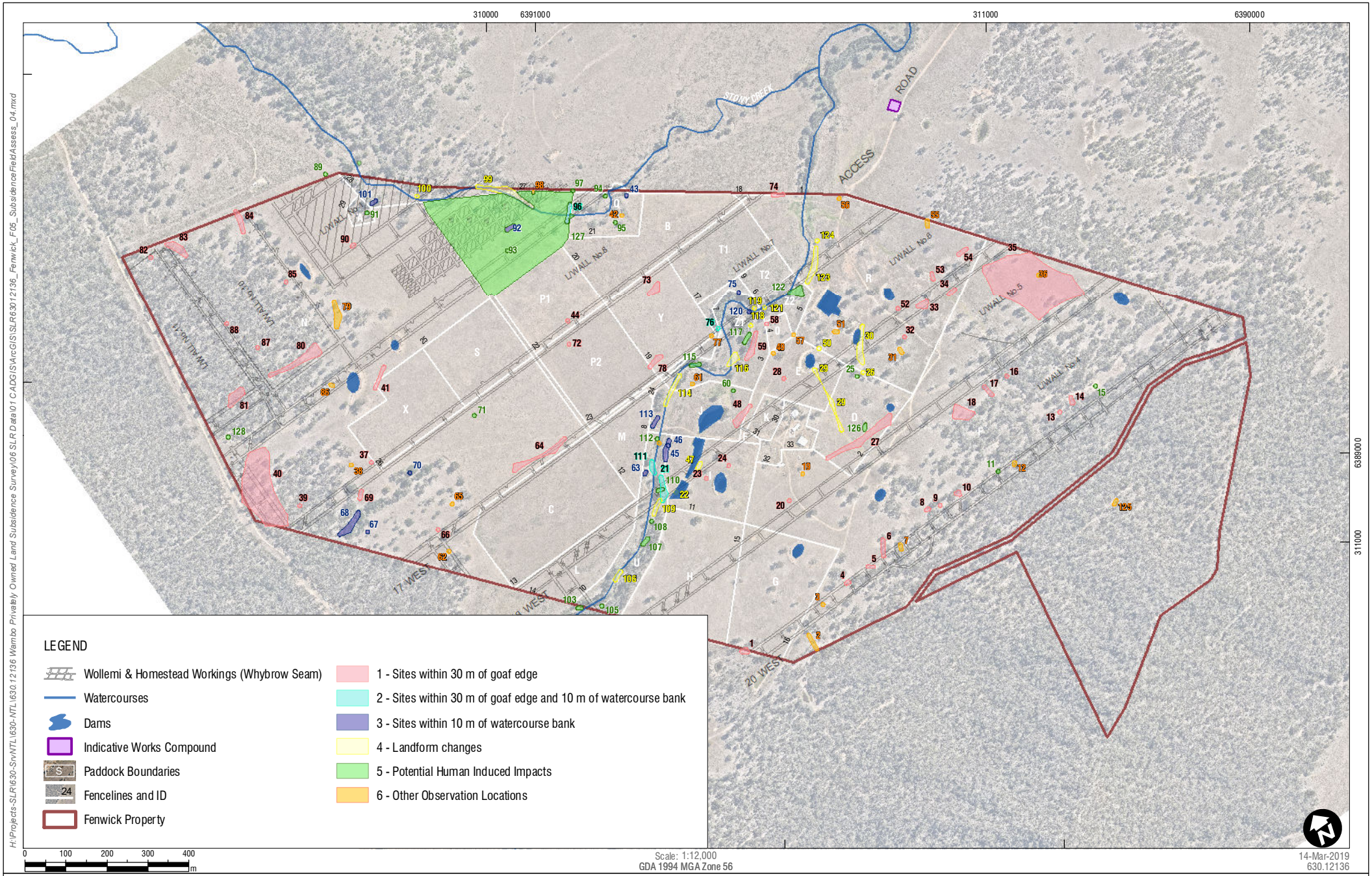
During the survey the following aspects were addressed:

- Recording of subsidence type and features, including width, length and depth of cracking.
- Recording the dimensions of indirect subsidence-related impacts.
- Photographs and GPS recording of direct and indirect subsidence impacts. This process allowed comparisons between work undertaken pre and post 2010 as well as any landform induced changes from historical subsidence remediation works.
- Recording of any observed indirect subsidence impacts such as ponding (including associated vegetation dieback) and changes in landform.

- Record non-mine related features.
- Defining and classifying subsidence and mine related impacts compared to non-mine related (agricultural and natural) occurring features.

Following the field assessment, recorded sites were categorised into six groups to assist with risk assessment, management and prioritisation of works. The categories are listed below and illustrated on **Figure 5**:

- 1 - Sites within 30 m of goaf edge. These sites are located within areas susceptible to surface impacts from subsidence and are potentially mining induced.
- 2 - Sites within 30 m of goaf edge and 10 m of watercourse bank. These sites are located within areas susceptible to surface impacts from subsidence and are potentially mining induced. However, based upon observations during fieldwork these sites may also be prone to natural processes (e.g. animal burrowing, erosion, subsurface water flows).
- 3 - Sites within 10 m of watercourse bank. These sites are not located in areas prone to surface subsidence effects and based upon observations during fieldwork may be attributable to natural processes (e.g. animal burrowing, erosion, subsurface water flows).
- 4 - Landform changes. These sites are potentially associated with subsidence related changes to overland flows (e.g. varied flow paths, changes to flow velocity, ponding) and are potentially mining induced.
- 5 - Potential Human Induced Impacts. These sites capture non-subsidence impacts (e.g. ineffective subsidence remediation, water management measures etc.).
- 6 - Other Observation Locations. Sites associated with this category are not located within areas susceptible to mining impacts and are likely due to other causes such as land management practices, animal activity, or tree stump decomposition.



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Note: Although not all of Site 35 is located within 30m of the goaf edge this area has been classed as a single site and is discussed within the SRP report

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Subsidence Field Assessment

FIGURE 5

9 Risk Assessment of Subsidence Impacts

9.1 Risk Rankings

A specific project risk assessment was undertaken on 4 July 2018 to assess potential risks associated with the sites identified during the field inspection. Risks posed by the subsidence impacts at the site included risks to personal safety (through pedestrian or vehicle movements), livestock injury, equipment damage, property damage/loss of land and environmental impacts.

The risk assessment was undertaken in accordance with the *Australian Standard AS/NZS ISO 31000:2009 Risk Management – Principles and Guidelines.* Impacts were assessed using the SLR risk matrix with sites risk ranked according to the consequence (ranked from 1 - highest to 5 - lowest), and likelihood (A highest to E lowest). Risks were ranked as either low, moderate, high or extreme to assist with prioritising remedial works. The aspects assessed during the risk workshop include:

- Sites within 30 m of goaf edge that are clearly related to subsidence.
- Sites within 30 m of goaf edge that may be related to subsidence.
- Landform changes.
- Sites within 10 m of watercourse bank.
- Sites beyond 30 m of goaf edge or 10 m of watercourse bank.
- Human induced impacts (e.g. man-made structures, ineffective subsidence remediation etc.).
- Sites where historical impacts were observed and rehabilitated.
- Land use.
- Approvals.

These aspects incorporate all site categories identified following the field assessment, but also addressed potential risks associated with historical sites, land use and approvals.

The risk assessment and SLR risk matrix have been provided as **Appendix C**.

9.2 Outcomes of Risk Assessment

In the initial risk assessment a total of 16 subsidence categories were risk-assessed, with four high risks, four moderate risks and eight low risks identified. No extreme risks were identified. The four high risks included:

- Sites within 30 m of goaf edge that are clearly related to subsidence with a potential risk to personal safety through pedestrian or vehicle movements.
- Landform changes with a potential risk to property damage/loss of land, resulting from changes to drainage paths and associated erosion.
- Landform changes with a potential risk of environmental impacts resulting in erosion.
- Human induced impacts (e.g. man-made structures, ineffective subsidence remediation etc.) from rock structures within South Wambo Creek resulting in environmental impacts.

A number of controls and additional actions were proposed, including:

- Developing this Subsidence Remediation Plan;
- Installation of temporary fencing;
- Implementation of subsidence remediation program;
- Undertaking a test-pit program to identify cause of impacts;
- Supervision of remediation works; and
- Incorporating records of previous remedial works into monitoring program.

Following the risk assessment, sites within each category were then individually ranked. This was undertaken to reflect the varying risk levels of sites within each defined category and to assist with prioritising remedial works. Of the 126 sites assessed, 20 were ranked as high risk, 25 were ranked as moderate risk, and 81 were ranked as low risk.

The results of this process are included within the live subsidence inspection action Microsoft Excel spreadsheet, provided with this Subsidence Remediation Plan. Additional detail regarding this spreadsheet has been provided in **Section 14**.

10 Subsidence Impact Remediation

10.1 Rehabilitation Objectives and Completion Criteria

The subsidence rehabilitation objectives for the property are listed in **Table 1**.

Table 1 Rehabilitation Objectives and Completion Criteria

Objective	Performance Indicator	Completion Criteria	Justification
1. Final landforms are safe, stable and suitable for the final land use.	1.1 Exclusion from subsidence impact sites and remedial works	Temporary fencing is established around newly identified subsidence related cracking >5 cm wide or potholes/slumping >0.2 m wide and >0.2 m in depth within one week of a site investigation.	Risk assessment
		Temporary fencing is established following remedial works as outlined in Section 10.3.1.1. This will be confirmed during supervision works using photographs and field sheets (refer Appendix D).	Exclusion of cattle and vehicle access from remediated sites to allow establishment of vegetation cover
	1.2 Landform is suitably prepared to remediate the identified impact type	'Clearly subsidence related sites' are remediated within 8 months of their identification or as outlined in Section 11. Remedial works are in accordance with the strategy in Section 10.3.1.2. This will be recorded using photographs and field sheets (refer Appendix D).	Risk assessment, CCL 743

Objective	Performance Indicator	Completion Criteria	Justification
		Sites classified as being 'changes to landform', 'human induced impacts' or 'other observed locations' are remediated as outlined in Section 11. Remedial works are in accordance with the strategy in Section 10.3.1.2. This will be recorded using photographs and field sheets (refer Appendix D).	Risk assessment
	1.3 Origin of recently formed cracks confirmed	Cracks of recent origin and expected to be related to shrink/swell clays are monitored until a minimum of 75 mm of rainfall within a five day period. This rainfall will be confirmed using the WCPL weather station. Following this rainfall and during the next scheduled monitoring event, the presence or absence of cracks within the rehydrated soil will be recorded using rainfall data from the WCPL weather station, photographs and field sheets (refer Appendix D). If cracks remain the sites will be managed as per subsidence related sites.	Blencowe, J.P.B., Moore S.D., Young G.J., Shearer R.C., Hagerstrom R., Conley W.M. and Potter J.S. 1960. U.S. Soil Department of Agriculture Bulletin 462. 1960
2. The growth medium is capable of supporting and maintaining the desired final land use.	2.1 Growth medium is suitable for rehabilitation or ameliorated as required	Imported topsoil is tested (pH, particle size analysis, EC and exchangeable sodium percentage) and results obtained prior to the material being transported to the works compound.	To ensure the properties of the growth medium are known and that it is suitable for rehabilitation, prior to it being transported to site
		Ameliorants (such as gypsum, lime, DAP) that are certified and non-contaminated are applied at the recommended rates as per Table 2. This is confirmed by soil testing results and recorded during work supervision using field sheets (refer Appendix D).	To ensure the growth medium is suitable for rehabilitation
		Topsoil is spread uniformly at the depth specified in Section 10.3. This is recorded during work supervision using field sheets (refer Appendix D) and photographs.	Wambo Coal Mining Operations Plan 2018 - 2020
	2.2 Rehabilitation sites are seeded using a suitable species mix for the desired land use.	A suitable species mix is applied to rehabilitated sites as specified in Section 10.3. Confirmed during supervision of works using field sheets (refer Appendix D) and photographs (to confirm suitable land use for species mix).	To ensure rehabilitation sites are seeded using a suitable species mix for the desired land use

Objective	Performance Indicator	Completion Criteria	Justification
3. Land affected by subsidence will be stable and will not present a greater safety or environmental hazard than surrounding land (within 200 m and not impacted by subsidence) or present a risk to future final land use options.	3.1 Absence of subsidence cracking/potholes	No visual subsidence surface cracks or potholes remaining (attributable to former mining operations) that present a risk to the environment, safety, or the final land use objectives. Determined during biannual monitoring using photographs and field sheets (refer Appendix D). Sites will be remediated within 8 months of their identification or as outlined in Section 11.	Risk assessment, CCL 743
	3.2 Erosion control	No rill, tunnel or gully erosion of >100 mm evident at the location of areas of subsidence remediation or identified impact sites. This will be achieved within 12 months of the commencement of remediation works or remediation of new sites. Determined during biannual monitoring with photographs, measurement and field sheets (refer Appendix D).	Criteria from the Wambo Coal Mining Operations Plan 2018 - 2020 have been refined to more appropriately address proposed remedial works and rehabilitation success.
	3.3 Landform	Remedial works required as a result of subsidence induced landform changes are completed within 9 months of the commencement of remediation works. Remedial works are in accordance with the strategy in Section 10.3.1.2. Determined during biannual monitoring with photographs and field sheets (refer Appendix D).	CCL 743
4. Identified indirect subsidence-related and non-subsidence impacts (e.g. ineffective subsidence remediation, water management measures etc.) are remediated and do not present a risk to the environment or final land use.	4.1 Infrastructure removed	Survey marks have been removed within 9 months of the commencement of remedial works or within 6 months of identifying new sites. The removal of survey marks will be confirmed using photographic evidence and suitable field sheets.	Wambo Coal Mining Operations Plan 2018 - 2020, CCL 743
	4.2 Built features*	All existing fence lines or any reinstated fence lines following remedial works are suitable for final land use (e.g. fence strained, posts are upright etc.) within 9 months of commencement of remedial works. Confirmed during one biannual monitoring inspection using photographic evidence and suitable field sheets.	Wambo Coal Mining Operations Plan 2018 - 2020, CCL 743

Objective	Performance Indicator	Completion Criteria	Justification
		Other built features and improvements on the property (buildings, sheds, etc.) are free of subsidence impacts. To be confirmed within 9 months of commencement of remedial works using survey reports, photographic evidence and suitable field/sign off sheets.	Notice under Section 240 (1)(b) and (c) of the Mining Act, Scope of Works approved by the Resources Regulator
	4.3 Landform	Previous landform issues resulting from rehabilitation works such as corrugation and slumping have been suitably addressed, are free draining and rehabilitated within 9 months of the commencement of remediation works. Landform remediation works will be assessed using photographic evidence and suitable field sheets.	CCL 743, Notice under Section 240 (1)(b) and (c) of the Mining Act, Scope of Works approved by the Resources Regulator
5. All dams and watercourses subject to subsidence impacts shall be hydraulically stable.	5.1 Creek stability	Stony Creek is functional and stable within 12 months of the commencement of remediation works, with an Ephemeral Stream Assessment rating score of >70.	Wambo Coal Mining Operations Plan 2018 - 2020, CCL 743, Ephemeral Stream Assessment (CSIRO)
		Remediated creek banks are to be no steeper than 3(H):1(V) as determined using suitably accurate slope measurement equipment, suitably scarified (>100 mm depth) and seeded with an approved riparian seed mix. Creek bank remediation works will be assessed using photographic evidence, detailed measurements and suitable field sheets.	The Blue Book (Landcom, 2004)
	5.2 Water Management	Dams constructed pre-mining hold water and any mining induced changes to overflow points do not result in downslope erosion issues. If overflow points need to be corrected to prevent erosion, this will be confirmed using photographic evidence and field sheets (refer Appendix D). The adequacy of re-established overflow points will be confirmed using survey data.	CCL 743, Notice under Section 240 (1)(b) and (c) of the Mining Act, Scope of Works approved by the Resources Regulator
6. The property is able to be used as a farming operation	6.1 Improved Pasture Species	In remediation areas, at least 75% of species surveyed are representative of pasture species from the landowner approved pasture mix sown into each remediation area. To be completed within 12 months from the commencement of remediation works. Remediated sites are to be inspected and confirmed using a field sheet (refer Appendix D) and photographic evidence.	Criteria developed to effectively monitor rehabilitation success for many small scale sites across a farming property. Traditional monitoring transects used for mining rehabilitation are not considered suitable given number and scale of sites.

Objective	Performance Indicator	Completion Criteria	Justification
		In remediated areas soil nutrient parameters are at least equal to surrounding non-rehabilitated areas. To be completed within 12 months from the commencement of remediation works. Remediated sites are to be soil tested for pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur with results presented in a letter report.	Comparison to surrounding non-rehabilitated areas
		Rehabilitation monitoring verifies weed presence at subsidence remediation sites is less than analogue sites within the same paddock and does not present a risk to rehabilitation.	Comparison to analogue sites
	6.2 Derived Native Pastures	In remediation areas, at least 75% of species surveyed are representative of native grass species from the native grass mix sown. To be completed within 18 months from the commencement of remediation works. Remediated sites are to be inspected and confirmed as suitable using a field sheet (refer Appendix D) and photographic evidence.	Criteria developed to effectively monitor rehabilitation success for many small scale sites across a farming property. Traditional monitoring transects used for mining rehabilitation are not considered suitable given number and scale of sites.
		In remediated areas, soil nutrient parameters are at least equal to surrounding non-rehabilitated areas. To be completed within 12 months from the commencement of remediation works. Remediated sites are to be soil tested for pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur with results presented in a letter report.	Comparison to surrounding non-rehabilitated areas
		Rehabilitation monitoring verifies weed presence at subsidence remediation sites is less than analogue sites within the same paddock and does not present a risk to rehabilitation.	Comparison to analogue sites

Objective	Performance Indicator	Completion Criteria	Justification
	6.3 Native Woodland	In remediation areas, at least 75% of species surveyed are representative of woodland species from the native woodland mix sown. To be completed within 24 months from the commencement of remediation works. Remediated sites are to be inspected and confirmed as suitable using a field sheet (refer Appendix D) and photographic evidence.	Criteria developed to effectively monitor rehabilitation success for many small scale sites across a farming property. Traditional monitoring transects used for mining rehabilitation are not considered suitable given number and scale of sites.
		In remediated areas, soil nutrient parameters are at least equal to surrounding non-rehabilitated areas. To be completed within 12 months from the commencement of remediation works. Remediated sites are to be soil tested for pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur with results presented in a letter report.	Comparison to surrounding non-rehabilitated areas
		Rehabilitation monitoring verifies weed presence at subsidence remediation sites is less than analogue sites within the same paddock and does not present a risk to rehabilitation.	Comparison to analogue sites
	6.4 Agricultural Suitability	All paddocks are usable as a cattle grazing pasture. To be completed within 18 months from the commencement of remediation works. Remediated sites are to be inspected and confirmed as suitable using a field sheet (refer Appendix D) and photographic evidence.	To achieve the landowners requested final land use
		Areas of suitable soil type can be cultivated and used for forage cropping or sowing improved pasture. To be completed within 18 months from the commencement of remediation works. Remediated sites are to be inspected and confirmed as suitable using a field sheet (refer Appendix D) and photographic evidence.	To achieve the landowners requested final land use
		Land surface on areas of suitable soil type is suitable for use of irrigation equipment. To be completed within 12 months from the commencement of remediation works. Remediated sites are to be inspected and confirmed as suitable using a field sheet (refer Appendix D) and photographic evidence.	Landowner agreement

Objective	Performance Indicator	Completion Criteria	Justification
		The carrying capacity of the property is not limited by visible subsidence impacts. To be completed within 12 months from the commencement of remediation works. Remediated sites are to be inspected and confirmed as suitable using a field sheet (refer Appendix D) and photographic evidence.	Risk assessment

Notes:

- *The review of subsidence monitoring data available for the site indicates that subsidence movements are complete and have been complete since soon after mining finished in 2001. Built features are not expected to experience any additional ground movements caused by mining subsidence beyond those experienced during the period of active mining (SCT 2018).
- The completion criteria provided in Table 1 are based upon available information at the time of report preparation. The criteria will continue to be refined following the Independent Review and during implementation of works under this Subsidence Remediation Plan in consultation with the Resources Regulator and landowner.
- Reference to 'remediation' within a specific timeframe captures the completion of activities outlined in Section 10.3 (e.g. backfilling, scarifying, topsoil application, amelioration and seeding), this does not infer the successful establishment of vegetation.

10.2 Overview of Previous Rehabilitation Works

A remediation notice for the extents of South Wambo Creek within Kharlibe was issued by the former Department of Infrastructure, Planning and Natural Resources (DIPNR) in 2004. Following discussions between DIPNR, WCPL and the landowner, WCPL were issued with a further remedial notice for the extent of Stony Creek within Kharlibe in June 2005. A Part 3A permit under the now repealed *Rivers and Foreshores Improvement Act 1948* was also issued for removal of a levee along Stony Creek. The earthworks under the remedial notice and Part 3A permit were undertaken in August 2005.

