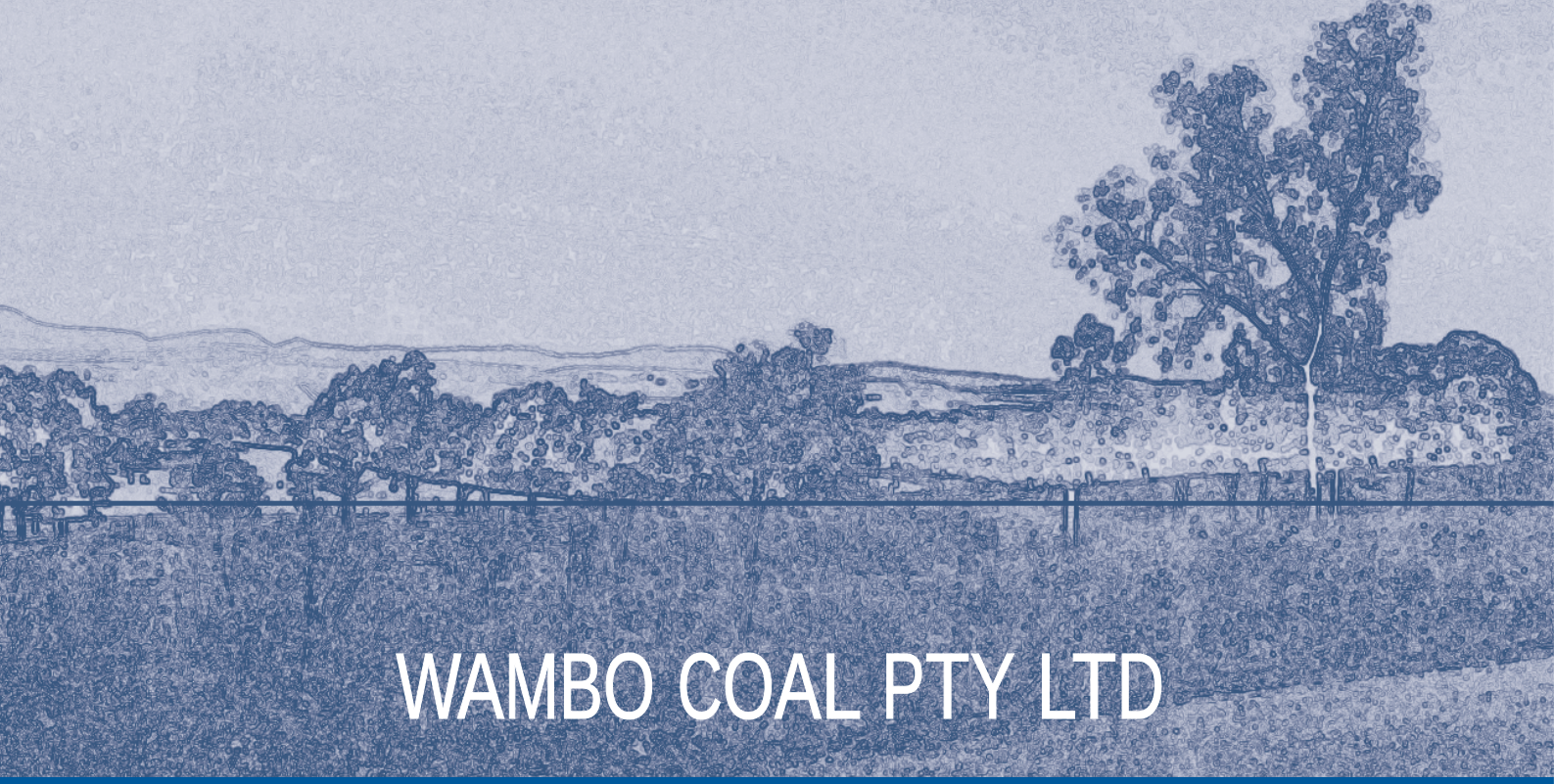


WAMBO COAL PTY LTD

NORTH WAMBO UNDERGROUND MINE

EXTRACTION PLAN
LONGWALLS 8 TO 10A

APPENDIX G

COAL RESOURCE RECOVERY PLAN
(Including Plans 1 to 7)