DgS (2011) noted that the subsidence cracks that occurred in the late 1990s were repaired by contractors on several occasions between 2000 and 2004. A D5 with a ripper or excavator was used to rip and cut down to the base of the cracks or bedrock (whichever occurred first) to depths of between 1 m and 5 m. The exposed cracks (and trenches) were then in-filled with spoil and track rolled back to the surface.

DgS was commissioned in 2011 to locate and measure potholes above Longwalls 4 – 8 and to determine the appropriate course of action to effectively repair the current (and possibly future holes) and minimise the possibility of reoccurrence. It was recommended that a woven geotextile be placed over an open crack exposed with a backhoe before backfilling with site soils. These sites were remediated in 2012, however the landholder noted that works were not completed in accordance with the recommended methodology due to inconsistent contractor supervision during works.

Mine Subsidence Engineering Consultants Pty Ltd (MSEC) were engaged by WCPL to assist with identification of ground surface impacts in March 2013. These sites were located above Longwalls 4 – 6 and on the southern side of South Wambo Creek. MSEC inspected the site and identified a range of impact sites within the property that were generally located close to the sides of panels, near the chain pillars where maximum hogging curvature and tensile strains occur. This inspection and associated report did not provide recommendations for remediation.

A further inspection by DgS (2014) noted that there had been recurrences of potholes at a number of these sites above Longwalls 4 – 8 and additional sites had been identified. DgS concluded that the effectiveness of the geofabric solution was affected by the sodic soils at the property. Further remediation measures recommended included deep ripping with gypsum application above subsidence crack affected areas, prior to re-seeding and limiting access during rehabilitation. It was also recommended that a Soil Improvement Management Plan between the stakeholders and WCPL include a procedure-based approach to maximise the effectiveness of the treatment. Placement of 'loamy Sand' fill was recommended for short-term repairs to large subsidence potholes prior to broader scale gypsum treatment. These works were undertaken between 2015 and 2017, however based on discussions with the landowner it is understood these works were not adequately supervised by the field supervisor at the time.

As outlined by SCT (2018), previous remediation of the subsidence cracks involved ripping and recompacting the soil. This procedure is unlikely to be effective over the long-term for controlling the potential for sinkholes and cracks to re-emerge. The replaced soil material simply continues to migrate into the bedrock subsidence cracks, particularly following periods of rainfall, and in due course another line of sink holes would be expected to develop. The reappearance of lines of sink holes and cracks along the edge of panels sometime later is not considered surprising given the use of this approach.

10.3 Remediation Methodologies

10.3.1 Proposed Rehabilitation Methodologies

This section provides an overview of the proposed rehabilitation for identified subsidence induced impacts, minor surface depressions, indirect subsidence-related and non-subsidence impacts (e.g. ineffective subsidence remediation, water management measures etc.). Recommended rehabilitation strategies for impacts within Stoney Creek have been outlined in **Section 10.3.3**. Refer to the "Recommended Action" column in the subsidence inspection action Excel Spreadsheet for details on each identified area.

10.3.1.1 Temporary Fencing

Following identification of impact sites, a review will be undertaken to assess the potential health and safety risks. If it is determined that a site poses a risk to human or animal safety, temporary fencing will be installed around subsidence/potholing areas. Impact thresholds requiring use of temporary fencing are outlined within the TARP (refer **Section 15**). If required, temporary fencing will be installed within one week of a site investigation.

To allow a vegetation cover to establish following rehabilitation, areas will be excluded from cattle and vehicle access. This will vary depending upon the rehabilitation type:

- Temporary fencing will be retained around remediated exotic pasture sites for a minimum period of six months (e.g. autumn species will be fenced until spring, spring species will be fenced until autumn) and when monitoring indicates that a cover has been established.
- Temporary fencing will be retained around remediated native grassland sites until monitoring indicates that a cover has been established.
- Areas remediated using native woodland or riparian species will be excluded from grazing until monitoring indicates that a cover has been established. The requirement for temporary fencing around these areas will be confirmed during site works and in consultation with the landowner.

Fencing will be removed only when all relevant criteria have been satisfied. This will be confirmed during biannual monitoring and will be recorded using photographs and a field sheet (refer **Appendix D**). Following the removal of temporary fences and site sign off, monitoring of the relevant sites will cease.

10.3.1.2 Remediation Works

Clearly Subsidence Related Sites

There were a number of features identified during the site visit that are clearly related to mining subsidence and the formation of subsidence cracks. These features involve the formation of a row of cracks and minor sink holes (typically 200 mm – 300 mm in diameter and substantially filled with soil material). Most of them have been previously identified and barricaded with temporary fencing. The list of these features includes:

1. Centre of panel at start of Longwall 4 (Site 1)
2. Along southern edge of Longwall 4 (Sites 10, 12, 17)
3. Longwall 5 fenced area (Site 24)
4. Longwall 5 eastern end (Sites 27, 31)
5. Longwall 6 eastern end (Sites 53 or 54)
6. Longwall 7 eastern end (Sites 73 and 78)
7. Longwall 8 western end (significant area of cracks in bush - Sites 40)
8. Longwall 10A southern end area (cracks in bush – Site 80)
9. Longwall 10A northern end in two fenced areas (Sites 83, 84)

The mechanism that leads to these features is considered to be well understood as being effectively a piping failure as described in DgS (2011). Permanent cracks in the bedrock typically form in the zone between the goaf edge of each longwall panel and 20 m – 30 m over the panel curving around the corners of the panel. Many of these cracks may become immediately apparent at the surface. In others dispersive surface soils migrate downward gradually over time.

A cavity or line of cavities form to leave a row of small sink holes and/or an open crack. The gradual migration of dispersive soils and the delayed presentation of subsidence cracks and sinkholes at the surface gives the appearance of ongoing ground movements and this may be misleading when no such movement has occurred.

SCT recommends that these features are the priority focus of remediation activity. It is considered quite likely that further lines of sink holes and cracks could continue to develop over time. A “watch and act” approach is recommended as part of the ongoing management of these features to manage any further sink holes that might develop. Additionally, the ‘self-healing’ trench approach may be undertaken as applicable, as several treatments could be done if further potholes get past the first trench.

As outlined in **Section 10.2**, previous remediation of the subsidence cracks involved ripping and recompacting the soil. This procedure is unlikely to be effective over the long-term for controlling the potential for sinkholes and cracks to re-emerge as replaced soil material simply continues to migrate into the bedrock subsidence cracks. An effective remediation strategy to stabilise the soils has been suggested by SLR and SCT:

- Expose the bedrock crack, backfill the crack with a coarse grained material of size D_{10} greater than 20% of the crack width.
- Following crack backfilling, geofabric (minimum Bidim A44) will be applied along with a layer of clay loam or silty clay loam type soil (minimum 35% clay content and minimum 300 mm in depth). These layers are designed to minimise the potential for migration of soils into bedrock cracks.

- Suitable compacted soil/fill will be applied above the clay liner to a minimum depth of 500 mm. This will be stabilised using gypsum if required and as confirmed by soil testing.
- In farming/cropping areas suitable soil/fill will be applied above the compacted material to a minimum depth of 500 mm. This will be stabilised using gypsum if required and as confirmed by soil testing.
- Topsoil will be applied to a depth of 100 mm (if available). The requirement for amelioration (e.g. gypsum, fertilisers) will be confirmed via soil testing (pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur) prior to the material being transported to the works compound. The surface will also be suitably prepared (refer **Section 10.3.1.4**) and a suitable seed mix will be applied (refer **Section 10.3.1.6**).
- The remediated areas will be backfilled slightly higher (50 mm – 100 mm) than the surrounding surface to allow for some settlement of the material. This will avoid the potential for water ponding in the areas.
- Appropriate supervision and quality control are necessary to achieve an effective outcome. This will include testing of clay material, fill material and topsoil to confirm suitability for works and amelioration requirements.

The exposing of bedrock cracks may not be practical in some areas because of the depth to bedrock or because other surface features make such activities difficult. For example, in bushland areas where complete remediation may involve removal of trees, the potential to cause impacts appears likely to be disproportionate to the benefits. Consultation with the landowners is recommended to determine whether the benefits are considered to outweigh the impacts of doing the work. In some cases, minor works followed by soil stabilisation may give a more practical outcome without causing unnecessary disturbance to the surface.

Consultation with the landowners and the Resources Regulator is required for the remediation at the start of Longwalls 8 and 10 to determine whether the impacts of the remediation works would be disproportionately intrusive in a bushland environment compared to the current impacts.

Changes to Landform

Changes to the landform are evident across Kharlibe. In most areas, the changes have been managed, for example through re-fencing to align with the longwall panels and minor earthworks to redirect surface flows. There are some areas where the final landform has caused increases in surface gradients leading to nick-point erosion. These will be remediated by shaping works (as required to achieve a maximum grade of 3(H):1(V)), topsoil to 100 mm (if available), scarified to a depth of 100 mm, ameliorated with gypsum at a rate of 0.5 kg/m^2 and seeded with a suitable seed mix. In most areas this erosion is relatively minor in the context of other adjacent agricultural impacts unrelated to subsidence. A more significant impact, however, has been along Stony Creek where a nick-point has formed and led to degradation and redirection of the flow channel over several hundred metres. Recommended rehabilitation of Stoney Creek is outlined in **Section 10.3.3**.

The landform has also been changed for a variety of reasons, some of which are potentially related to mining induced subsidence. The redirection of surface flows has resulted in exacerbated flow velocities and erosion in some areas. It is generally recommended that these sites would be backfilled, shaped (as required to achieve a maximum grade of 3(H):1(V)), topsoil to 100 mm (if available), scarified to a depth of 100 mm, ameliorated with gypsum at a rate of 0.5kg/m^2 and seeded with a suitable seed mix. Details for these activities are provided below. If bank stabilisation works are required, further design will be required prior to the commencement of remedial works.

Human Induced Impacts

A range of works have been undertaken on the property since the late 1990's including remedial works, survey, exploration and property improvement works (i.e. dam construction). Inspection of the property identified that some of these activities require ongoing maintenance or management to achieve the desired land use.

Various rehabilitation sites across the property require ongoing maintenance to improve vegetation establishment (i.e. Sites 11, 25, 71, 89 and 93). It is recommended that these sites are ripped to a maximum of 500 mm, topsoiled to a maximum of 100 mm (if available), ameliorated (as determined by soil testing) and seeded with a suitable species mix (refer **Section 10.3.1.6**). Additional detail of these activities is outlined below.

Additionally, fieldwork identified a number of sites that have evidence of slumping (i.e. Site 126) and corrugation (i.e. Site 127) following rehabilitation. It is considered that these impacts have resulted from poor surface preparatory works during rehabilitation. SLR recommends the following management measures:

- Site 126: backfill using a suitable material, topsoil to 100 mm (if available), scarify to 100 mm, ameliorate (as confirmed by soil testing) and seed using a suitable species mix (refer **Section 10.3.1.6**).
- Site 127: rip to a maximum of 500 mm, topsoil to 50 mm (if available), ameliorate (as confirmed by soil testing) and seed the entire paddock using a suitable species mix (refer **Section 10.3.1.6**).

Site 91 is a dam located in the northeast corner of Kharlibe, adjacent to Stony Creek. It is understood to have been used by WCPL as a borrow pit post-mining in anticipation of the need for water storage. The structure is understood to be ineffective and unused. Its decommissioning would return the area to agricultural use. The Project Team is awaiting feedback from the landowners regarding the retention or decommissioning and backfilling of this dam. This will be confirmed prior to the commencement of works.

Site 62 is a backfilled drill sump excavated for exploration drilling activities at the western end of Longwall 6. The surface has settled over time leaving a minor depression in the surface. The depression is several metres across but not significantly out of context with nearby contour drains. It is recommended that this site is backfilled using a suitable material, topsoil to 100 mm (if available), scarified to 100 mm, ameliorated (as confirmed by soil testing) and seeded using a suitable species mix (refer **Section 10.3.1.6**). It is noted that the location of this site on **Figure 5** is indicative and that the site will be ground truthed prior to works at the site.

The requirement for amelioration (e.g. gypsum, fertilisers) will be confirmed via soil testing (pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur) prior to the material being transported to the works compound.

Other Observed Locations

There are numerous minor depressions evident across the site. These include:

- Small cone shaped depressions typically less than 1 m diameter and less than 200 mm deep with an apparently solid bottom.
- Depressions and holes clearly associated with rotting tree stumps (example excavated above Longwall 8 and found to be tree stump).
- Depressions and holes associated with soil disturbance (example on road edge to the south of Longwall 4 well outside the area of subsidence).
- Sunken fence posts.
- Depressions and holes that are formed within 10 m of Stony Creek and other minor tributaries consistent with animal activity and erosion of soils caused by piping failure around the creek banks.

- Collapsed wombat holes (numerous along the edges of watercourses).
- Animal scrapings / wallows (example is a depression above centre of large block of solid coal to the west of 14 West Panel is not subsidence related).
- Rotted fence post holes (boundary fence above 14 West and Longwall 8).
- Disturbance to the natural landform associated with normal farming activities (for instance cleaning out dams or piling up fallen trees and branches).

The origin of many of these depressions is not considered likely to be related to mining activity but minor excavation of a representative number would be needed to confirm this expectation. One sinkhole that had recently emerged near the start of Longwall 8 as a small round hole was excavated by hand during the field inspections and found to be the result of a decaying tree stump. The sudden and ongoing appearance of these features, particularly the sudden appearance of small holes, could be mistaken for the subsidence related phenomena described above, but the more likely cause for the majority of the sites is considered likely to be natural processes associated with tree stump decay below the surface.

The process of remediating these features would involve backfilling using a suitable material, scarifying the surface to 100 mm, ameliorating (as determined by soil testing) and seeding with a suitable species mix (refer **Section 10.3.1.6**). The requirement for amelioration (e.g. gypsum, fertilisers) will be confirmed via soil testing (pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur) prior to the material being transported to the works compound.

Cracking of Recent Origin (Shrink/Swell Cracking)

There are numerous examples of cracks that are fresh and have formed recently. These cracks are considered to be associated with subsoil shrinkage following the extended period of below average rainfall (refer **Section 3.1**). These cracks are typically too small to present a safety hazard to stock or personnel. Examples include cracks:

- Near top of minor ridge adjacent to watercourse over Longwall 4.
- Near the start of Longwall 5.
- Near the road above Longwall 5.
- A line of holes / cracks above the centre of Longwall 7.
- Multiple cracks in the Longwall 8 starting area (in bushland).

These cracks are also observed in areas remote from mine subsidence. They are expected to disappear when the soil is rehydrated following significant rainfall, in the order of over 75 mm over a five day period. This rainfall will be confirmed using the WCPL weather station.

10.3.1.3 Site Excavation Program

As outlined above, sites classified as 'Other Observed Locations' and some sites also located within 30 m of the goaf edge may have resulted from non-mining related processes (i.e. Site 35 may have a mixture of mining and non-mining induced impact sites). It will be important to confirm the source of impacts to ensure that a suitable remediation methodology is used for each site (i.e. backfilling, scarifying, ameliorating and seeding for non-mining induced surface depressions and as recommended for 'Clearly Subsidence Related Sites').

A program of minor excavations will be undertaken across a representative number of impact sites to confirm the absence/presence of mining influence. This program will be undertaken to allow further refinement of the remediation program.

Further excavations will be undertaken for any future sites as needed, to confirm future remediation requirements.

10.3.1.4 Soil Resources and Surface Preparation of Remediation Sites

Soil resources will need to be sourced for the rehabilitation works where existing soils are deemed unsuitable (due to the dispersive nature of these soils backfilled material cannot be used). Prior to sourcing soil, testing will be undertaken to assess suitability for use on the property. Testing will include pH, particle size analysis, EC and exchangeable sodium percentage.

Agricultural land will be prepared by:

- Deep ripping to maximum 500 mm (two passes, cross ripping at right angles) at sites where the size of the remediation area is appropriate for ripping. Note that follow up treatment may be required, this will be determined by monitoring program and TARP.
- Ploughing/scarifying (twice) to level after ripping and incorporate gypsum. Application rates for gypsum will be determined by soil tests.
- Harrowing (twice, to level, remove weeds and prepare seedbed).
- Sowing with seeder. Seed to be sown at correct depth for selected species. Small seed box may be required for small pasture seed.
- Fertiliser can be applied during seeding or just prior. Rate and type of fertiliser to be determined by soil test results and in consultation with the landowner.

Impact sites associated with remnant native vegetation (woodland or riparian) may be difficult to access, with equipment access potentially resulting in greater disturbance than the identified issue. In such instances, low impact remediation methods may be used or natural infilling. This will be determined in consultation with the landowner. Accessible sites adjacent to native vegetation communities and unsuitable for agricultural use will be prepared by:

- Lightly contour-ripping the surface after topsoil spreading to a maximum depth of 100 mm (if available) to create a ‘key’ between the topsoil and the subsoil. Some minor remedial works may only require scarifying the surface.
- The respread topsoil surface will be scarified across the contour prior to or during seeding to reduce runoff and increase infiltration.
- Fertiliser can be applied during seeding or just prior. Rate and type of fertiliser to be determined by soil test results and in consultation with the landowner.

10.3.1.5 Amelioration

Soil testing will be undertaken to determine the appropriate application of ameliorants where necessary. These ameliorative measures may include the use of gypsum, lime and/or fertiliser to improve the chemical and/or nutrient properties of the soil.

Table 2 provides details of application rates, subject to soil testing.

Table 2 Ameliorant Application Rates

Exchangeable Sodium (ESP)	Gypsum Rate per Ha	Gypsum Rate per m²
5 to 10%	2 to 5 tonnes	0.2 to 0.5 kilograms
Greater than 10%	5 to 10 tonnes	0.5 to 1.0 kilograms
pH (1:5 water) Unit	**Lime Rate per Ha**	**Lime Rate per m²**
If 0.1 to 0.5 below nearby non-rehabilitated area	1 to 2 tonnes	0.1 to 0.2 kilograms
Greater than 0.5 below nearby non-rehabilitated area	3 to 5 tonnes	0.3 to 0.5 kilograms
Phosphorus & Nitrogen Milligrams per Kilograms	**DAP Rate per Ha**	**DAP Rate per m²**
If 1 to 5 below non-rehabilitated area	60 to 80 kilograms	6 to 8 grams
Greater than 5 below nearby non-rehabilitated area	90 to 120 kilograms	9 to 12 grams
Sulfur mg/kg if gypsum not used at site	**Gypsum Rate per Ha**	**Gypsum Rate per m²**
If 1 to 5 below surrounding non-rehabilitated area	1 to 2 tonnes	0.1 to 0.2 kilograms
Greater than 5 below nearby non-rehabilitated area	3 to 4 tonnes	0.3 to 0.4 kilograms
Calcium:Magnesium if lime not previously used	**Lime Rate per Ha**	**Lime Rate per m²**
If 0.1 to 0.5 below nearby non-rehabilitated area	1 to 2 tonnes	0.1 to 0.2 kilograms
Great than 0.5 below nearby non-rehabilitated area	3 to 4 tonnes	0.3 to 0.4 kilograms

10.3.1.6 Seeding

Sowing is undertaken shortly after topsoil spreading to avoid loss of topsoil due to wind and rain action. The majority of the remediated sites will be revegetated with pasture using non-native species and in consultation with the landowner. A provisional list of pasture species that may be used in the revegetation of agricultural lands is provided in **Table 3**.

Table 3 Pasture Species Seed Mix

Season	Species	Application Rate (kg/ha)
Autumn Winter	Oats	15
	Cocksfoot	3
	Tall Fescue	3
	White clover	1.5
	Woolly pod vetch	4.5
	Sub clover	4
	Red clover	2
	TOTAL	**33**
Spring	Japanese Millet	10
	Lucerne	8
	White clover	1.5
	Kikuyu	3
	Premier Digit grass	3
	Red clover	2
	TOTAL	**27.5**

Revegetation within or directly adjacent (i.e. 50 m) to remnant riparian vegetation communities (refer **Section 10.3**) may include species as River Oak (*Casuarina cunninghamiana*) and Rough-barked Apple (*Angophora floribunda*). A selection of native and non-native grasses (such as those listed in **Table 4**) may also be used in the revegetation of the riparian zone.

Where remediation works are undertaken within or directly adjacent (i.e. 50 m) to remnant native woodland communities that are currently unsuitable for agriculture, a suitable woodland species mix will be used in rehabilitation. A provisional list of species for woodland areas is provided in **Table 4**.

Seeding of areas using woodland or riparian species will be confirmed by ground truthing and in consultation with the landowner.

Table 4 Woodland Species Seed Mix

Scientific Name	Common Name
Trees*	
Allocasuarina luehmanii	Bulloak
Allocasuarina verticillata	Drooping Sheoak
Angophora floribunda	Rough-barked Apple
Brachychiton populneum	Kurrajong
Casuarina glauca	Swamp Oak
Corymbia maculata	Spotted Gum
Eualyptus albens	White Box
Eualyptus crebra	Narrow-leaved Ironbark

Scientific Name	Common Name
Eucalyptus dawsonii	Slaty Gum
Eucalyptus fibrosa	Red Ironbark
Eucalyptus moluccana	Grey Box
Eucalyptus punctata	Grey Gum
Eucalyptus teretitornis	Forest Red Gum
Melaleuca decora	Honeymyrtle
Notelaea microcarpa	Native Olive
Geijera salicifolia	Brush Wilga
Shrubs*	
Acacia filicifolia	Fern-leaf Wattle
Acacia implexa	Hickory Wattle
Acacia amblygona	Fan Wattle
Acacia falcate	Sickle Wattle
Acacia decora	Western Silver Wattle
Acacia decurrens	Green Wattle
Acacia parvifolia	-
Grevillea montana	Grevillea
Hibbertia linearis	-
Cassinia quinquefaria	Cough Bush
Grasses and Herbs*	
Dianella revoluta	Blue Flax Lily
Lomandra multiflora	Many-flowered Matrush
Chloris venticosa	Tall Windmill Grass
Laxmannia gracilis	Wire Lily
Gahnia aspera	Rough Saw-sedge
Aristida vagans	Threeawn Speargrass
Austrodanthonia sp.	Wallaby Grass
Austrostipa scabra ssp. *falcata*	Speargrass
Cymbopogon refractus	Barbwire Grass

* Sowing rates for tree and shrub species, grass species will be determined prior to rehabilitation activities.

Where remediation works are undertaken within derived native grassland communities, a suitable grassland species mix will be used in rehabilitation and fenced off. This will be needed to limit impacts of selective grazing upon rehabilitation success (i.e. seeding perennial pasture species within derived natives would be selectively grazed). A provisional list of species for native grassland areas is provided in **Table 5**.

Seeding of areas using native grassland species will be confirmed by ground truthing and in consultation with the landowner.

Table 5 Native Grassland Species Seed Mix

Scientific Name	Common Name
Austrodanthonia	Bunderra Wallaby Grass
Austrodanthonia caespitosa	Ringed Wallaby Grass
Austrodanthonia richardsonii cv. Hume	Hume Wallaby Grass
Austrodanthonia richardsonii cv. Taranna	Taranna Wallaby Grass
Austrodanthonia setacea	Smallflower Wallaby Grass
Austrostipa aristiglumis or *Austrostipa bigeniculata*	Plains Grass
Austrostipa scabra	Speargrass
Austrostipa verticillata	Slender Bamboo Grass
Dichelachne micrantha	Shorthair Plumegrass
Elymus scaber	Common Wheatgrass
Lachnagrostis filiformis	Blown Grass
Aristida ramosa	Wiregrass
Bothriochloa macra/decipiens	Redgrass/Pitted Bluegrass
Chloris truncata	Windmill Grass
Chloris ventricosa	Tall Windmill Grass
Cymbopogon refractus	Barbed Wire Grass
Dichanthium sericeum	Queensland Bluegrass
Digitaria brownii	Cotton Panic Grass
Digitaria divaricatissima	Umbrella Grass
Eriochloa pseudoacrotricha	Early Spring Grass
Panicum decompositum	Native Millet
Panicum effusum	Hairy Panic

* Species selection and sowing rates will subject to availability, species on adjacent/surrounding land and consultation with the landowner.

10.3.2 Mitigation Measures

General Mitigation Measures

The following management measures will be implemented:

- During remediation works ground disturbance will be kept to the minimum area possible. Vehicles will use existing tracks where they exist and all temporary access routes, if required will be confirmed in consultation with the landowner. Any impacts associated with temporary access routes (e.g. compaction) will be remediated by WCPL following the completion of works in the area.

- A compound will be set up for the storage of equipment and materials during the remedial works. This compound will be fenced for safety. It is proposed that this compound will be situated on WCPL land, along the access road to the Kharlibe property. An indicative location for the compound has been illustrated on **Figure 5**, however other sites along the road may also be considered. Following completion of remedial works, the compound, and all equipment and materials will be removed from the site.
- To minimise risk of weed spread, all contractor vehicles will be maintained in a clean condition (e.g. no dried mud, vegetation or seeds on the exterior of vehicles) and will travel through Bulga. This will reduce the risk of transferring any weeds from adjacent land.
- All waste generated on site (e.g. wastes produced from the operation, packaging materials, general waste etc.) will be removed from the property each day.
- All works will be supervised full time by a suitably qualified person (e.g. member of the Project Team) to ensure that the works are undertaken in accordance with this Subsidence Remediation Plan. Photographic evidence and field sheets (refer Appendix D) will be used as evidence that works were correctly undertaken as required under this Plan.
- If remedial works intersect any fences, these will be reinstated following the completion of rehabilitation works (and subject to temporary fencing requirements).

Erosion and Sediment Control

Prior to subsidence remediation works, erosion and sediment controls will be established for each remediation site, as required, and in accordance with *Managing Urban Stormwater: Soils and Construction Vol. 1, 4th edition* (the Blue Book) (Landcom, 2004). This will include:

- Ensure erosion and sediment control measures are designed and constructed effectively;
- Minimise surface disturbance and restrict access to undisturbed areas;
- Progressively rehabilitate and stabilise disturbed areas;
- Maximise sediment retention onsite;
- Choose the erosion and sediment control technique to account for site conditions such as soil, weather and construction conditions;
- Construct sediment control structures, such as sediment fencing, hay bales etc. to contain runoff from disturbed areas;
- Restrict disturbance of the site from vehicles and livestock;
- Maintain all erosion and sediment control measures in proper working order at all times; and
- Monitor the site and adjust erosion and sediment control practices to maintain the required performance standard.

10.3.3 Stony Creek Rehabilitation Methodology

The proposed Stony Creek remediation works are expected to be undertaken using a staged approach to minimise the extent of the disturbance within the creek at any given time. As such, it is expected that this work can be undertaken when favourable weather is forecast (and outside of periods of stream flow) to minimise the risk to the surrounding environment.

If works within Stony Creek are required during periods of wet weather, then a suitably compacted and armoured (i.e. geofabric and rock) coffer dam with a suitably sized bypass pipe (gravity fed or pumped) shall be constructed upslope of the works (in accordance with the current best practice) to divert clean water from upstream past the disturbance areas.

Any additional disturbance areas created during remediation works will also be remediated including shaping (as required), ripping and seeding with a suitable seed mix.

SLRs Duncan Barnes assessed the Stony Creek site and provided the following rehabilitation recommendations for sites 94 to 101:

Site 94

Maintain as much vegetation on eroded batter as possible, batter back significantly eroded areas to a maximum grade of 3(H):1(V), topsoil to 100 mm (if available), scarify and seed with a suitable seed mix. The existing rocks placed at the toe of the creek batters are to remain at this location and are not to be disturbed.

Works are to be undertaken when good weather has been forecasted with adequate downstream sediment control measures installed prior to works within Stony Creek. Appropriate approvals will be obtained prior to the works (i.e. consent from the landowner, Controlled Activity Approvals etc.).

Site 95

Monitor.

Site 96

Maintain as much vegetation on eroded batter as possible, batter back significantly eroded areas to a maximum grade of 3(H):1(V), apply gypsum at an approximate rate of 1 kg/m², topsoil to 100 mm (if available), rip and seed with a suitable seed mix (possibly with tube stock at this site).

Works are to be undertaken when good weather has been forecasted with adequate downstream sediment control measures installed prior to works within Stony Creek. Appropriate approvals will be obtained prior to the works (i.e. consent from the landowner, Controlled Activity Approvals etc.).

Site 97

Backfill slump hole, rip and seed.

Site 98

Backfill slump holes, rip and seed.

Site 99

Maintain as much vegetation on eroded batter as possible, batter back significantly eroded areas to a maximum grade of 3(H):1(V), apply gypsum at an approximate rate of 1kg/m², topsoil to 100 mm (if available), rip and seed with a suitable seed mix.

Where the creek batters accept significant lateral inflows (predominately on the northern bank) it is recommended that they be lined to prevent scouring during the rehabilitation phase. Lining with jute mesh is recommended in areas of significant lateral sheet inflow whereas lining with rip rap rock material is recommended in areas of significant side arm inflows from concentrated flow paths. Staging of these works is also recommended to minimise the potential risk during the construction period.

Works are to be undertaken when good weather has been forecasted with adequate downstream sediment control measures installed prior to works within Stony Creek. Appropriate approvals will be obtained prior to the works (i.e. consent from the landowner, Controlled Activity Approvals etc.).

Site 100

Backfill bed erosion, topsoil to 100 mm (if available), scarify and seed with a suitable seed mix. Works are to be undertaken when good weather has been forecasted. Appropriate approvals will be obtained prior to the works (i.e. consent from the landowner, Controlled Activity Approvals etc.).

Site 101

Backfill piping failure locations on creek bank.

Backfill any bed erosion, topsoil to 100 mm (if available), scarify and seed with a suitable seed mix.

Where the near vertical batters with exposed dispersive soils are present clear vegetation on eroded batters, batter back to a maximum grade of 3(H):1(V), apply gypsum at an approximate rate of 1kg/m^2, topsoil to 100 mm (if available), rip and seed with a suitable seed mix.

Works are to be undertaken when good weather has been forecasted with adequate downstream sediment control measures installed prior to works within Stony Creek. Appropriate approvals will be obtained prior to the works (i.e. consent from the landowner, Controlled Activity Approvals etc.).

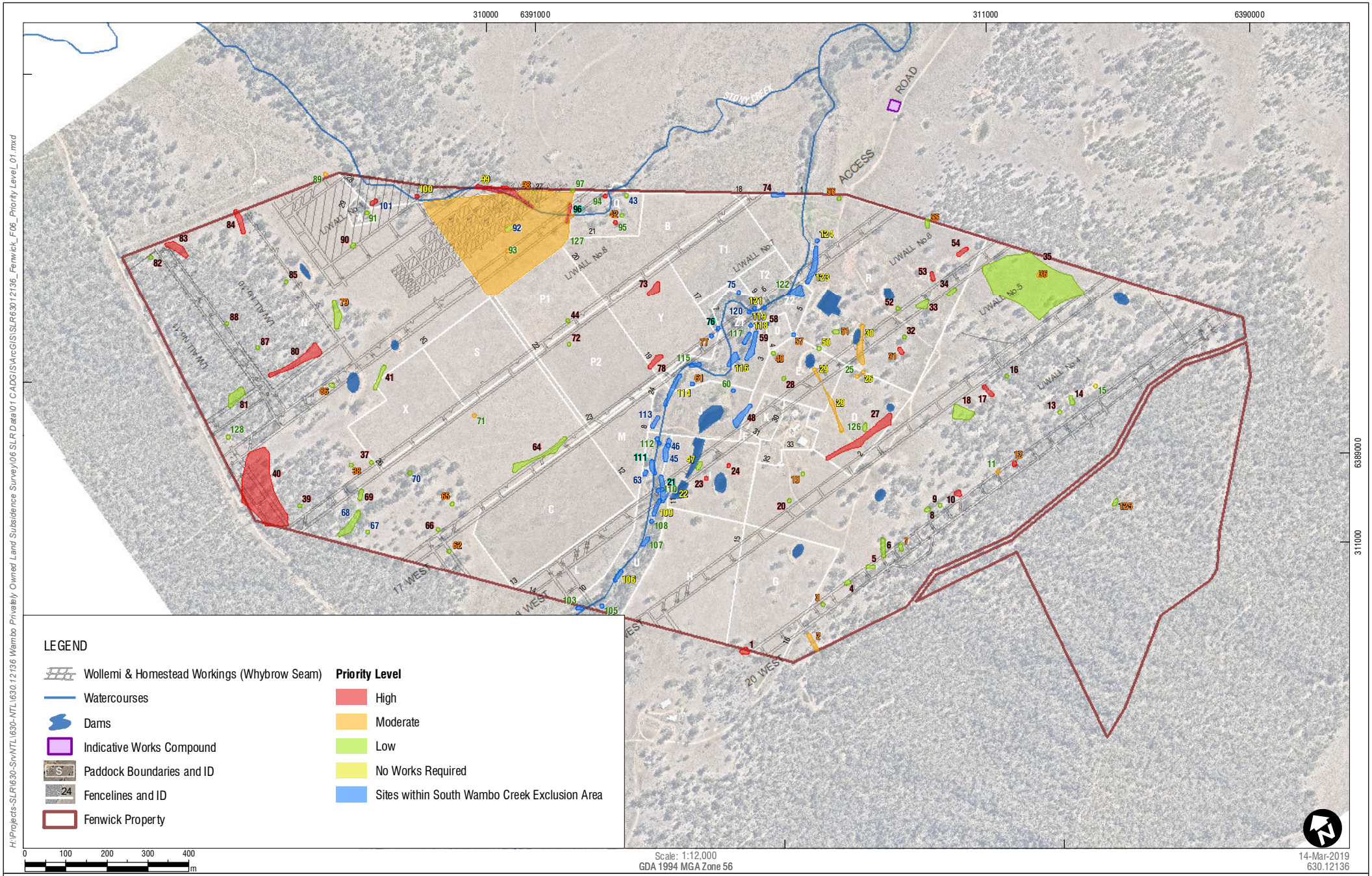
11 Schedule of Works

The schedule of works for this Subsidence Remediation Plan ultimately needs to be finalised in consultation with WCPL, the landowners, and to the satisfaction of the Resources Regulator. This section presents the priorities and approach recommended by the authors of this report.

The immediate priorities are considered to be remediation of:

1. Impacts that are clearly subsidence related and works associated within Stony Creek.
2. Areas that have been ineffectively remediated in the past and surface features associated with changes in landform.
3. Features that are probably not subsidence related once the origin of these features has been established through minor excavations on a representative number of such features. These features include minor depressions associated with tree stump decay and depressions associated with wombat holes typically within 10 m of drainage lines.

These aspects have been shown on **Figure 6**.



Note: Although not all of Site 35 is located within 30m of the goaf edge this area has been classed as a single site and is discussed within the SRP report

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Priority of Works

FIGURE 6

The remediation activities associated with filling of the sites where surface cracks are clearly subsidence related would be expected to take no more than a few months once permissions are in place from the landowners, WCPL and other regulatory authorities. The timeframe to obtain these permissions would depend on a range of factors beyond the control of WCPL or the authors of this report.

It is recommended that the period during which permissions are obtained from relevant authorities is used by WCPL to determine an effective remediation strategy for the cracks, perhaps by running some trials on subsidence cracks on similar soil and landform types located on WCPL owned land. The trials would allow WCPL to refine the remediation process including equipment, human resources, materials, timing requirements for works etc. The development of this strategy should involve SLR and SCT so as to build upon the combined experience of all three groups. Further detail regarding the remediation methodologies will be identified during the approval period.

Table 6 outlines the schedule of works in order of priorities for remediation. These priorities have been developed through the risk assessment process described in **Section 9**.

Table 6 Schedule of Works

Priority	Project Timeline	Description
-	Months 1-3	Preparation, approvals, WCPL remediation trials etc.
High	Months 4-8	Remediation of clearly subsidence related cracks
High	Months 4-8	Stoney Creek remediation works
Mod	Months 6-8	Ineffective previous remediation activities
Mod	Months 6-8	Remediation of surface features associated with landform change
Low	Months 8-9	Remediation of sites that are probably not subsidence related.
-	Months 8-24	Ongoing Care and Maintenance of remediated sites
-	Months 8-36	Monitoring

This schedule may be refined subject to feedback from the landowner regarding impact site remediation priorities, results of the site excavation program, unforeseen operational delays or weather (i.e. period of significant rainfall or drought). All variations to the works schedule will be in consultation with the landowner and the Resources Regulator.

12 Post Remediation Care and Maintenance

Following the remediation works, areas will require the restriction of stock/vehicle access during vegetation establishment. Monitoring will be undertaken (refer **Section 13**) to assess the effectiveness of rehabilitation. Results will be compared against the Trigger Action Response Plan (TARP) and if required, maintenance works will be undertaken such as:

- Repair of erosion, diversion of drainage paths and de-silting of sediment control structures;
- Slashing, re-seeding and/or supplementary planting;
- Application of fertiliser to address nutrient deficiency;
- Application of ameliorants;
- Repairing fencing if damaged; and

- Pest animal control measures.

Post-remediation works will also need to consider weed management. A number of weeds were identified from the site inspection, including:

- *Senecio madagascariensis* (Fireweed);
- *Lycium ferrocissimum* (African Box Thorn);
- *Malva parviflora* (Small-Flowered Mallow);
- *Hypochaeris radicata* (Cat's Ear);
- *Solanum sp*. (Yellow Fruit);
- *Abutilon theophrasti* (Chinese Lantern); and
- *Dysphania sp* (Small Crumbweed).

Weed management measures may include spraying or manual removal. These measures will be developed in consultations with the landowner.

13 Monitoring and Inspections

Monitoring will be undertaken to assess the effectiveness of remediation works against completion criteria, identify any new sites, and to inspect new sites identified by the landowner. Monitoring will be undertaken at the frequency outlined in **Table 7**.

The results of monitoring will be compared against the TARP (refer **Section 15**). If this review identifies that any triggers have been exceeded, actions will be implemented accordingly.

Table 7 Monitoring and Inspection Schedule

Monitoring Type	Frequency	Responsibility
Visual inspection of rehabilitation areas to review against completion criteria and determine the requirement for any remedial works.	Monthly for the first 4 months during initial vegetation establishment then six-monthly thereafter. Following a rainfall event (i.e. 20 mm rainfall on a 24 hour calendar day.	Project Team member or alternative consultant as approved by DPE

Monitoring Type	Frequency	Responsibility
Subsidence inspection comprising: • Type and location of any subsidence/potholing, and features including maximum width, length and depth of cracking. Depth of cracking to be measured using an incremental string line with a weight attached to the end; • Photographs and GPS record of any subsidence feature location; and • Recording of any subsidence impacts; • Review of rehabilitation success, including species/weed establishment; • Comparison of sites against results of former monitoring to identify any trends; and • Recommendations for any follow up remedial works as required.	Six-monthly (May and November) until completion criteria this Subsidence Remediation Plan have been meet. The need for ongoing monitoring will be reviewed at this time.	Project Team member or alternative consultant as approved by DPE
Assessment of meeting Completion Criteria	Six Monthly (May and November)	Project Team member or alternative consultant as approved by DPE

Note: Timing of biannual monitoring may vary due to unforeseen circumstances, operational delays or weather (e.g. periods of significant rainfall). All variations to the monitoring schedule will be in consultation with the landowner and the Resources Regulator.

14 Recording Future Impacts

The results of all field inspections noted in **Table 7** as well as any inspections undertaken by the landowner will be recorded. A live subsidence database (in the form of a MS excel spreadsheet) exists for WCPL that has captured the details of all known subsidence sites. The data set is available for use during monitoring inspections to ensure no change to identified sites and to allow for recording new sites.

Details recorded in the spreadsheet include:

- Date identified;
- Site reference number;
- Site location;
- Mining area;
- Site dimensions, if relevant;
- A description of site problem/issue;
- Recommended action;
- Site classification (e.g. category as listed in **Section 8**);
- Risk rating; and
- Photographs of the site.

If additional sites are identified by the landowner, the following procedure should be followed:

- The site location is to be captured using hand held GPS. The site condition is to be captured via photographs taken using a digital camera with in-built GPS. Where possible, the photograph should also include a reference item that can be used to demonstrate scale (e.g. ruler, walking stick, tennis ball etc.). *Note: an updated procedure will be provided to the landowner following purchase of a suitable camera by WCPL.*
- Data captured via the handheld GPS is to be collated in a Microsoft Excel spreadsheet with the following information:
  - Point ID
  - Coordinates
  - Comment on identified impact or site
  - Date recorded
  - All additional data to be classified using SLR constraints mapping data: to determine if location is in possible subsidence zone.
- The Microsoft Excel spreadsheet and supporting photographs are to be provided to WCPL. The information will be reviewed to identify if any management measures are needed, beyond the scheduled inspection program. The data and photographs will be incorporated into the property data set for consideration during future works.
- New subsidence impacts will be investigated by WCPL personnel within 2 business days of receiving notification from the landowner. If actions such as fencing are not required under the TARP (refer **Section 15**) an extraordinary site inspection will not be arranged. However, the site will be included in the ongoing monitoring/inspection program. The requirements for future remedial works will be determined by the Project Team.
- All new sites/data will be assigned a unique ID that will continue chronologically. The site will be categorised using the available constraints mapping data.
- Following biannual monitoring events, any changes to the status of identified sites will be reflected within the property data set. As outlined in **Section 16**, an updated copy of the subsidence inspection action Microsoft Excel spreadsheet will be provided to the landowner, the Resources Regulator and SCT within one month of each biannual subsidence monitoring event.

The responsibilities for this reporting schedule are outlined in **Table 8**.