Peabody ENERGY

WAMBO COAL PTY LTD
NORTH WAMBO UNDERGROUND MINE

COAL RESOURCE RECOVERY PLAN
LONGWALLS 8 - 10A

PREPARED BY
WAMBO COAL PTY LTD

APRIL 2015
Project No. WAM-09-15
Document No. 00666447.docx

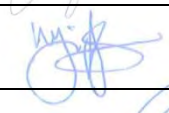
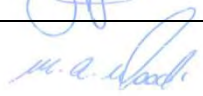
DOCUMENT CONTROL

Document No.	CRRP LW8-10A
Title	Coal Resource Recovery Plan for North Wambo Underground Mine Longwalls 8 – 10A
General Description	A plan demonstrating the effective recovery of the available resource from the mining of Longwalls 8 – 10A at the North Wambo Underground Mine
Key Support Documents	Wambo Coal Extraction Plan for North Wambo Underground Mine Longwalls 8 – 10A

Revisions

Rev No	Date	Description	By	Checked
A	November 2012	Original Draft	WCPL and Resource Strategies	-
B	December 2012	Final for Submission	WCPL and Resource Strategies	P. Fletcher
C	February 2014	Revised to include Longwalls 9 and 10	WCPL and Resource Strategies	M. Millgate
D	April 2015	Revised to include Longwall 10A	WCPL and Resource Strategies	M. Millgate

Approvals

	Name	Position	Signed	Date
Originator	T. Favell	Environment and Community Manager		10/04/2015
Checked	T. Britten	Technical Services Manager		10/04/2015
Confirmed	M. Wood	NWU Manager of Mining Engineering		10/04/2015

The nominated Coordinator for this document is	NWU Technical Services Superintendent

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1 INTRODUCTION

The Wambo Coal Mine is an open cut and underground coal mining operation located approximately 15 kilometres (km) west of Singleton, near the village of Warkworth, New South Wales (NSW). The Wambo Coal Mine is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited.

The North Wambo Underground Mine is a component of the approved Wambo Coal Mine. The North Wambo Underground Mine commenced in 2005 and involves extraction of coal by longwall mining methods from the Wambo Seam within Mining Lease (ML) 1402, ML 1594, Coal Lease 397 and Consolidated Coal Lease 743 (**Figures 1 and 2**).

The potential environmental impacts of the existing Wambo Coal Mine were assessed in the *Wambo Development Project Environmental Impact Statement* (the Wambo Development Project EIS) (WCPL, 2003). Development Consent DA 305-7-2003 for the Wambo Coal Mine was granted on 4 February 2004 by the then NSW Minister for Urban Affairs and Planning under Part 4 of the NSW *Environmental Planning and Assessment Act, 1979*.