Table 8 Recording Subsidence Responsibilities

Ongoing Works/Tasks	Responsibility
Recording location of additional subsidence sites with GPS and digital camera.	Landowner / Environmental Advisor or Manager
Data captured via the handheld GPS collated in a Microsoft Excel spreadsheet	Environmental Advisor or Manager / External Consultant
Any changes to the status of identified sites recorded within the property data set.	Environmental Advisor or Manager / External Consultant
An updated copy of the subsidence inspection action Microsoft Excel spreadsheet provided to the landowner, the Resources Regulator and SCT within one month of each biannual subsidence monitoring event.	Environmental Advisor or Manager / External Consultant

15 Trigger Action Response Plan

SLR has developed a Trigger Action Response Plan (TARP) for the management of subsidence-related impacts at the site and to ensure successful rehabilitation (refer **Table 9**). The TARP has been developed using the completion criteria and it will be implemented by the monitoring program (refer Section 13). During monitoring the field sheets (refer **Appendix D**) will be used to assess impact sites and remediated sites against the TARP. If monitoring identifies that triggers have been initiated, WCPL will implement the respective response.

It is noted that this TARP is only related to impacts attributable for former mining operations. Potholes and slumping attributed to other causes (land management, animal activity and tree stump decay etc.) will be rehabilitated once as per the measures outlined in **Section 10.3**, however ongoing repair of these occurrences are not within the scope of this TARP.

Table 9 Trigger Action Response Plan

Aspect/ Category	Key Element	Trigger* Response	Condition Green	Condition Amber	Condition Red
Subsidence induced impacts	Surface Cracking/ Potholing	Trigger	Visual inspections identify that there is no evidence of surface cracking or pothole/slumping.	Minor surface cracking <5 cm wide or pothole/slumping <0.2 m wide and <0.2 m in depth	Surface cracking >5 cm wide or pothole/slumping >0.2 m wide and > 0.2 m in depth
		Response	No response required. Continue monitoring program.	In response to observed impact, fence off area if posing a potential safety risk to people or stock. Undertake investigation as to whether impact is attributed to former mine workings or other factors (e.g. shrink/swell clays, stump decay, animal activity. etc.). If attributable to former mine workings, repair in consultation with landowner. Continue to monitor cracks and repairs using photographic records and suitable field/sign off sheets. If not attributable to former mining activity, no response.	In response to observed impact, fence off area if posing a potential safety risk to people or stock. Undertake investigation as to whether impact is attributed to former mine workings or other factors (e.g. shrink/swell clays, stump decay, animal activity. etc.). If attributable to former mine workings, repair as required in consultation with landowner. Continue to monitor cracks and repairs using photographic records and suitable field/sign off sheets. If not attributable to former mining activity, no response.

Aspect/ Category	Key Element	Trigger* Response	Condition Green	Condition Amber	Condition Red
Vegetation	Groundcover	Trigger	Two years following rehabilitation to woodland, vegetative cover (vegetation, leaf litter, mulch) is within 10-20% of analogue sites^.	Two years following rehabilitation to woodland, total ground cover (vegetation, leaf litter, mulch) is within 20-40% of analogue sites^.	Two years following rehabilitation to woodland, total ground cover (vegetation, leaf litter, mulch) is more than 40% of the range of analogue sites^.
		Response	No response required. Continue monitoring program.	Undertake investigation and implement care and maintenance activities in consultation with the landholder, if required.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate. Review rehabilitation methodology and revise this document in consultation with the landowner and the Resources regulator, if required.
		Trigger	Following rehabilitation to pasture or native grassland, vegetative cover (vegetation, leaf litter, mulch) is within 10-20% of analogue sites^.	Following rehabilitation to pasture or native grassland, total ground cover (vegetation, leaf litter, mulch) is within 20-40% of analogue sites^.	Following rehabilitation to pasture or native grassland, total ground cover (vegetation, leaf litter, mulch) is more than 40% of the range of analogue sites^.
		Response	No response required. Continue monitoring program.	Undertake investigation and implement care and maintenance activities in consultation with the landholder, if required.	A suitably trained person to inspect the site. Investigate use of appropriate management options to remediate. Remediate as appropriate. Review rehabilitation methodology and revise this document in consultation with the landowner and the Resources regulator, if required.

Aspect/ Category	Key Element	Trigger* Response	Condition Green	Condition Amber	Condition Red
Rehabilitation success	Rehabilitation repair monitoring	Trigger	Inspections do not identify any failures at rehabilitation sites.	Inspections identify failure at rehabilitation sites (e.g. erosion, weed infestation, or pest animal activity).	Inspections identify multiples failures at several rehabilitation sites (e.g. erosion, weed infestation, or pest animal activity).
		Response	No response required. Continue monitoring program with photographic evidence and suitable field/sign off sheets.	Undertake investigation and implement care and maintenance activities in consultation with the landholder, if required.	Undertake investigation and implement care and maintenance activities in consultation with the landholder, if required. Review rehabilitation methodology and revise this document in consultation with the landowner and the Resources regulator, if required.
Landform stability	Erosion control	Trigger	No gully or tunnel erosion. No rilling present.	Minor gully or tunnel erosion present and/or rilling <100 mm wide and/or <100 mm deep.	Significant gully or tunnel erosion present and/or rilling >100 mm wide and/or <100 mm deep.
		Response	No response required. Continue monitoring program.	Remediate as appropriate (e.g. backfill, shape, ameliorate and seed). Continue to monitor erosion and repairs using photographic records and suitable field/sign off sheets.	A suitably trained surface water engineer to inspect the site and undertake a review of the drainage of the area and provide recommendations to appropriately remediate the erosion. Investigate opportunities to install water management infrastructure to address erosion. Undertake a review of the drainage of the area and provide recommendations to appropriately remediate the erosion. Remediate (backfill, shape, ameliorate and seed) as soon as practicable. Continue to monitor erosion and repairs using photographic records and suitable field/sign off sheets.

Aspect/ Category	Key Element	Trigger* Response	Condition Green	Condition Amber	Condition Red
	Drainage condition	Trigger	No drainage issues identified at rehabilitation sites.	Landforms exhibiting minor drainage issues, such as erosion due to changed upslope flow regimes, but does not threaten to cause rehabilitation failure.	Landforms exhibiting significant drainage issues, such as erosion due to changed upslope flow regimes, threatening or causing rehabilitation failure.
		Response	No response required. Continue monitoring program.	A suitably trained surface water engineer to inspect the site. Investigate opportunities to address issues. Remediate as appropriate.	A suitably trained surface water engineer to undertake a review of the drainage design and provide recommendations to appropriately remediate the area. Remediate as soon as practicable. Liaise with the Resource Regulator regarding landform.

Aspect/ Category	Key Element	Trigger* Response	Condition Green	Condition Amber	Condition Red
Dam and Watercourse Stability	Creek Stability	Trigger	No creek stability issues identified at rehabilitation sites within Stony Creek.	Remediated creek sites exhibit minor stability issues and/or do not meet remediation criteria but do not threaten to cause rehabilitation failure or significant adverse environmental impacts. CSIRO Stream Health Assessment indicates that the creek is 'Potentially Stabilising' or 'Active' (activity rating 50 – 69).	Remediated creek sites exhibit significant stability issues, threatening or causing rehabilitation failure and/or significant adverse environmental impacts. CSIRO Stream Health Assessment indicates that the creek is 'Very Active' (activity rating <50).
		Response	No response required. Continue monitoring program.	Suitably qualified surface water engineer to undertake investigation as to the cause of the observed stability issue. Undertake additional remediation measures, as required in consultation with landowner and relevant government agencies. Continue to monitor creek site and repairs using photographic records, detailed measurements and suitable field/sign off sheets.	Suitably qualified surface water engineer to undertake investigation as to the cause of the observed stability issue. Install temporary erosion and sediment control measures, as required. Undertake remediation measures in consultation with landowner and relevant government agencies. Continue to monitor creek site and repairs using photographic records, detailed measurements and suitable field/sign off sheets.

Aspect/ Category	Key Element	Trigger* Response	Condition Green	Condition Amber	Condition Red
	Dam Stability	Trigger	No dam or overflow stability issues identified.	Dam and dam overflow sites exhibit minor stability issues but do not threaten to cause rehabilitation failure (if applicable) or significant adverse environmental impacts or safety impacts.	Dam and dam overflow sites exhibit significant stability issues, threatening or causing rehabilitation failure (if applicable), significant adverse environmental impacts and/or safety concerns.
		Response	No response required. Continue monitoring program.	Suitably qualified surface water engineer to undertake investigation as to the cause of the observed stability issue and whether the issues are likely to be mining induced or caused by other factors such as poor construction post mining. Undertake additional remediation measures, as required in consultation with landowner. If overflow changes are not causing any stability issues, no works may be required. Continue to monitor dam site and repairs using photographic records, detailed measurements and suitable field/sign off sheets.	Suitably qualified surface water engineer to undertake investigation as to the cause of the observed stability issue and whether the issues are likely to be mining induced or caused by other factors such as poor construction post mining. If immediate safety or environmental risks are identified then the landowner will be notified and temporary precautionary measures implemented, as required. Undertake additional remediation measures, as required in consultation with landowner. Continue to monitor dam site and repairs using photographic records, detailed measurements and suitable field/sign off sheets.

Aspect/ Category	Key Element	Trigger* Response	Condition Green	Condition Amber	Condition Red
Remediation With Suitable Pasture Species for Farming Operations	Grassland Pasture Species	Trigger	Visual inspection of remediated sites identifies at least 75% of species surveyed are representative of pasture species from the approved pasture mix sown into each remediation area.	Visual inspection of remediated sites identifies less than 75% of species surveyed are representative of pasture species from the approved pasture mix sown into each remediation area.	Visual inspection of remediated sites identifies less than 50% of species surveyed are representative of pasture species from the approved pasture mix sown into each remediation area.
		Response	No response required. Continue monitoring program.	Undertake investigation and implement care and maintenance activities in consultation with the landholder. Sites are to be soil tested by an agronomist for pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur and appropriate ameliorants applied. Weeds controlled by hand pulling or registered herbicide application. All actions undertaken in consultation with landowner.	Sites are to be soil tested by an agronomist for pH, EC, ESP, Ca:Mg, organic matter, phosphorus, potassium, nitrogen and sulfur and appropriate ameliorants applied. Weeds controlled by hand pulling or registered herbicide application. Re-sowing of pasture mix undertaken under advisement of agronomist. All actions undertaken in consultation with landowner.

** Triggers will be assessed in consideration with local impacts to surrounding analogue sites (e.g. weather extremes, fire, etc.)*
^ Analogue sites to be established prior to rehabilitation works in consultation with the landowner. The suitability of selected analogue sites will be outlined in a letter report. The letter report will be provided to the landowner for consultation, prior to issue to the Resources Regulator for approval.

16 Reporting

The Annual Review is prepared and submitted in accordance with Schedule 6, Condition 5 of Development Consent DA 305-7-2003. The Resources Regulator accepts an Annual Review satisfies the requirement for an Annual Environmental Management Report under CCL 743. WCPL will include the following in each Annual Review during implementation of this Subsidence Remediation Plan: a summary of remedial works undertaken during the calendar year; and an overview of performance against the schedule of works (refer **Section 11**). The Annual Review will be available on the company website.

Within one month of each biannual subsidence monitoring program, an updated copy of the subsidence inspection action Microsoft Excel spreadsheet will be provided to the landowner, the Resources Regulator and SCT. As part of this process, results will be assessed against the TARP. If any exceedances are identified, actions will be implemented in consultation with the Resources Regulator and the landowner.

17 Implementation

Table 10 defines personnel who are responsible for the monitoring, review and implementation of this Subsidence Remediation Plan.

Dispute resolution over proposed remediation methods and priorities will be undertaken in consultation with the Landowner and the RR, and where appropriate, will be recorded in Annual Reviews (refer **Section 16**). All grievances between stakeholders will be communicated internally (i.e. between parties) and not via the media or public forums once this SRP has been finalised. Grievances will also be given time to be resolved and possibly be addressed on a monthly basis during the works and as required after works are completed.

Should there be any changes to the approved Project Team (Ken Mills, Adam Williams, Murray Fraser and Duncan Barnes), it would be in consultation with the landowner and endorsed by the Resources Regulator.

Table 10 Responsibilities for Implementation of this Subsidence Remediation Plan

Title	Responsibility
Landowners	Provide data and photographs for new sites to WCPL in accordance with the procedure outlined in this Subsidence Remediation Plan. Provide feedback to assist with prioritisation of impact site remediation.
WCPL Mine Manager	Provide resources required to implement this Subsidence Remediation Plan.

Title	Responsibility
WCPL Environmental	Undertake monitoring and inspections as required (refer **Table 7**). Engage external specialists/contractors to undertake monitoring, supervision, rehabilitation and maintenance required under this Subsidence Remediation Plan. Undertake/coordinate maintenance, as required. Ensure all personnel undertaking works in relation to this Subsidence Remediation Plan are suitably qualified, trained and competent. Report the progress of works under this Subsidence Remediation Plan in the Annual Review. Undertake site based actions to implement this Subsidence Remediation Plan in cooperation with the Mine Manager. Investigate new impact sites within two days of receiving notification from the landowner. Provide copy of the updated Subsidence Inspection Action Spreadsheet to the landowner, Resources Regulator and SCT within one month of each biannual subsidence monitoring event.
Project Team	Undertake monitoring and inspections as required (refer **Table 7**). Supervise rehabilitation works to ensure they are undertaken in accordance with this Subsidence Remediation Plan. Provide ongoing advice as required to assist with successful rehabilitation of current and future impact sites under this Subsidence Remediation Plan. Undertake relevant training and inductions as required. Ensure that activities are undertaken in accordance with this Subsidence Remediation Plan. Undertake all works in accordance with a Job Safety Analysis, prepared in consultation with the landowners and WCPL. Maintain a live subsidence database for the property (in ArcGIS and Microsoft Excel).
Contractors	Implement the environmental controls and procedures outlined in this Subsidence Remediation Plan. Undertake relevant training and inductions as required. Ensure that activities are undertaken in accordance with this Subsidence Remediation Plan. Undertake all works in accordance with a Job Safety Analysis, prepared in consultation with the landowners and WCPL.

18 References

DgS (2011) *Assessment of Surface Pothole Sites above Longwalls 4 to 8 at the Abandoned Homestead Mine, Warkworth.*

DgS (2014) *Review of Surface Pothole Repair Sites on the Fenwick Property above Longwalls 4 to 8 at the Abandoned Homestead Mine, Warkworth.*

Enviroscienses Pty Ltd (1989) *Extension of Homestead Underground Mine at Warkworth.*

GE Holt and Associates Pty Ltd (1989) *Report on Assessment of the Impact of Subsidence from Workings in the Whybrow Seam at Wambo Colliery*.

Holt and Clark (1995) TBA

Landcom (2004) *Managing Urban Stormwater: Soils and Construction Vol. 1, 4th edition*.

MSEC (2013) *Site Visit to Locate Ground Surface Impacts above Homestead Mine.*

Nelson (2015) *Stocking Rate & Water Consumption Review R & J Fenwick 'Kharlibe' Wambo South*.

NSW Department of Planning (2008) *Impacts of Underground Mining on Natural Features in the Southern Coalfield: Strategic Review.*

OEH (2007) *Vegetation Formations and Classes of NSW (version 3.03 - 200m Raster) - David A. Keith and Christopher C. Simpson. VIS_ID 3848,* accessed 25 July 2018, available: https://datasets.seed.nsw.gov.au/dataset/vegetation-classes-of-nsw-version-3-03-200m-raster-david-a-keith-and-christopher-c-simpc0917

OEH (2017) *Australian Soil Classification (ASC) Soil Type map of NSW, NSW Office of Environment and Heritage, Sydney.* Accessed 25 July 2018, Available: https://datasets.seed.nsw.gov.au/dataset/australian-soil-classification-asc-soil-type-map-of-nsweaa10

WCPL (2018a) *Wambo Coal Biodiversity Management Plan*.

WCPL (2018b) *Extraction Plan – South Bates Extension Underground Mine Longwalls 17 – 20*.

APPENDIX A

Evidence of Consultation during Plan Development

Planning & Environment
Resources Regulator

Peter Jaeger
Wambo Coal Pty Limited
1 PMB
Singleton NSW 2330

Our ref: OUT18/5767

5 April 2018

Dear Peter,

CL397 (*Mining Act 1973*) and CCL743 (*Mining Act 1973*), Wambo Coal Pty Limited, Section 240(1)(b) and (c) Notice – Approval of Technical Experts

The Resources Regulator, within the Department of Planning and Environment (the Department), is responsible for the administration of the *Mining Act 1992* (the Act) and associated Regulations. It is the role of the Department to ensure the requirements under the Act and associated Regulations are followed.

Wambo Coal Pty Limited were issued directions under Section 240(1)(b) and (c) of the *Mining Act 1992* on 9 February 2018 (Our Ref. OUT18/2285) to prepare a Subsidence Remediation Plan to rehabilitate subsidence within Lot 1 DP178612.

In response to the Section 240(1)(b) and (c) Specified Measure B, Wambo Coal Pty Limited submitted a list of the following technical experts proposed to prepare the Subsidence Remediation Plan on 29 March 2018 (Our Ref. INW18/9340):

a. Dr Ken Mills (Strata Control Technology Operations Pty Limited)

b. Adam Williams (SLR Consulting Australia Pty Limited)

c. Murray Fraser (SLR Consulting Australia Pty Limited)

d. Duncan Barnes (SLR Consulting Australia Pty Limited)

The Resources Regulator approves the above technical experts to prepare the Subsidence Remediation Plan.

Wambo Coal Pty Limited also proposed to include Steven Ditton (Ditton Geotechnical Services Pty Limited) in the project team at the request of the affected landholders, Mr and Mrs Fenwick. The Resources Regulator notes that Steven Ditton has declined the request to be included in the primary project team. Notwithstanding, the Resources Regulator may consider engagement of Steven Ditton or another suitably qualified independent subsidence expert as part of the draft Subsidence Remediation Plan review process.

If you have any questions about this letter, please contact Neil McElhinney directly on (02) 4063 6724.

Yours sincerely,

Matthew Newton
Acting Director Environmental Sustainability Unit
Resources Regulator
NSW Department of Planning and Environment

cc. Mr and Mrs Fenwick – via email randjfenwick@bigpond.com

From:	Benson, James
To:	"Neil Mcelhinney"
Cc:	Jaeger, Peter F; Monique Meyer
Subject:	RE: s.240 Point C Draft SOW
Date:	Tuesday, 22 May 2018 3:29:00 PM
Attachments:	RE s.240 Point C Draft SOW.msg image001.png Re s.240 Point C Draft SOW.msg 630.12136-M01-v0.2 Draft SOW.pdf

Hi Neil,

Please find attached the updated draft Scope of Works for the Wambo Subsidence Remediation Plan as required under DI 0588 2018.
Also attached is email correspondence of consultation with, and comments from, the landholder. We are also planning to meet with the Landholders again tomorrow to discuss any further questions regarding the Scope of Works and to start discussions on the Subsidence Remediation Plan.
Within the draft Scope of Works document, changes to the original draft are in red text and indicate where the landholders relevant feedback has been incorporated.
Can you please seek comments from the Director ESU and provide feedback by the 24th of May.

Please let me know if you have any queries regarding this matter.

Regards,

James Benson
Environmental Advisor - Contract
Peabody Australia
PMB 1, Singleton NSW 2330
Phone: +61 2 6570 2209 | Mob: +61 (0)407 921 461
jbenson@peabodyenergy.com

From: Benson, James
Sent: Wednesday, 9 May 2018 11:04 AM
To: 'Neil Mcelhinney'; Jaeger, Peter F
Cc: Monique Meyer
Subject: RE: s.240 Point C Draft SOW

Hi Neil,

Thank you for your response.

A meeting was held on the 27th April between representatives of Wambo, the approved experts and the landholder to discuss the content of the Scope of Works. Subsequent to this meeting a Draft Scope of Works was prepared and provided to the landholder on the 4th of May for comment. The landholder is currently reviewing this draft.

As soon as feedback has been received from the Landholder, I will endeavour to provide you with the updated Draft Scope of Works and the landholders comments, as soon as possible.

Regards,

James Benson
Environmental Advisor - Contract

Peabody Australia
PMB 1, Singleton NSW 2330
Phone: +61 2 6570 2209 | Mob: +61 (0)407 921 461
jbenson@peabodyenergy.com

-

From: Neil Mcelhinney [mailto:neil.mcelhinney@planning.nsw.gov.au]
Sent: Tuesday, 8 May 2018 5:18 PM
To: Jaeger, Peter F
Cc: Benson, James; Monique Meyer
Subject: RE: s.240 Point C Draft SOW

Peter,

The Resource Regulator acknowledges the receipt of the Draft Scope of Works for comment by the landholder.

The intent of DI 0588 2018 Specified Measure C is that the Director ESU will review the Draft Scope of Works following consultation with the landholder and necessary amendments have been made. Evidence of the consultation, including comment received from the landholder are to be also submitted for review.

The Director ESU will then provide comment as appropriate.

Kind regards,

Neil McElhinney
Inspector Environment
Environmental Sustainability Unit
Resources Regulator
516 High Street | Maitland NSW 2320
PO Box 344 HRMC NSW 2310
T 02 4063 6724 M 0429 154 075
neil.mcelhinney@planning.nsw.gov.au

Please update your address books to reflect my new phone number and @planning address.

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From: Jaeger, Peter F [mailto:PJaeger@peabodyenergy.com]
Sent: Friday, 4 May 2018 3:04 PM
To: Neil McElhinney (neil.mcelhinney@industry.nsw.gov.au) <neil.mcelhinney@industry.nsw.gov.au>
Cc: Benson, James <JBenson@peabodyenergy.com>
Subject: RE: s.240 Point C Draft SOW

Hi Neil,

As required under point C) of the notice, WCPL is required to submit a draft Scope of Works (SOW) for the development of the SRP by the 25 May 2018. The attached draft SOW is being provided to ESU and 'Kharlibe' landholders for consultation and comment prior to final submission of the SOW on 25 May 2018.

I have included James Benson (Wambo – Environmental Advisor) in this email that will help out with coordinating the submission in my absence.

Thanks,

Peter Jaeger
Senior Environmental Advisor
Wambo Coal
PMB 1 | Singleton, NSW 2303
Office Phone: +61 2 6570 2206 | Mob: +61 417 527 585
pjaeger@peabodyenergy.com

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From:	Benson, James
To:	"R & J Fenwick"
Cc:	"Neil Mcelhinney"; "Monique Meyer"; Catherine Lewis; Jaeger, Peter F
Subject:	s.240 Scope of Works
Date:	Thursday, 24 May 2018 4:16:00 PM
Attachments:	image001.png 630.12136-M01-v0.3 SOW.PDF

Dear Janet and Ron,

Please find attached the Scope of Works for the Subsidence Remediation Plan that has been sent to the Resources Regulator this afternoon. The red text in this version shows the changes that were made since the previous version and incorporates feedback from the Resources Regulator that was received yesterday.

Please contact me if you have any questions regarding this updated Scope of Works.

Regards,

James Benson
Environmental Advisor - Contract
Peabody Australia
PMB 1, Singleton NSW 2330
Phone: +61 2 6570 2209 | Mob: +61 (0)407 921 461
jbenson@peabodyenergy.com

NSW GOVERNMENT | Planning & Environment

James Benson
Wambo Coal Pty Limited
PMB 1
Singleton NSW 2330

Our ref: DOC18/336935

25 May 2018

cc: Peter Jaeger

Dear James

Subject: CL397 (*Mining Act 1973*), CCL743 (*Mining Act 1973*) Wambo Coal Pty Limited – Review of Scope of Works re Section 240 Subsidence Remediation Plan

We refer to your Scope of Works for the development of the Subsidence Remediation Plan which was received by the NSW Department of Planning and Environment – Resources Regulator (the Department) on 24 May 2018 (Department Reference: DOC18/334080).

Following review, it is determined that the Scope of Works is to the satisfaction of the Director Environmental Sustainability Unit of the Resources Regulator.

The Department advises that it declines the opportunity to attend the risk assessment and the landholder consultation meeting as outlined in the key milestones.

If you require additional information on this matter please contact Neil McElhinney at the Resource Regulator - Environmental Sustainability Unit's Maitland office on 40636724.

Yours sincerely,

MATTHEW NEWTON
A/Director, Environmental Sustainability
Resources Regulator
NSW Department of Planning and Environment

From:	R & J Fenwick
To:	Jaeger, Peter F
Cc:	Benson, James
Subject:	Re: Access Protocol Guidelines to Access "Kharlibe" s.240
Date:	Tuesday, 12 June 2018 3:08:29 PM
Attachments:	image001.png Signed Access Protocol to access Kharlibe.pdf

Hi Pete,
Attached is the protocol, signed.
It will be ok for the team to come onto our property for the purpose of commencing the survey.
They will need to come to the house on arrival for pre- survey information.
regards,
Janet and Ron

From: Jaeger, Peter F
Sent: Tuesday, June 12, 2018 12:55 PM
To: randjfenwick@bigpond.com
Cc: Benson, James
Subject: Access Protocol Guidelines to Access 'Kharlibe' s.240

Hi Ron and Janet,

Please find attached the signed *Access Protocol Guidelines to Access 'Kharlibe' for the purpose of meeting the requirements of the s240 order by the Resources Regulator of NSW DoPE* with the changes you provided on Friday 8 June 2018.

Could you and Janet sign and return a signed copy. Following this I will organise the survey team to be available 13-14 June 2018 to start the works at 0900hrs. Please confirm that 13-14 June 2018 is suitable to you for our survey team to come onto your property to commence the survey work.

Albert has signed the attached protocol for convenience to get moving with the s240 process but the execution of the protocol is not to be taken as an acknowledgement that the 2000 Compensation and Access Agreement is not still in force and operational. As Albert has previously stated to you Wambo considers that that Agreement still is enforceable.

Regards,

Peter Jaeger
Senior Environmental Advisor
Wambo Coal
PMB 1 | Singleton, NSW 2303
Office Phone: +61 2 6570 2206 | Mob: +61 417 527 585
pjaeger@peabodyenergy.com

Peabody

From:	Benson, James
To:	"R & J Fenwick"
Subject:	Risk Assessment Invitation
Date:	Wednesday, 27 June 2018 1:34:00 PM
Attachments:	image001.png

Hi Ron and Janet,

I have just sent out a meeting invitation via Outlook for the Subsidence risk assessment. I'm not sure if you will receive this so I am following it up with this email.

I just want to confirm that you will be able to make this meeting. I have scheduled it for 9am Wednesday 4th of July. Please let me know as soon as practical if this timing is not suitable and provide an alternative time.

Regards,

James

James Benson
Environmental Advisor - Secondee
Peabody Australia
PMB 1, Singleton NSW 2330
Phone: +61 2 6570 2349 | Mob: +61 (0)407 921 461
jbenson@peabodyenergy.com

From:	R & J Fenwick
To:	Benson, James
Cc:	Adam Williams; Ken Mills
Subject:	Re: Risk Assessment
Date:	Monday, 16 July 2018 4:11:21 PM
Attachments:	image001.png
Importance:	High

Hi James,

The risk assessment spreadsheet appears to provide intent to treat all components of the impacts of subsidence to our property.

The opinions being given regarding subsidence do not have substantiated evidence to contradict what has been presented and accepted in the past.

A resurgence of impacts has been evident since 2010 with Wambo Coal accepting its responsibility for the newly evident subsidence.

Within the risk assessment a potential confusion of the issues around the ongoing subsidence is noted regarding changes that may or may not be related to subsidence under the premise of direct impact and perhaps overlooking the indirect impacts and potential domino effects.
A major concern noted that appears within the bounds of water and watercourses and I have serious concern with the issue of Water impacts, issue 17 being disregarded, or apparently so, with the allegation that it was *"Being addressed by separate process with DPE and excluded from the scope of the risk assessment."*

- Subsidence has had an ongoing impact on the property including the surface flows and aquifers and
- Subsidence impacts are evident as seen in the damage resulting from minor and major changes to drainage paths or ponding, to the environmental impacts resulting in erosion on the land and within the creek boundaries (both creeks) as well as
- More serious property damage including loss of land, resulting from varied changes to drainage paths and associated erosion

To totally disregard Water impacts defeats the purpose of attending to the Section 240 notice issued by NSW Resource Regulator.

If there is any contrary direction from RR or DoPE I believe that this must be presented to us under the expected transparency requirement.

It must be considered and accepted that there is impact with consequences.

It must be accepted by the consultants and Wambo Coal and evaluated.

Many of the impacts must be dealt with within the framework of the Subsidence Remediation Plan.

Within item 14, the historical records and data have not been lost. They have either not been sought or not produced.

Within the issue 15 Land use, the only issue regards land use relates to remedial works not to the satisfaction of the landowners and the RR. Land use was to be the pivot of the process, to return the land use of the property to an accepted state, presumably agreeable to the RR and the landowner.
regards,

Ron and Janet

From: Benson, James
Sent: Tuesday, July 10, 2018 8:48 AM
To: R & J Fenwick
Subject: Risk Assessment

Hi Ron and Janet,

Please find attached the risk assessment spread sheet that we worked on last week.

Regards,

James Benson
Environmental Advisor - Secondee
Peabody Australia
PMB 1, Singleton NSW 2330
Phone: +61 2 6570 2349 | Mob: +61 (0)407 921 461
jbenson@peabodyenergy.com

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WAMBO COAL PTY LTD

ABN: 13 000 668 057

Level 13, BOQ Centre
259 Queen Street
Brisbane, Queensland 4000
PMB 1
Singleton, NSW 2330
Australia
Tel + 61 (0) 2 6570 2200
Fax + 61 (0) 2 6570 2290

05 July 2018

Mr. Neil McElhinney
Inspector Environment
Resource Regulator
516 High St Maitland NSW 2320
PO Box 344 HRMC NSW 2310

RE: Seeking Extension to Section 240(1)(b) and (c) of *Mining Act 1992* D) Submission of Draft SRP

Dear Neil,

In accordance with section 240(1) (b) and (c) of the *Mining Act 1992*, Wambo Coal Pty Ltd (WCPL) is required to develop and submit a Subsidence Remediation Plan (SRP) for 'Kharlibe' (Lot 1 DP178612) to the satisfaction of the Director, Environmental Sustainability Unit (ESU), Division of Resources and Geoscience (DRG) within the Department of Planning and Environment (DPE).

Required under point D) of the notice, WCPL is required to provide a Draft Subsidence Remediation Plan to the Director ESU by the 27/07/2018. WCPL in consultation with the approved experts conducting the Subsidence Remediation Plan, wish to seek an extension to this submission date by an additional month, to 31/08/2018.

To date, key milestones have been reached including detailed field surveys and a risk assessment to rank the findings of the field surveys. Stakeholder consultation and engagement has continued to be productive throughout these processes.

The project timeline is slightly behind the originally proposed schedule provided with the Scope of Works. The field surveys originally planned over one week took place over two weeks in order to capture all subsidence and non-subsidence related features, 125 in total. There have been delays in the provision of data during the works impacting our ability to collate and process information and data. Some relevant information is still yet to be received. We have also added an additional step in the process and that is a separate review meeting with the Resource Regulator after incorporating the landholders feedback. Further to the above additions in time, the approved subsidence expert for this plan, Dr Ken Mills, will be working overseas between 14th and 27th of July.

WCPL together with the approved experts believe that an additional month to submit a draft will produce a more detailed plan resulting in better long term benefits without compromising the timing of proposed remediation works. I have enclosed an updated gantt chart that outlines the proposed changes to support the time extension.

Can you please provide an answer to this request at you earliest convenience.

Yours sincerely,

Peter Jaeger
Senior Environmental Advisor
Wambo Coal Pty Ltd
Phone: (02) 6570 2206

From:	Benson, James
To:	"R & J Fenwick"
Cc:	Jaeger, Peter F; "Monique Meyer"; "Neil Mcelhinney"
Subject:	Subsidence Remediation Plan Review Meeting Date
Date:	Thursday, 9 August 2018 10:05:00 AM
Attachments:	image001.png

Hi Ron and Janet,

We are on track to provide you with a copy of the draft Subsidence Remediation Plan on Monday the 13th August. We would like to have a review meeting early the following week. The aim of this meeting will be to go through each section of the plan, discuss your feedback and answer any questions that you may have into the content.

Would you be available on either the 20th or 21st of August to meet at Wambo with SLR and SCT, to provide feedback on the draft plan?

Regards,

James Benson
Environmental Advisor - Secondee
Peabody Australia
PMB 1, Singleton NSW 2330
Phone: +61 2 6570 2349 | Mob: +61 (0)407 921 461
jbenson@peabodyenergy.com

APPENDIX B

Kharlibe: Subsidence Remediation Plan (SCT, 2018)

Strata Control Technology

WAMBO COAL PTY LTD

'Kharlibe' Subsidence Remediation Plan – SCT Component of SLR Report

NWAM4795

Mining Research and Consulting Group

SCT Operations Pty Ltd PO Box 824 Wollongong NSW 2520 Australia
Phone: +61 2 4222 2777 Email: sctnsw@sct.gs Website: www.sct.gs
ABN 23 078 328 953

REPORT TO

Peter Jaegar
Senior Environmental Advisor
Wambo Coal
PMB
Singleton, NSW 2303

TITLE

'Kharlibe' Subsidence Remediation Plan – SCT Component of SLR Report

REPORT NO

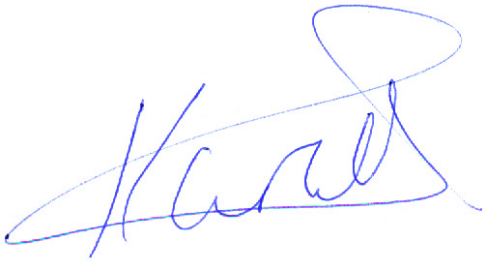
NWAM4795

PREPARED BY

Ken Mills

DATE

24 September 2018



Ken Mills
Principal Geotechnical Engineer

Report No	Version	Date
NWAM4795	Draft	10 August 2018
NWAM4795	Draft	11 August 2018
NWAM4795	Draft	13 August 2018
NWAM4795	Draft	28 August 2018
NWAM4795	Final	24 September 2018

SUMMARY

Wambo Coal Mine (Wambo) is an open cut and underground coal mining complex located approximately 15 kilometres west of Singleton in the New South Wales Hunter Valley. The mine complex is owned and operated by Wambo Coal Pty Ltd, a subsidiary of Peabody Energy Australia Pty Ltd (Peabody). In the 1990's, Wambo's Homestead and Wollemi Mines extracted a series of longwall panels below 238 hectares of agricultural land referred to as 'Kharlibe' causing the surface to be lowered, subsidence cracks to form and various other impacts to become apparent. Peabody is required to prepare a Subsidence Remediation Plan in consultation with the landholder at the behest of the NSW Resource Regulator and commissioned SLR Consulting Pty Ltd (SLR) and SCT Operations Pty Ltd (SCT) to assist in this process. This report presents the SCT component of a joint report being prepared by SLR for Wambo to form the 'Kharlibe' Subsidence Remediation Plan.

SCT and SLR undertook a program of work that included field inspections of the entire 'Kharlibe' property, a review of available subsidence monitoring data and a review of previous studies. This program of work indicates that the subsidence movements at 'Kharlibe' are consistent with the ground movements that would be expected for the mining geometries and overburden depths involved. Available subsidence monitoring data indicates that these movements were complete soon after mining and there has not been significant additional movement since then. The ongoing appearance of surface cracks and minor sinkholes relate to soil migration, a phenomenon that does not involve or require ongoing ground movement of the underlying rock strata.

The subsidence impacts that have resulted from these movements include:

- lowering of the ground surface above the central part of each panel causing redirection of surface runoff, including in the bed of watercourses and changes to overflow points in some dams
- formation of cracks in the rock strata underlying the surface alluvium, most of which were evident immediately following subsidence, and others which have become apparent over time through soil migration into cracks in the underlying strata, in most cases following one or more attempts at remediation
- non-uniform lowering of the thalweg of drainage lines and watercourses leading to flatter grades in some areas and increased erosion in others, causing for instance surface flows to cut through the ground that has not subsided above the remaining chain pillars.

As per instruction, consideration of remediation for impacts to South Wambo Creek and the surface within 40m from the banks on either side are not included in this study. The remaining priorities for remediation include sites where subsidence cracks related to mining subsidence are clearly visible and present a hazard to stock and personal safety and the site of nick-point erosion on Stony Creek.

The remediation recommended for sink hole formation would involve excavation of the soil profile to the level of the underlying bedrock, where possible, placing stabilised course grained material in the cracks in the bedrock, overlaying a suitable barrier (such as one comprising geofabric, clay, and stabilised soil material), back filling and compacting the soil profile to within 0.5m of the surface, leaving the top 0.5m uncompacted and ideally stabilised with gypsum and applying 0.1m of topsoil suitable for seeding. It is recommended that the priority for treatment of these sites is determined in consultation with the landowner to fit best with their farming priorities.

The extent and nature of remediation activities at the start of Longwalls 8 and 10 should be discussed with the landowners because the impact of remediation may be greater than the benefits in these bushland settings.

It is envisaged that all the crack remediation work would be completed in a single campaign lasting between several weeks and several months depending on weather, accessibility and the depth to bedrock. Ongoing monitoring to confirm effectiveness should continue for several seasons at least.

The design of the nick-point erosion control on Stony Creek is outside of SCT's expertise and is not considered in this report, but timely attention to this remediation is likely to reduce the extent of the impacts associated with this erosion.

Other effects are evident in the landform that may be confused with mining related subsidence impacts but have origins that may not necessarily be subsidence related. These include:

- depressions caused by rotting tree stumps (below ground level)
- animal burrows along river banks
- settlement of exploration drilling sumps
- soil shrinkage cracks in extended dry periods.

A strategy to confirm that the characteristics and likely origin of a representative number of these features is recommended. The management of these features could involve backfilling with soil material.

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1. INTRODUCTION

Wambo Coal Mine (Wambo) is an open cut and underground coal mining complex located approximately 15 kilometres west of Singleton in the New South Wales Hunter Valley. The mining complex is owned and operated by Wambo Coal Pty Ltd, a subsidiary of Peabody Energy Australia Pty Ltd (Peabody). In the 1990's, Wambo's Homestead and Wollemi Mines extracted a series of longwall panels below 238 hectares of agricultural land referred to as 'Kharlibe' causing the surface to be lowered, subsidence cracks to form and various other impacts to become apparent. Peabody is required to prepare a Subsidence Remediation Plan in consultation with the landholder at the behest of the NSW Resource Regulator and commissioned SLR Consulting Pty Ltd (SLR) and SCT Operations Pty Ltd (SCT) to assist in this process. This report presents the SCT component of a joint report being prepared for Wambo to form the 'Kharlibe' Subsidence Remediation Plan.

This report is structured to provide a site description, a review of measured subsidence behaviour and a discussion of remediation strategies based on subsidence impacts observed during four days of site visits to 'Kharlibe'.

2. SITE DESCRIPTION

Figure 1 shows an outline of 'Kharlibe' relative to the Wambo longwall panels superimposed onto a 1:25,000 topographic series map of the area. This map was produced in 1975 and, therefore, pre-dates any mining in the area.

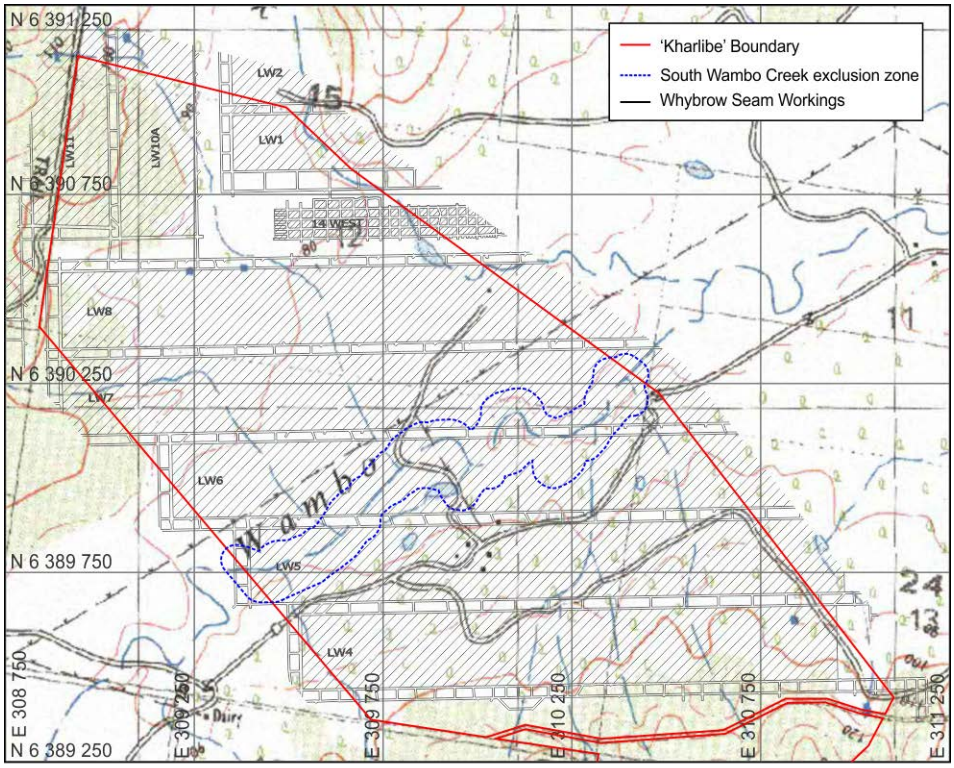


Figure 1: Site plan of 'Kharlibe' with underground workings

2.1 Surface

'Kharlibe' comprises Lot 1 of DP178612. The 238ha property is located on the slopes and alluvial flats either side of South Wambo Creek and to the south of Stony Creek. The slopes steepen on the southern and western boundaries of the property. The steeper slopes are vegetated with scattered trees that grade into bushland. The alluvial flats and gentler slopes to the south of South Wambo Creek are used for agricultural purposes; primarily grazing and cropping. The homestead and associated farm buildings are located centrally to the property on the southern side of South Wambo Creek.

South Wambo Creek is a tributary of Wollombi Brook. Stony Creek and several minor drainage lines cross the property and flow into South Wambo Creek.