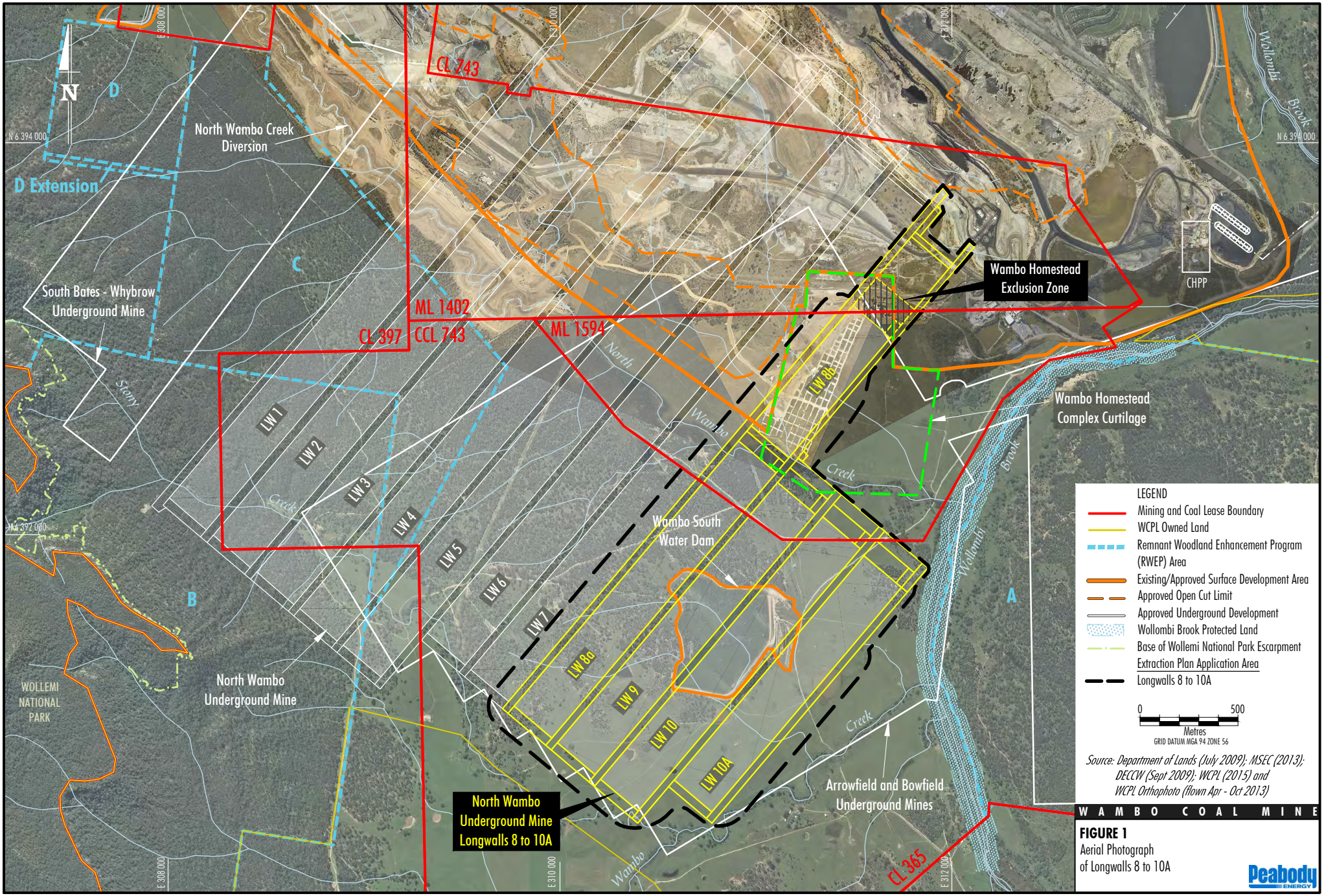
An application to modify the Development Consent (DA 305-7-2003 MOD 2) was lodged in January 2005 to facilitate the re-orientation of the North Wambo Underground Mine longwall panels and allow access to the Wambo Seam via the open cut highwall and was approved on 4 May 2005. The application was accompanied by the *Wambo Development Project – Wambo Seam Underground Mine Modification Statement of Environmental Effects* (North Wambo SEE) (WCPL, 2005).

A subsequent application to modify the Development Consent (DA 305-7-2003 MOD 13) was lodged in December 2012 to allow an extension to the approved North Wambo Underground Mine to include two additional longwalls (Longwalls 9 and 10) and was approved on 8 July 2013. The application was accompanied by the *North Wambo Underground Mine Modification Environmental Assessment* (North Wambo Modification EA) (WCPL, 2012).