2.2 Mining

'Kharlibe' is located in an area where coal is present in the Whybrow and Wambo Seams. Figure 2 shows contours of overburden depth to the Whybrow Seam. The Wambo Seam is located approximately 80m below the Whybrow Seam. Both seams dip to the southwest at an average gradient of approximately 1 in 14.

A narrow pillar extraction panel known as 14 West was mined prior to the start of longwall mining in an area to the south of Longwall 1. This panel ranges from 86m wide to 107m wide at overburden depths ranging from 150m to 165m.

Wambo mined a narrow pillar extraction panel (14 West) and eight longwall panels in the Whybrow Seam directly below 'Kharlibe' in the period between July 1990 and the end of 2000. Most of the panels were mined as part of the Homestead Mine. The last two, Longwalls 10A and 11, were mined as part of Wollemi Mine.

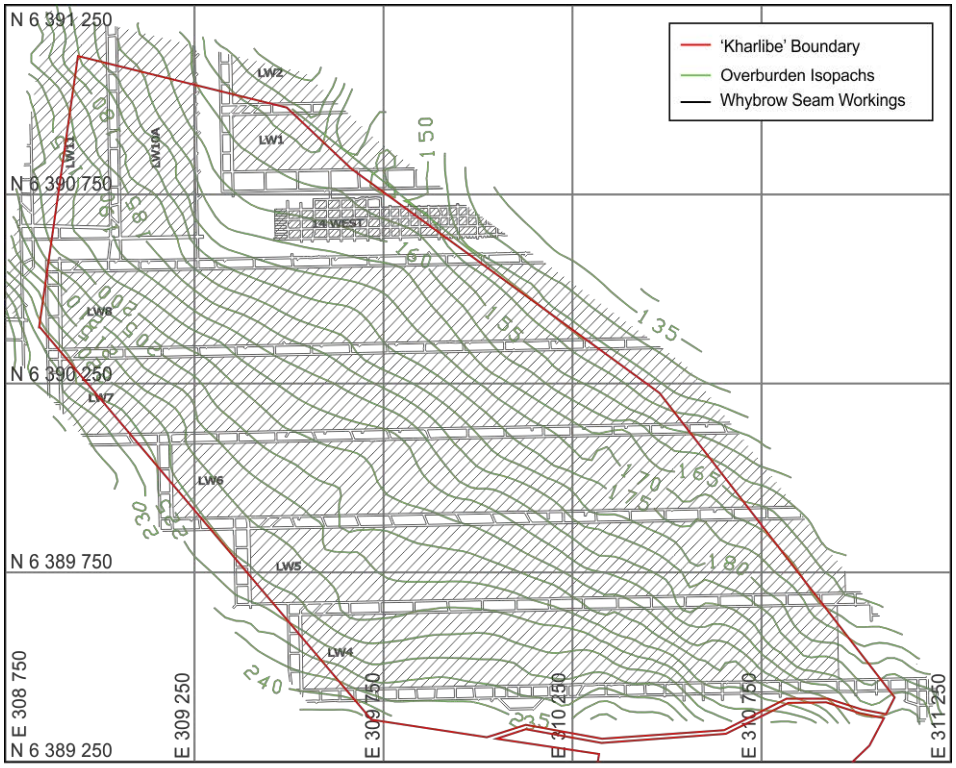


Figure 2: Contours of overburden depth

Table 1 summarises the panel width, overburden depth range, indicative mining height (DgS 2011) and indicative period of mining below 'Kharlibe'.

Table 1: Whybrow Longwall Panels Below 'Kharlibe'

Panel	Width (m)	Overburden Depth Range (m)	Mining Height (m)[1]	Period of Mining Below 'Kharlibe'[2]
14 West	107	150-165	-	July 1990 – Nov 1990
LW1	157	145-160	-	May 1991 – Oct 1991
LW2	172	145-150	-	May 1992
LW4	205	180-235	2.9	Oct 1993 – Sept 1994
LW5	205	160-220	3.5	Oct 1994 – May 1995
LW6	204	120-240	3.5	July 1995 – Jan 1996
LW7	208	125-220	3.5	May 1996 – Feb 1997
LW8	210	105-220	3.5	May 1997 – Dec 1997
LW10A	210	155-190	2.7	Aug 1999 – Oct 1999
LW11	210	175-210	2.7	Aug 2000 – Oct 2000

[1] From Table 1 in DgS (2011)
[2] Dates are indicative and estimated based on panel start and finish dates and regular panel retreat rates

Seven more longwall panels were mined in the Wambo Seam in an area to the north and northeast of 'Kharlibe', but these have had no perceptible impact on the property. Longwalls 5-7 were the closest panels to 'Kharlibe' and came within approximately 240m at an overburden depth of approximately 240m. The sections of longwall panels with any potential to cause subsidence impacts at 'Kharlibe' were extracted between December 2011 and June 2013. LIDAR monitoring is available across this period to confirm no perceptible ground movements.

3. SUBSIDENCE MONITORING

Subsidence monitoring provides a basis to determine the characteristics of subsidence behaviour to provide context for the types of impacts that are observed. The subsidence monitoring used for this study includes several conventional subsidence lines over longwall panels adjacent to 'Kharlibe', aerial photogrammetry observations controlled by a series of survey control points located on the panel centrelines within 'Kharlibe' and some detailed crack monitoring observations available for Longwall 10A.

3.1 Conventional Subsidence Lines

There is understood to have been a conventional subsidence line located over Longwall 4, but this line was removed at the request of the landowner. However no subsidence monitoring data from conventional subsidence lines for this line or other lines located on 'Kharlibe' was able to be sourced for this study. Figure 3 shows the locations of subsidence lines monitored during mining of longwall panels adjacent to 'Kharlibe'. The subsidence behaviour observed on these lines is

expected to be similar to and comparable with the subsidence behaviour that occurred on 'Kharlibe'.

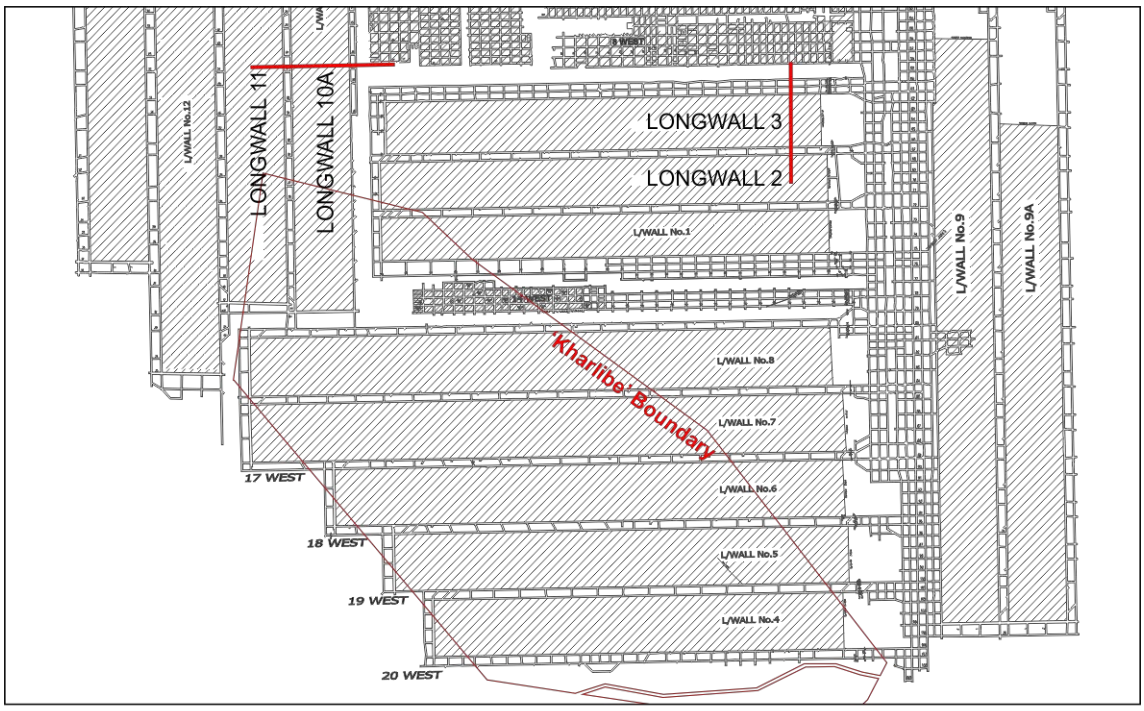


Figure 3: Location of subsidence monitoring lines

3.1.1 Longwall 2 / 3 Subsidence Profile

Figure 4 shows a profile of the subsidence that was measured above Longwalls 2 and 3. This profile illustrates subsidence behaviour referred to as supercritical width subsidence where the panels are wide relative to overburden depth. This behaviour is representative of subsidence behaviour at overburden depths less than about 120m i.e. over most of the eastern part of 'Kharlibe'.

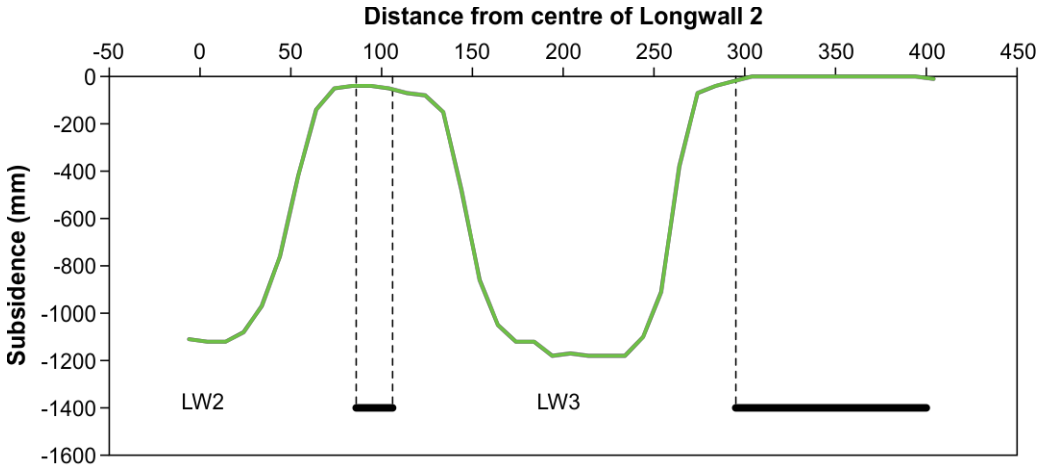


Figure 4: Subsidence profile of Longwalls 2 and 3

The overburden depth along the Longwall 2 / 3 subsidence line ranges from 95m to 100m. Longwall 2 is 172m wide. Longwall 3 is 189m wide. The subsidence profile has characteristics that are typical of panels that are wide relative to the overburden depth (known as supercritical in subsidence engineering terms).

There is a section in the middle of the panel where maximum subsidence has been reached at approximately 1.2m. The seam thickness mined is inferred to have been approximately 2.2m based on general experience in this area of the Hunter Valley of maximum subsidence reaching 55% of seam thickness mined.

Subsidence over the 20m wide chain pillars is less than 50mm in this profile. As the overburden depth increases, subsidence over the chain pillar typically increases and the zone of maximum subsidence reduces in width, but the profile remains generally similar to that shown in Figure 4.

The ground surface experiences significant stretching (tensile strains) where the profile transitions from the low subsidence that occurs over the chain pillars. In this profile, at an overburden depth of approximately 100m, the zone of maximum stretching occurs at approximately 10-30m from the edge of each panel so that cracking is likely in this area.

3.1.2 Longwall 10A / 11 Subsidence Profile

Figure 5 shows a profile of the subsidence that was measured above Longwalls 10A and 11. This profile illustrates subsidence behaviour for panels approaching critical width where the panel width is similar in magnitude to the overburden depth. This behaviour is representative of subsidence behaviour at overburden depths greater than about 150m i.e. over the western and southern parts of 'Kharlibe'.

The overburden depth along the Longwall 10A / 11 subsidence line ranges from 140m in the east and over most of Longwall 10 to 160m over Longwall 11. Both Longwall 10A and Longwall 11 are 210m wide. The chain pillar is 20m wide. The subsidence profile has characteristics that are typical of panels that are of similar width to the overburden depth (known as critical width panels in subsidence engineering terms).

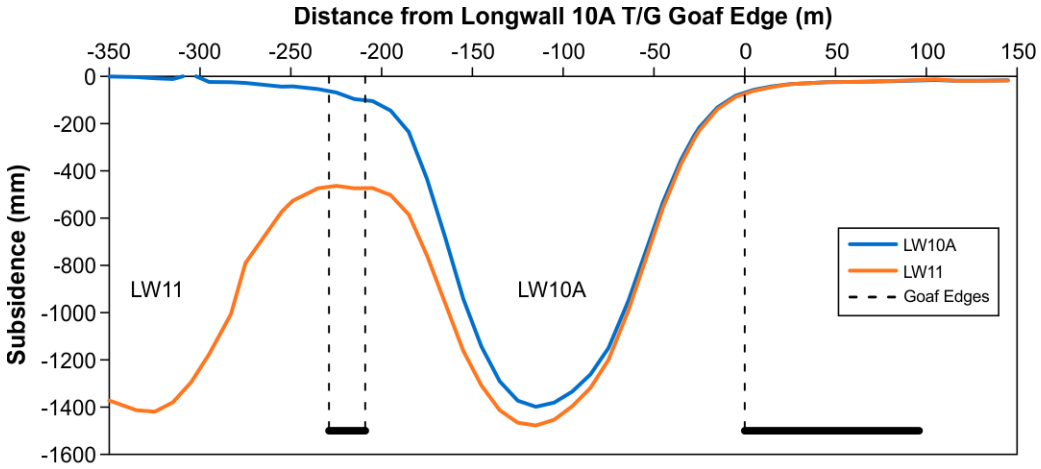


Figure 5: Subsidence profile of Longwalls 10A and 11

There is a section in the middle of the panel where maximum subsidence approaches 1.5m. This maximum subsidence is 55% of the 2.7m nominal mining height (DgS 2011) consistent with general experience in this area of the Hunter Valley.

Subsidence over the 20m wide chain pillars is approximately 470mm in this profile. At an overburden depth of 150m, elastic strata compression subsidence (Mills 1998) is expected to be approximately 200mm (150-250mm), so 470mm of subsidence observed implies the rock column above the chain pillar has softened as a result of the overburden load concentrated onto it by the adjacent longwall extraction. This effect is recognised by Heritage (2017).

The profile shown in Figure 5 indicates the ground surface experiences maximum stretching where the profile transitions from the low subsidence that occurs over the chain pillars. In this profile, at an overburden depth of 160m, the zone of maximum stretching occurs in the range 20-30m from the edge of each panel. This zone is where surface cracking is likely to be most evident.

3.2 Observations of Surface Cracking

Figure 6 shows the surface cracking observed at various stages of mining Longwall 10A. These cracks are consistent with expected subsidence behaviour about longwall panels at overburden depths of 150-250m. Their characteristics are discussed in this section.

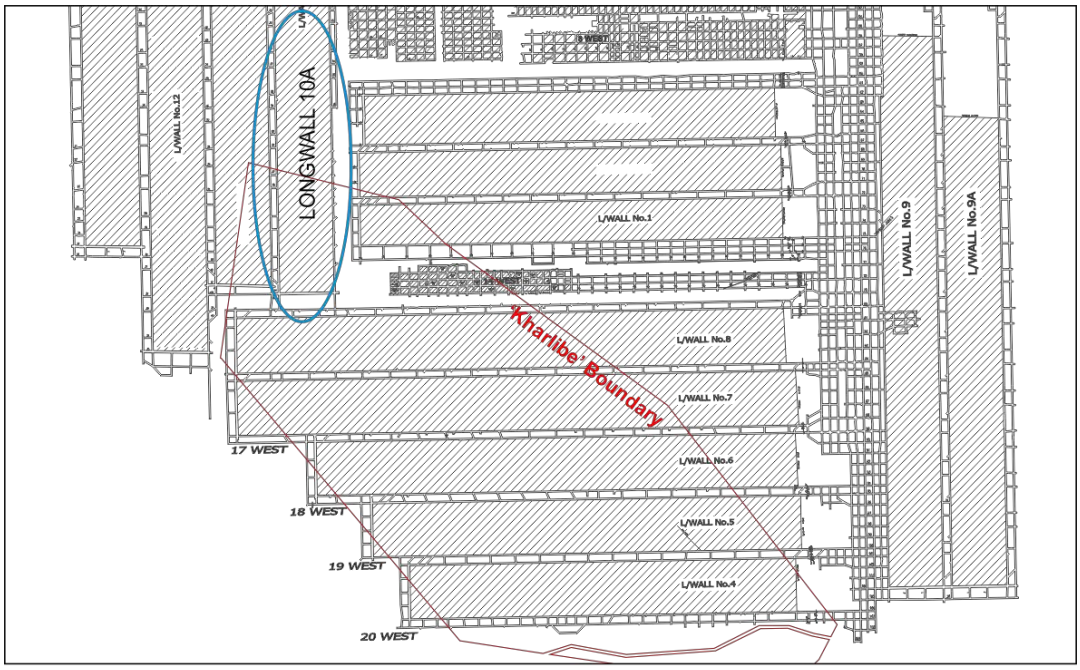
3.2.1 Bedrock Cracking

Cracks in the bedrock strata are observed to occur most prolifically in the interval between the goaf edge and about 30m from the goaf edge on all the solid edges of the extracted panel. Cracks tend to curve around the corners of the panel and the corners of the retreating longwall face because the overburden strata is able to bridge across these corners.

Cracks in the bedrock tend to remain open along the permanent goaf edges. Those cracks that form in the central part of each panel tend to be transitory in nature. The central part of each panel is subject to compression strains that tend to close cracks that may have formed in a stretching part of the subsidence cycle, to close. Cracks that form above the retreating longwall face tend to be temporary in nature and close again as the longwall face moves on.

Cracks tend to be more apparent at the start of the longwall panel because of the tendency for subsiding strata to move laterally in the direction of mining. This tendency combined with the natural systematic ground movements from outside the panel toward the longwall panel add together to create permanent cracks that are generally wider at the start of each longwall panel.

Cracks are more prolific on the uphill side of the panel consistent with the phenomenon of downslope horizontal movements described by Mills (2001). This phenomenon involves a tendency for subsiding strata to move horizontally in a downslope direction.



Location of Longwall 10A

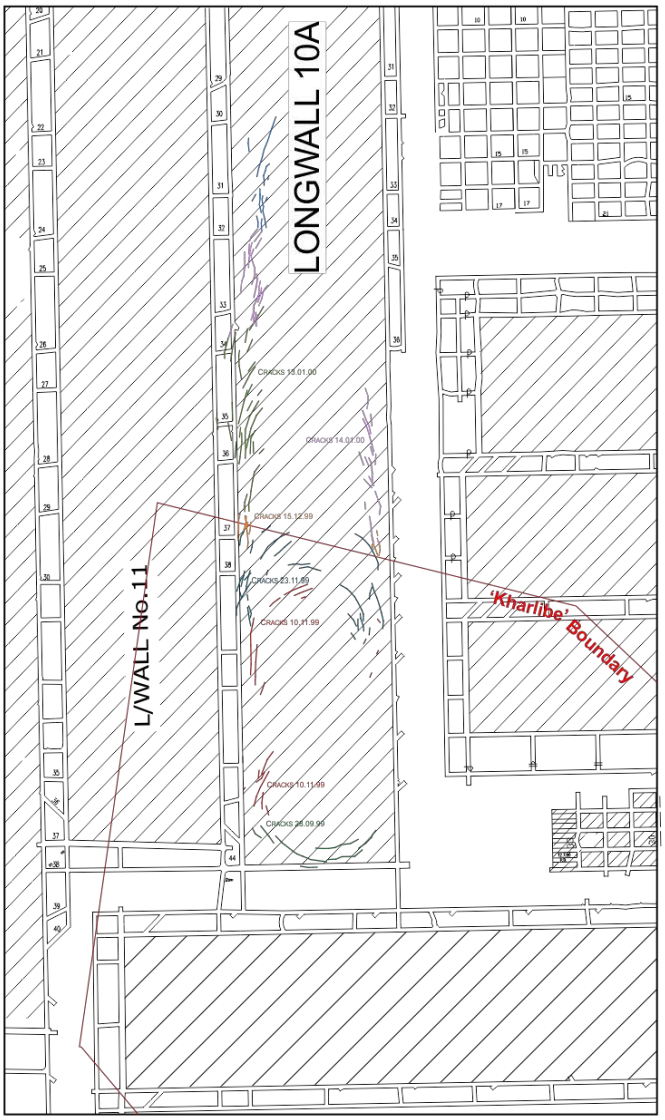


Figure 6: Location of cracks observed over Longwall 10A

3.2.2 Maximum Tensile Strains

Holla (1991) provides a guide to the magnitude of maximum tensile strains based on observations in the Western Coalfield of New South Wales. Experience indicates that maximum tensile strains can be estimated in the Hunter Valley using the Holla approach and the formula:

$$E+_{max} = K\ S_{max} / D$$

where $E+_{max}$ is the maximum tensile strain, K is a constant equal to 1500, S_{max} is the maximum subsidence and D is the overburden depth. For maximum subsidence of 1.5m and an overburden depth of 160m, the maximum tensile strain estimated using this approach is 14mm/m.

Experience indicates that cracks are readily apparent in bushland environments and grassland surfaces when the maximum tensile strain exceeds about 5mm/m. The experience at 'Kharlibe' of mining induced cracks being readily observable following longwall mining is consistent with the maximum tensile strains expected.

3.2.3 Crack Widths

DgS (2011) estimates maximum tensile strains in the range 4-9mm/m at the surface for the longwall panels that have been mined below 'Kharlibe' and maximum cracks widths in the range 40-90mm wide.

These crack widths are considered representative of the maximum crack width in rock materials. It is common for the sides of mining subsidence induced cracks that form in soil materials to collapse so that the crack width at the surface may be significantly wider than at the bedrock interface.

3.3 Remote Sensing of Landform Changes

Measurements of the surface landform elevation have been made across 'Kharlibe' on multiple occasions. During the period of mining, multiple surveys were made using photogrammetry. Although, the photogrammetry dataset available to SCT for this study is incomplete and patchy, the data that is available provides a strong indication of the nature of the subsidence that occurred during mining. Since then, two surveys using the LIDAR technique have so far been made; one in 2011 and the other in 2017.

These various surveys provide detail of the landform changes that have occurred across the site during the period of mining and since then. The 2011 LIDAR survey is only available as a contour plot. The surface was reconstructed from the contour plot using a "natural neighbour" interpolation routine. The contour data and this interpolation function has some limitations that are evident in the surface that was regenerated.

Figure 7 shows a three dimensional model of the surface as it is currently (2017 survey). Parts of the surface are also available based on photogrammetric surveys completed prior to mining. There are some limitations in the dataset available, so a complete surface has not yet been possible to construct.

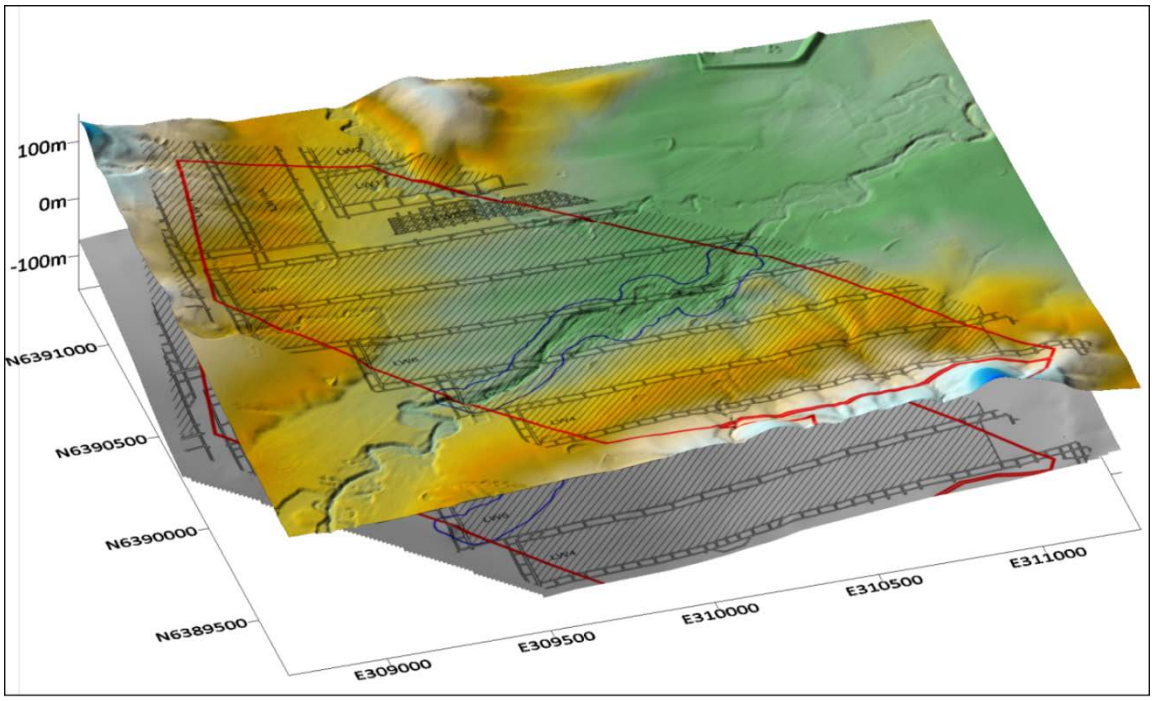


Figure 7: 3D view of current surface and underground workings below 'Kharlibe'

The accuracy of the LIDAR surveys is estimated to be ±0.2m. The photogrammetric surveys appear to have a similar accuracy for the individual panel survey but there are some inconsistencies that degrade confidence in the overall surface generated.

3.3.1 Mining Period

Figure 8 shows a plot of the differences in the pre-mining surfaces measured in the early 1990's using photogrammetry and the surface measured in 2017 using LIDAR. This difference represents the ground movements that have occurred during the period of mining and for two decades after. The pre-mining dataset is limited so there are areas where no data is displayed.

The subsidence troughs that developed in the centre of each panel are clearly evident. Maximum subsidence ranges up to about 1.8m but is generally in the range 1.4-1.6m. Maximum subsidence consistently occurs in the central part of each panel. Subsidence over the chain pillars is generally less than 0.4m and commonly less than 0.2m.

The downcutting of a watercourse through the ground above a chain pillar that subsided less is evident in the southern eastern part of 'Kharlibe'. This downcutting was observed on the ground during the field inspection and is commonly observed in areas where a pre-mining stream gradient re-establishes itself after subsidence.

Changes in water level in dams and other changes in level are also evident.

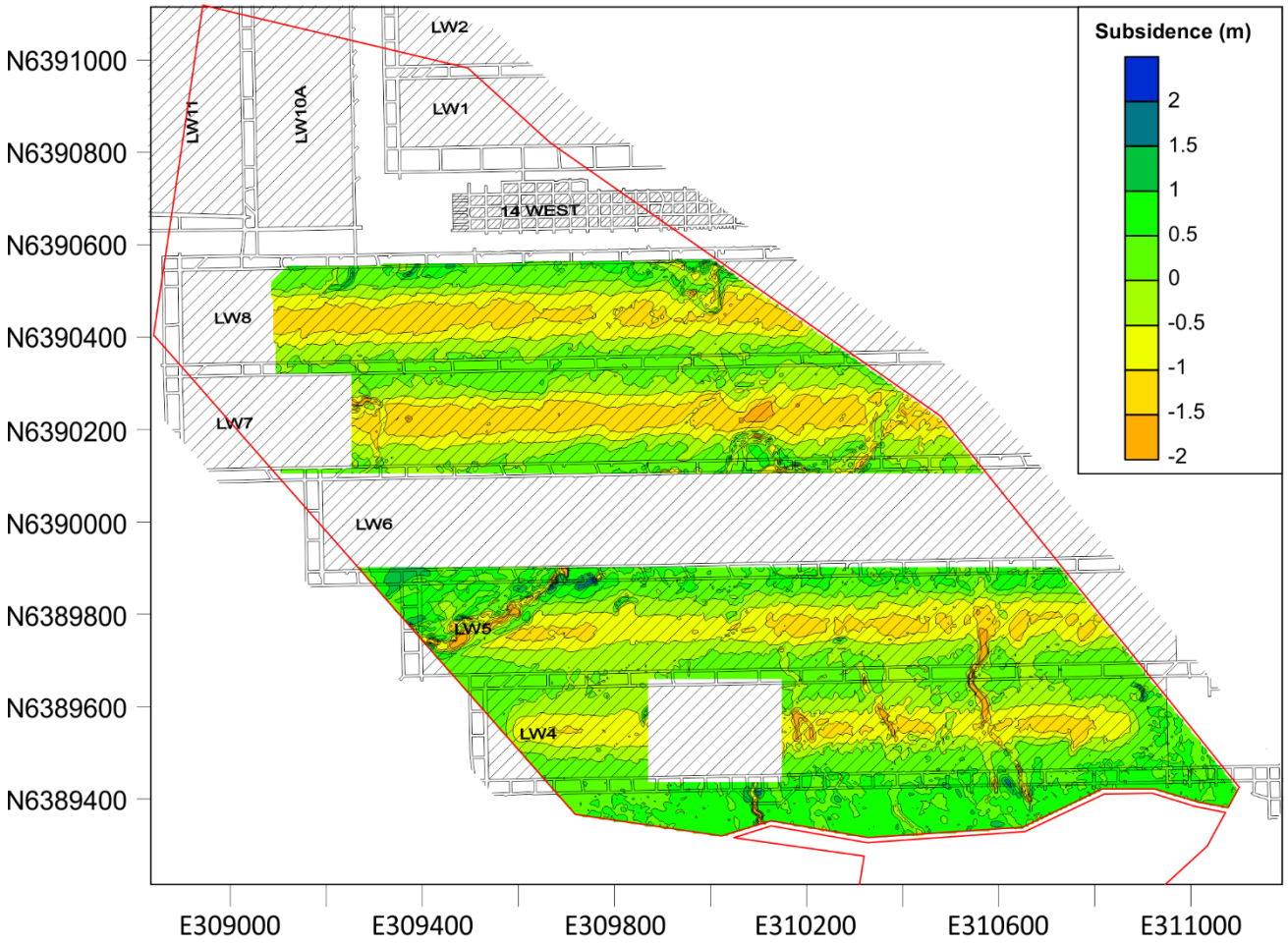


Figure 8: Subsidence Contours

3.3.2 Post Mining Period

Figure 9 shows a comparison of the surfaces for the period between 2011 and 2017. This data indicates that there has not been any significant surface subsidence since 2011.

Although there are some indications of further localised ground movements in the centre of each panel, these apparent movements are considered to be an artefact of interpolation routine used to generate the surface from widely spaced contour lines. The original LIDAR data from the 2011 survey was not able to be sourced for this study. The contours used to generate the 2011 surface are shown in Figure 9. The areas of additional subsidence all occur in areas where the contour lines from the subsided ground profiles are widely spaced.

There is no additional subsidence apparent in the northeast corner of 'Kharlibe' in the period since 2011. North Wambo Mine extracted longwall panels within 240m of 'Kharlibe'. The effect of these longwall panels is clearly apparent in the broader LIDAR image, but there is no indication of further significant subsidence within 'Kharlibe' since 2011 and, therefore, from mining the North Wambo longwall panels.

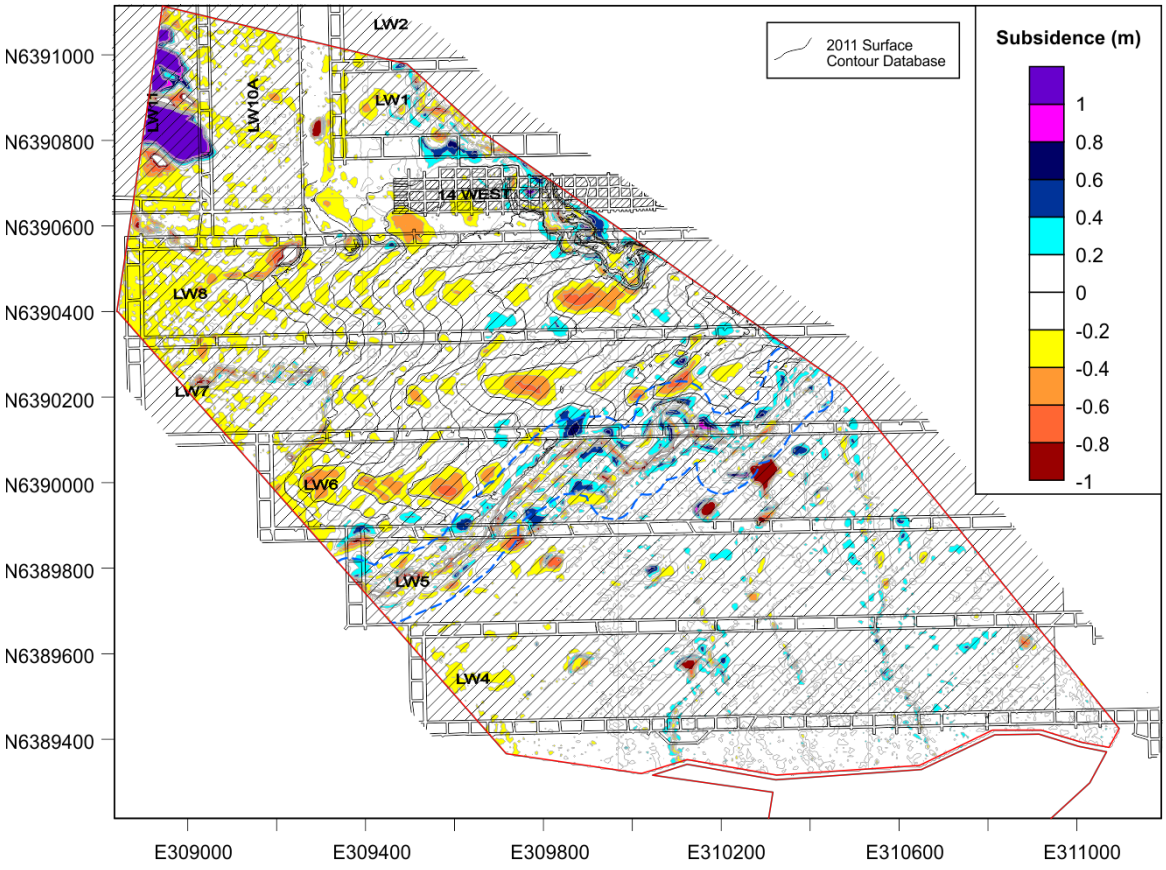


Figure 9: Difference between 2011 and 2017 LIDAR surfaces (noting the 2011 surface was recreated from surface contours as shown)

There are some anomalies evident in the two LIDAR datasets. One of these is evident in the heavily treed area in the northwest corner of 'Kharlibe' where there appears to be upward movement of some metres. This anomaly is likely to be associated with the density of the tree cover and is certainly not real.

4. REMEDIATION ACTIVITIES

This section is aimed to identify suitable rehabilitation objectives and completion criteria for the remediation of direct and indirect subsidence-related impacts. These are suitable for inclusion in the Wambo Mining Operations Plan although the scale of the works is not expected to take more than a few months to complete. Previous rehabilitation activities relating to remediation of subsidence cracks are reviewed. As instructed, subsidence impacts and rehabilitation activities relating to South Wambo Creek and the area within 40m of the top of bank (shown in Figures 1, 7 and 9) are not considered in this report.

A range of features were observed and identified during the surface inspections. These features have been catalogued and referenced by SLR. It should be recognised that the sites identified do not include many sites that have been successfully remediated or any that may have yet to present at the surface.

For the purposes of establishing priorities for remediation, the sites identified have been classified in this section based on the certainty with which they are

subsidence related and not related to other effects. The categories include sites that are:

- clearly subsidence related in their presentation during the surface inspections
- associated with changes in landform causing redirection of flow or erosion
- depressions that may be related to mining subsidence but may have other causes
- fresh cracking that does not have characteristics consistent with mining subsidence.

These categories of feature and the options for remediation are discussed in this section.

4.1 Clearly Subsidence Related

There were numerous features identified during the surface inspections that are clearly related to mining subsidence and the formation of subsidence cracks. These features are characterised by a row of cracks and minor sink holes (typically 200-300mm in diameter and substantially filled with soil material). Most of these features have been previously identified and barricaded with temporary fencing. The list of these features includes:

1. Centre of panel at start of Longwall 4 (Site 1)
2. Along southern edge of Longwall 4 (Sites 10, 12, 17)
3. Longwall 5 fenced area (Site 24)
4. Longwall 5 eastern end (Sites 27, 31)
5. Longwall 6 eastern end (Sites 53 or 54)
6. Longwall 7 eastern end (Sites 73 and 78)
7. Longwall 8 western end (significant area of cracks in bush - Sites 40)
8. Longwall 10A southern end area (cracks in bush – Site 80)
9. Longwall 10A northern end in two fenced areas (Sites 83, 84)

Following consultation with the landowners, the suggested priority for paddocks and works would be:

1. Paddock Y, consisting of, but not restricted to sites 73, 77 and 78
2. Paddock R, consisting of, but not restricted to sites 26, 30, 31, 32, 33, 34, 51, 52, 53 and 54
3. Paddock D, consisting of, but not restricted to sites 25, 26, 27, 29 and 126
4. Paddock F consisting of simple areas (2 off) below the road approaching the house from drums, not restricted to sites 19 and 20

The mechanism that leads to these features is considered to be well understood. This mechanism is effectively a piping failure as described in Ditton (2011). Permanent cracks in the bedrock typically form in the zone between the goaf edge

of each longwall panel and 20-30m over the panel, curving around the corners of the panel (as shown in Figure 6). Many of these cracks may become immediately apparent at the surface. In others dispersive surface soils migrate downward gradually over time.

A cavity or line of cavities form to leave a row of small sink holes and/or an open crack. The gradual migration of dispersive soils and the delayed presentation of subsidence cracks and sinkholes at the surface gives the appearance of ongoing ground movements even though no such movement has occurred.

SCT recommends that these features are the priority focus of remediation activity. It is anticipated that this work could be completed within a few weeks to months with a concerted effort. The priority for which sites are remediated first should be determined in consultation with the landowners to optimise the opportunities for reseeding and reuse of the surface to fit with their ongoing land use requirements.

It is considered quite likely that further lines of sink holes and cracks could continue to develop over time. A "watch and act" approach is recommended as part of the ongoing management of these features to manage any further sink holes that might develop.

It should be recognised that the procedure that was originally used for remediating the subsidence cracks involved ripping and recompacting the soil over a large area. This procedure is unlikely to be effective over the long-term for controlling the potential for sinkholes and cracks to re-emerge. The soil material that is replaced continues to migrate into the bedrock subsidence cracks, particularly following periods of heavy rainfall. In due course, another line of sink holes develops. The reappearance of lines of sink holes and cracks along the edge of panels would be expected if the soil is not stabilised or otherwise prevented from migrating downward into bedrock cracks.

An effective remediation strategy is likely to involve changing the dispersive nature of the soil material so that it is not dispersive, filling the bedrock cracks with coarse grained material and providing a non-dispersive barrier between the soil profile and subsidence crack to prevent downward migration of soil particles.

The concept is to expose the bedrock crack, backfill the crack with stabilised coarse-grained material, place a non-dispersive barrier layer across the crack supported on the coarse-grained material and backfill above the barrier to the surface with a minimum 0.5m of stabilised fill/subsoil and 0.1m of topsoil. Suitable materials to use as a barrier to soil particle movement include a geofabric overlain by a suitably graded 0.3m clay layer.

Appropriate supervision and quality control are necessary to achieve an effective outcome. Improvements on the 50% success rate reported by DgS (2014) for the approach of excavation and backfilling are expected.

The exposing of bedrock cracks may not be practical in some areas because of the depth to bedrock or because other surface features make such activities difficult. For example, in bushland areas where complete remediation may involve removal of trees, the potential to cause additional impacts appears likely to be

disproportionate to the benefits. Consultation with the landowners is recommended to determine whether the benefits are considered to outweigh the impacts of doing the work. In some cases, minor works followed by soil stabilisation may give a more practical outcome without causing unnecessary disturbance to the surface.

The schedule for this work program to remediate surface cracks needs to be developed in consultation with Wambo, the landowners and the Resource Regulator, but the scope of the work program is relatively small. It is anticipated that most of the physical works could be completed within a few months of concerted effort once permissions had been obtained.

The work required to stabilise Stony Creek, ongoing care and maintenance of re-established pasture and ongoing monitoring to confirm remediation effectiveness would be ongoing for some years and perhaps up to a decade or more depending on the outcomes observed.

4.2 Changes to Landform

Changes to the landform are evident across 'Kharlibe'. In most areas, the changes have been managed, for example through re-fencing to align with the longwall panels and minor earthworks to redirect surface flows. There are some areas where the final landform has caused increases in surface gradients leading to nick-point erosion. In most areas this erosion is relatively minor in the context of other adjacent agricultural impacts unrelated to subsidence. A more significant impact, however, has been along Stony Creek where a nick-point has formed and led to degradation and redirection of the flow channel over several hundred metres.

SCT does not have expertise in the management and control of nick-point erosion, but the development of a control strategy is recommended if further impacts are to be avoided. It is understood that SLR has addressed the remediation effort that would be required.

The landform has also been changed for a variety of reasons, some of which are related to mining but not mining subsidence.

Site 91 located in the northeast corner of 'Kharlibe' adjacent to Stony Creek is understood to have been used by Wambo as a borrow pit for post-mining landform management. The excavation is understood to be ineffective as a dam and remains unused. Refilling with soil material would return the area to agricultural use, but a decision to undertake any works should be made in consultation with the landowners.

A backfilled drill sump (Site 62) excavated for exploration drilling activities at the western end of Longwalls 6 and 7 has settled over time to leave a minor depression in the surface. The location of this site was not accurately surveyed during the site inspection and although it is shown over Longwall 6, the depression is understood to be located further to the north over Longwall 7. The depression is several metres across but not significantly out of context with nearby contour drains. Filling of this depression is considered a low priority.