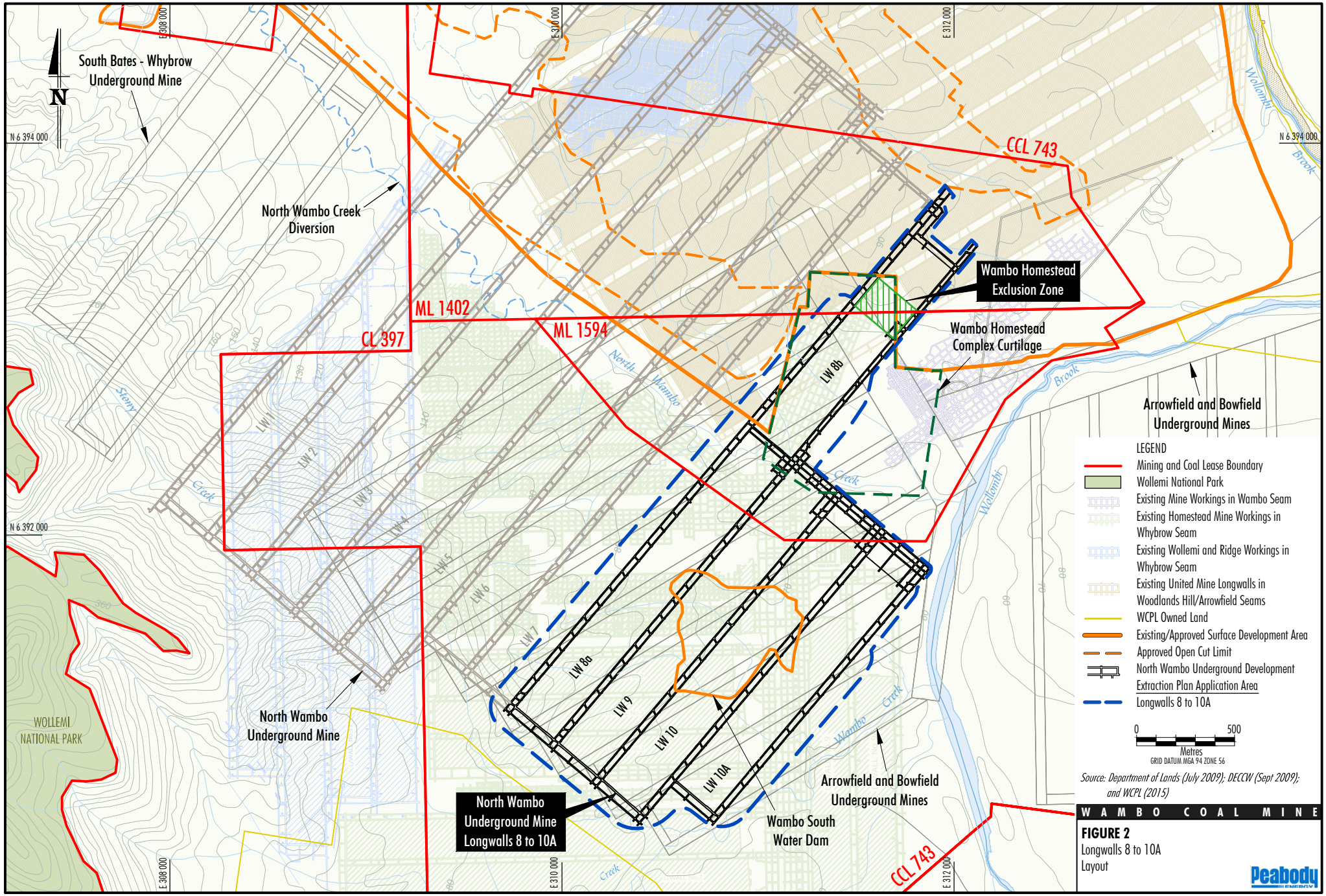
An application to modify the Development Consent (DA 305-7-2003 MOD 14) was lodged in September 2014 to allow a minor extension to the approved North Wambo Underground Mine to include an additional longwall (Longwall 10A). The application was accompanied by the *North Wambo Underground Mine Longwall 10A Modification Environmental Assessment* (North Wambo Longwall 10A Modification EA) (WCPL, 2014).

A Subsidence Management Plan (SMP) for Longwalls 1 to 6 at the North Wambo Underground Mine (WCPL, 2006) was approved by the NSW Department of Primary Industries – Mineral Resources on 11 December 2006. An Extraction Plan for Longwalls 7 and 8 was approved by the NSW Department of Planning and Infrastructure (DP&I) for Longwall 7 on 16 May 2013 and for Longwall 8 on 24 September 2013. Subsequently, a revised Extraction Plan for Longwalls 7 to 10 was approved by the Department of Planning and Environment on 4 July 2014.