4.3 Minor Depressions

There are numerous minor depressions evident across the site. These include:

- small cone shaped depressions typically less than 1 metre diameter and less than 200mm deep with an apparently solid bottom
- depressions and holes clearly associated with decaying tree stumps (example excavated above Longwall 8 and found to be tree stump)
- depressions and holes associated with soil disturbance (example on road edge to the south of Longwall 4 well outside the area of subsidence)
- sunken fence posts
- depressions and holes that are formed within 10m of Stony Creek and other minor tributaries consistent with animal activity and erosion of soils caused by piping failure around the creek banks
- collapsed wombat holes (numerous along the edges of watercourses)
- animal scrapings / wallows (example is a depression above centre of large block of solid coal to the west of 14 West Panel is not subsidence related)
- rotted fence post holes (boundary fence above 14 West and Longwall 8)
- disturbance to the natural landform associated with normal farming activities (for instance cleaning out dams or piling up fallen tree branches).

The origin of most of the depressions and sunken fence posts is not considered likely to be related to mining activity. Minor excavation of a representative number would be needed to confirm the absence of mining influence. One sinkhole that had recently emerged near the start of Longwall 8 as a small round hole was excavated by hand during the surface inspections and found to be the result of a decaying tree stump. The sudden and ongoing appearance of these features, particularly the sudden appearance of small holes, could reasonably be mistaken as subsidence related. However, natural process associated with tree stump decay are considered the more likely cause for the majority of sites.

The process of remediating these features would involve backfilling and compacting the soil material to fill the depressions. The requirement to undertake this work would depend on the outcomes of initial investigations on the origin of these features and Wambo's willingness to undertake remediation of non-subsidence related remediation. The total work involved is expected to be less than a few weeks.

4.4 Cracking of Recent Origin (Shrink/Swell Cracking)

There are numerous examples of cracks that are fresh and have formed recently. These cracks are considered to be associated with soil shrinkage following the extended period of below average rainfall. These cracks are typically too small to present a safety hazard to stock or personnel. Examples include cracks:

- near top of minor ridge adjacent to watercourse over Longwall 4
- near the start of Longwall 5
- near the road above Longwall 5

- a line of holes / cracks above the centre of Longwall 7
- multiple cracks in the Longwall 8 starting area (in bushland).

These cracks are also observed in areas remote from mine subsidence. They are expected to disappear when the soil is rehydrated following rain.

4.5 Strategies Not Recommended

The practice of broad scale ripping of the near surface appears likely to cause significant disturbance to the fragile soil profile without being particularly effective. This practice does not specifically target the areas where bedrock subsidence cracks are located and sink holes are likely to appear. Furthermore, it can cause broad scale disturbance and degradation of the soil. Once complete, the potential for re-emergence of further sink holes and cracks is likely to be high as demonstrated by the fresh sink holes and cracks that have been observed since about 2010.

4.6 Built Features

The review of subsidence monitoring data available for the site indicates that subsidence movements are complete and have been complete since soon after mining finished in 2001.

Built features such as the main residence, farm sheds and fences are not expected to experience any additional ground movements caused by mining subsidence beyond those experienced during the period of active mining.

4.7 Stockpiles

There are several stockpiles of material that relate to previous remediation activities. It is recommended that all stockpiles are removed from site during the proposed remediation activities.

5. REFERENCES

DgS 2011 "Assessment of Surface Pothole Sites above Longwalls 4 to 8 at the Abandoned Homestead Mine, Warkworth." Ditton Geotechnical Services Pty Ltd Report to North Wambo Mine dated 24 November 2011.

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Holla L. 1991 "Evaluation of Surface Subsidence Characteristics in the Western Coalfield of New South Wales" Australian Coal Journal No 31 1991 pp19-30.

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APPENDIX C

Risk Assessment

Risk Register for the Fenwick Property Subsidence Remediation Plan

Aspect	Risk Reference Number	Potential Issue / Risk	Existing Controls and/or Management Responses	Existing Controls					Proposed Additional Controls / Recommended Actions	Responsibility
				C	L	R				
Sites within 30 m of goaf edge that are clearly related to subsidence	**1**	Personal safety through pedestrian or vehicle movements	GIS data set Markers (informal use of branches, rocks etc.)	3	C	3C	13	(H)	Develop the Subsidence Remediation Plan Temporary fencing Remediation program	WCPL, SCT, SLR
	2	Livestock injury or equipment damage	Paddock rotation Temporary fencing Markers (informal use of branches, rocks etc.) Remedial works	4	D	4D	21	(L)	Develop the Subsidence Remediation Plan Temporary fencing Remediation program	WCPL, SCT, SLR
Sites within 30 m of goaf edge that may be related to subsidence	**3**	Personal safety through pedestrian or vehicle movements	GIS data set Markers (informal use of branches, rocks etc.)	4	D	4D	21	(L)	Develop the Subsidence Remediation Plan Remediation program Test pit program to identify cause of impacts	WCPL, SCT, SLR
	4	Livestock injury or equipment damage	Markers (informal use of branches, rocks etc.)	5	C	5C	22	(L)	Develop the Subsidence Remediation Plan Remediation program Test pit program to identify cause of impacts	WCPL, SCT, SLR
Landform changes	**5**	Property damage/loss of land, resulting from changes to drainage paths and associated erosion	Remedial works Paddock fencing/stock exclusion	3	C	3C	13	(H)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
	6	Environmental impacts resulting in erosion	Paddock fencing/stock exclusion	3	C	3C	13	(H)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
	7	Property damage resulting from minor changes to drainage paths or ponding	Not applicable	4	D	4D	21	(L)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
Sites within 10 m of watercourse bank	**8**	Personal safety through pedestrian movements	GIS data set Markers (informal use of	5	D	5D	24	(L)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
	9	Livestock injury	GIS data set Markers (informal use of	5	E	5E	25	(L)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
Sites beyond 30 m of goaf edge or 10 m of watercourse bank	**10**	Personal safety through pedestrian movements	GIS data set Markers (informal use of branches, rocks etc.)	5	C	5C	22	(L)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
	11	Livestock injury or equipment damage	GIS data set Markers (informal use of branches, rocks etc.)	5	D	5D	24	(L)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
Human induced impacts (e.g. man-made structures, less than adequate rehabilitation etc.)	**12**	Rock structures within South Wambo Creek resulting in environmental impacts	GIS data set Paddock fencing/stock exclusion	2	C	2C	8	(H)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
	13	Less than adequate remedial works resulting in minor environmental impacts	GIS data set	4	C	4C	18	(M)	Develop the Subsidence Remediation Plan* Remediation program *Seek advise from DPE and the RR regarding the remediation within South Wambo Creek.	WCPL, SCT, SLR
Sites where historical impacts were observed and rehabilitated	**14**	Loss of historical records and data regarding previous works/impacts, resulting in inadequate management	GIS data set Records of previous works and studies	4	C	4C	18	(M)	Supervision of remediation works Incorporate records of previous remedial works into monitoring program	WCPL, SCT, SLR
Land use	**15**	Remedial works not to the satisfaction of the landowners and the RR	Consultation with all stakeholders during development of the Subsidence Remediation Plan	3	D	3D	17	(M)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
Approvals	**16**	Delays to development of Subsidence Remediation Plan resulting from failure to receive timely clarification regarding South Wambo Creek remedial works	Not applicable	3	D	3D	17	(M)	Develop the Subsidence Remediation Plan Remediation program	WCPL, SCT, SLR
Water impacts	**17**	Being addressed by separate process with DPE and excluded from the scope of the risk assessment.								

Table 1: Risk Matrix

Likelihood Rating	Consequence Rating 1	2	3	4	5
A	1 (Ex)	2 (Ex)	6 (H)	10 (H)	15 (M)
B	3 (Ex)	5 (Ex)	9 (H)	14 (M)	19 (M)
C	4 (Ex)	8 (H)	13 (H)	18 (M)	22 (L)
D	7 (H)	12 (H)	17 (M)	21 (L)	24 (L)
E	11 (H)	16 (M)	20 (M)	23 (L)	25 (L)

Table 2: Likelihood Category and Criteria

Category		Criteria
A	Almost Certain	Will occur at least once or multiple times each year. > 95% likelihood
B	Likely	Will occur multiple times in a year. 75% - 95% likelihood
C	Possible	Will probably occur at least once 2-5 years. 25% to 75% likelihood
D	Unlikely	Will occur once every 5-20 years. 5% to 25% likelihood.
E	Rare	Will occur every +20 years. <5% likelihood.

Table 3: Consequence Criteria

Rank	Health & Safety	Property Damage ($AUD)	Environment	Community/Reputation
1	Fatality(s)	>$1M loss or gain	Long term effects on environment requiring major remediation	Major damage to reputation receiving national or international negative media
2	Permanent or total disability resulting in an inability to work	$250K - $1M loss or gain	Medium to long term impacts requiring significant remediation	Major damage to reputation receiving state wide negative media
3	Significant medical treatment resulting in temporary inability to work	$50K – 250K loss or gain	Serious short to medium term requiring moderate remediation	Moderate damage to reputation localised to the regional media
4	Medical treatment or injury resulting in change of normal duties	$5K – $50K loss or gain	Reversible impacts requiring minor remediation	Some local public concern
5	First aid injury. Treatment on site return to normal duties	<$5K loss or gain	Limited damage to minimal area of low significance or previously disturbed areas requiring very minor or no remediation	No impact on stakeholders or reputation

Table 4: Risk Ranking

Risk Ranking		Description	Action
1 to 5	Extreme Risk	Risks that significantly exceed the risk acceptance threshold.	Control Review Plan must be Developed
6 to 13	High Risk	Risks that exceed the risk acceptance threshold.	
14 to 20	Moderate Risk	Risk acceptance threshold.	Control Review Plan may be Developed
21 to 25	Low Risk	Risks that are below the risk acceptance threshold.	

APPENDIX D

Field Sheets

Kharlibe Site Assessment									
Site	No evidence of surface cracking or pothole/slumping	Minor surface cracking <5 cm wide or pothole/slumping <0.2 m wide and <0.2 m in depth	Surface cracking >5 cm wide or pothole/slumping >0.2 m wide and >0.2 m in depth	Subsidence Type	Length	Width	Depth	Comment	Tick if Amber or Red
	Green	Amber	Red						Response Needed

Kharlibe Rehabilitation Assessment

Site Number:		**Monitoring Date:**	
		Monitored By:	

Temporary Fencing

Condition		Rating
G	Temporary fencing was installed as required, as specified by the SRP	
R	Temporary fencing was not installed as required, as specified by the SRP	

Comments:

Vegetation - Groundcover

Condition - Woodland		Rating
G	Two years following rehabilitation to woodland, vegetative cover (vegetation, leaf litter, mulch) is within 10-20% of analogue sites	
A	Two years following rehabilitation to woodland, total ground cover (vegetation, leaf litter, mulch) is within 20-40% of analogue sites	
R	Two years following rehabilitation to woodland, total ground cover (vegetation, leaf litter, mulch) is more than 40% of the range of analogue sites	
Condition – Pasture or Native Grassland		Rating
G	Following rehabilitation to pasture or native grassland, vegetative cover (vegetation, leaf litter, mulch) is within 10-20% of analogue sites	
A	Following rehabilitation to pasture or native grassland, total ground cover (vegetation, leaf litter, mulch) is within 20-40% of analogue sites	
R	Following rehabilitation to pasture or native grassland, total ground cover (vegetation, leaf litter, mulch) is more than 40% of the range of analogue sites	

Comments:

Rehabilitation Success – Rehabilitation Repair Monitoring

Condition		Rating
G	Inspections do not identify any failures at rehabilitation sites	
A	Inspections identify failure at rehabilitation sites (e.g. erosion, weed infestation, or pest animal activity)	
R	Inspections identify multiples failures at several rehabilitation sites (e.g. erosion, weed infestation, or pest animal activity)	

Comments:

Landform Stability – Erosion Control

Condition		Rating
G	No gully or tunnel erosion. No rilling present	
A	Minor gully or tunnel erosion present and/or rilling <100 mm deep	
R	Significant gully or tunnel erosion present and/or rilling >100 mm deep	

Comments:

Kharlibe Rehabilitation Assessment

Landform Stability – Drainage Condition

Condition		Rating
G	No drainage issues identified at rehabilitation sites	
A	Landforms exhibiting minor drainage issues, such as erosion due to changed upslope flow regimes, but does not threaten to cause rehabilitation failure	
R	Landforms exhibiting significant drainage issues, such as erosion due to changed upslope flow regimes, threatening or causing rehabilitation failure	

Comments:

Dam and Watercourse Stability – Creek Stability

Condition		Rating
G	No creek stability issues identified at rehabilitation sites within Stony Creek (activity rating >70).	
A	Remediated creek sites exhibit minor stability issues and/or do not meet remediation criteria but do not threaten to cause rehabilitation failure or significant adverse environmental impacts. CSIRO Stream Health Assessment indicates that the creek is 'Potentially Stabilising' or 'Active' (activity rating 50 – 69)	
R	Remediated creek sites exhibit significant stability issues, threatening or causing rehabilitation failure and/or significant adverse environmental impacts. CSIRO Stream Health Assessment indicates that the creek is 'Very Active' (activity rating <50)	

Comments:

Dam and Watercourse Stability – Dam Stability

Condition		Rating
G	No dam or overflow stability issues identified.	
A	Dam and dam overflow sites exhibit minor stability issues but do not threaten to cause rehabilitation failure (if applicable) or significant adverse environmental impacts or safety impacts.	
R	Dam and dam overflow sites exhibit significant stability issues, threatening or causing rehabilitation failure (if applicable), significant adverse environmental impacts and/or safety concerns.	

Comments:

Remediation with Suitable Pasture Species for Farming – Grassland Pasture Species

Condition		Rating
G	Visual inspection of remediated sites identifies at least 75% of species surveyed are representative of pasture species from the approved pasture mix sown into each remediation area.	
A	Visual inspection of remediated sites identifies less than 75% of species surveyed are representative of pasture species from the approved pasture mix sown into each remediation area.	
R	Visual inspection of remediated sites identifies less than 50% of species surveyed are representative of pasture species from the approved pasture mix sown into each remediation area.	

Comments:

Monitoring Requirements

Condition	Action	
All Conditions Green	No further monitoring needed	
Amber or Red Conditions Present	Continue monitoring	

Kharlibe Stream Assessment			
Creek Name:		**Monitoring Date:**	
Site Number:		**Monitored By:**	
Vegetation			
1	Little or no vegetation growing		
2	Any vegetation present is short-lived: partial burial of plants by sediment		
3	Dense perennial plant cover, similar to vegetation on bank; wetland species composition: no burial by sediment		
Drainage Line Floor	**Rating:**		
Drainage Line Walls	**Rating:**		
Aspect and Shape			
1	Very actively eroding: caving, mass wasting and/or tunnelling present: depth>width		
2	Actively eroding: slight undercutting, near vertical walls, alluvial fans also eroding: depth=width		
3	Potentially stabilising: side walls become rounded and crusted alluvial fan at foot of side walls width>depth		
4	Stabilising: wall angle less than 65°, small inactive alluvial an at foot of side walls: width>depth		
5	Stable: gentle sloping walls, generally low “S” shaped bed/bank continuum: width >depth		
Drainage Line Cross Section	**Rating:**		
Longitudinal Morphology			
1	Currently incising bed in pre-existing loose sediment; benching, scour holes in bed: high flows and erosion		
2	Flat, continuous, loose sediment with signs of recent/frequent movement		
3	Flat with cohesive fine textured “soil-like” bed		
4	Non cascading pools or ponds, with non-slaking, non-dispersive clay base, implying low energy flow		
Drainage Line	**Rating:**		
Types of Materials on Floor			
1	Similar or smaller particle size and/or density than materials in walls (e.g. unconsolidated fine sand deposit)		
2	Slightly larger particle size than and/or denser (more consolidated) than material on walls (e.g. well sorted gravel)		
3	Larger particle size and/or denser material on walls: surface armouring (e.g. cobbles, competent country rock)		
Drainage Line Floor	**Rating:**		
Material on Walls			
1	Dispersive material is exposed for >1m of wall height		
2	Materials that slake rapidly, or disperse are exposed to >0.3m and <1m of vertical wall height		
3	Materials that slake and/or disperse are exposed to <0.3m of wall height		
4	Materials that do not slake or disperse are exposed on wall surface		

Kharlibe Stream Assessment		
Drainage Line Walls	**Rating:**	
Nature and Shape of Bank Edge		
1	Very steep slope, >30° creating high velocity flow	
2	Steep bank, 10-30°, permitting moderate to high velocity lows	
3	Moderately sloped bank, 5-10°	
4	Gently sloped bank/floodplain, laterally extensive, <5°	
5	Flat bank/floodplain, laterally extensive	
Stream Bordering Flats and/or Slopes	**Rating:**	
Lateral Flow Regulation		
1	Side arm channel inflow: very high inflow rates	
2	Bare bank, laterally extensive	
3	Sparse grassland/woodland with bare soil bank lip: moderate flow rate, some highly focused inflow locations	
4	Dense grassland: low inflow rate, mostly diffuse	
5	Woodland with denser litter: very low, diffuse inflow rate	
Into Drainage Line	**Rating:**	
Total Rating		
Rating Total (out of 32)		
Rating Total (%)		
Classification	**Action**	
Stable (>70 %)	No further monitoring needed	
Active (<70%)	Continue monitoring	
Details of Photographs		
Photo Number	Description	
	Right Hand Bank (Looking Downstream)	
	Upstream	
	Downstream	
	Left Hand Bank (Looking Downstream)	
General Comments		

Kharlibe Remediation Assessment			
Site Number:		**Assessment Date:**	
		Assessed By:	

Requirements – All Sites		
Remediation Steps	**Photo Number**	**Completed**
Temporary fencing was installed as required, as specified by the SRP		
If remediation works intersect farm fences, liaise with landowner and photograph to record existing condition prior to removing any fence.		
Contractor vehicles are maintained in a clean condition (i.e. no dried mud, vegetation or seeds on exterior of vehicles) and will travel through Bulga		
All waste generated on site is removed from the site each day		

Requirements - Clearly Subsidence Related		
Remediation Steps	**Photo Number**	**Completed**
Backfilling of exposed bedrock crack with coarse grain material		
Application of Geofabric		
Application of minimum 300 mm of clay loam or silty clay loam soil type		
Application of compacted soil/fill of minimum depth 500 mm (with gypsum if required by soil testing)		
Application of suitable soil/fill of minimum depth 500 mm (if farming/cropping area) (with gypsum if required by soil testing)		
Application of topsoil to minimum depth 100 mm		
Application ameliorants if required by soil testing (at rate specified by Table 2 of the Subsidence Remediation Plan)		
Surface is suitably prepared as outlined in Section 10.3.1.4 of the Subsidence Remediation Plan		
Backfilling to slightly higher than surrounding surface (50 mm – 100 mm)		
Seeding with recommended seed mix (pasture, woodland, riparian or native grassland) in consultation with the landowner		

Requirements – Changes to Landform		
Remediation Steps	**Photo Number**	**Completed**
Backfilling (if required)		
Shaping works (to achieve maximum grade of 3(H):1(V))		
Scarified to depth of 100 mm		
Application of topsoil to minimum depth 100 mm		
Application of gypsum at 0.5 kg/m^2		
Seeding with recommended seed mix (pasture, woodland, riparian or native grassland) in consultation with the landowner		

Kharlibe Remediation Assessment		
Requirements – Human Induced Impacts		
Remediation Steps	**Photo Number**	**Completed**
Backfilling using suitable material (sites 62 and 126)		
Scarified to depth 100 mm (sites 62 and 126)		
Ripping to maximum depth 500 mm (sites 11, 25, 71, 89, 93 and 127)		
Application of topsoil to a maximum of 100 mm (sites 11, 25, 62, 71, 89, 93 and 126) or 50 mm (site 127)		
Application of required amelioration at rate specified by Table 2 of the Subsidence Remediation Plan)		
Seeding with recommended seed mix (pasture, woodland, riparian or native grassland) in consultation with the landowner		
Requirements – Other Observed Locations		
Remediation Steps	**Photo Number**	**Completed**
Backfilling using suitable material		
Scarified to depth of 100 mm		
Application of required amelioration at rate specified by Table 2 of the Subsidence Remediation Plan)		
Seeding with recommended seed mix (pasture, woodland, riparian or native grassland) in consultation with the landowner		
Final Condition		
Required works fully completed		
Required works not fully completed (provide further remedial actions below)		
Further Remedial Actions Required:		
General Comments:		
Comments:		
Signed by Assessor:		

ASIA PACIFIC OFFICES

BRISBANE
Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

CANBERRA
GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

DARWIN
5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

GOLD COAST
Ground Floor, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

MACKAY
21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

MELBOURNE
Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

NEWCASTLE
10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

PERTH
Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

ROCKHAMPTON
rockhampton@slrconsulting.com
M: +61 407 810 417

SYDNEY
2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

TAMWORTH
PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

TOWNSVILLE
Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

AUCKLAND
68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

NELSON
5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

NEW PLYMOUTH
Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695