The approved Extraction Plan for Longwalls 8 to 10 has been revised to include the remaining longwall within the North Wambo Underground Mine extent (Longwall 10A) for a consolidated Extraction Plan for Longwalls 8 to 10A (**Figures 1 and 2**).



WAM-09-15_EP LW8-10A_CRRP MP_102B



WAM-09-15_EP LW8-10A_CRRP MP_101C

1.1 PURPOSE AND SCOPE

Purpose: This Coal Resource Recovery Plan for Longwalls 8 to 10A has been prepared to demonstrate the effective recovery of the available resource at the North Wambo Underground Mine.

Scope: This Coal Resource Recovery Plan includes Longwalls 8 to 10A of the North Wambo Underground Mine.

This Coal Resource Recovery Plan has been prepared in accordance with Condition 22C(g) of Schedule 4 of the Development Consent (DA 305-7-2003) as a component of the North Wambo Underground Mine Longwalls 8 to 10A Extraction Plan. Condition 22C(g) of Schedule 4 of the Development Consent (DA 305-7-2003) requires:

> *22C. The Applicant shall prepare and implement an Extraction Plan for the second workings within each seam to be mined to the satisfaction of the Secretary. Each Extraction Plan must:*
>
> *...*
>
> *(g) include the following to the satisfaction of the DRE:*
>
> - *a coal resource recovery plan that demonstrates effective recovery of the available resource.*
>
> *...*

Plans 1 to 7 as described in the Draft *Guidelines for the Preparation of Extraction Plans Required under Conditions of Development Consents, Project Approvals and Mining Lease Conditions for Underground Coal Mining* (Version 5) (Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy, 2015) are provided in **Attachment 1**. **Plan 1**, **Plan 2** and the **Plan 7** (**Attachment 1**) present the proposed mine plan, Longwalls 8 to 10A Application Area and surface features overlying Longwalls 8 to 10A. **Plan 5** presents the current WCPL mining tenements and details land ownership.

This Coal Resource Recovery Plan forms part of WCPL's Environmental Management System for the Wambo Coal Mine. The relationship of this Coal Resource Recovery Plan to the Wambo Coal Mine Environmental Management System is described in Section 1.2 of the Extraction Plan.

2 RESOURCE DESCRIPTION

2.1 SITE GEOLOGY OVERVIEW

The Wambo Coal Mine is situated within the Hunter Coalfield subdivision of the Sydney Basin, which forms the southern part of the Sydney-Gunnedah-Bowen Basin (WCPL, 2003). The coal bearing rocks of the Sydney Basin are Permian in age and are typically associated with low-lying gentle topography (WCPL, 2003). The overlying rocks of Triassic age cover large parts of the Sydney Basin and tend to form prominent escarpments where they outcrop (WCPL, 2003).

Mining activities at the Wambo Coal Mine include both open cut and underground mining of several coal seams from the Wittingham Coal Measures, which combine with the Newcastle Coal Measures to form the Singleton Supergroup (**Figure 3**). A summary of the coal measure stratigraphy underlying the Wambo Coal Mine area is provided in **Figure 3**.

Wittingham Coal Measures are divided into the Jerrys Plains Subgroup, Vane Subgroup, Denman Formation and Archerfield Sandstone (WCPL, 2003). The Jerrys Plains Subgroup contains eight formations with 15 named coal seams (WCPL, 2003). The Jerrys Plains Subgroup is up to 800 metres (m) thick and generally consists of relatively coarse clastic sediments (DMR, 1993). 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, 2003).

Coal seams previously, currently and proposed to be mined at the Wambo Coal Mine include (**Figure 3**):

- Whybrow Seam;
- Redbank Creek Seam;
- Wambo Seam;
- Whynot Seam;
- Arrowfield Seam; and
- Bowfield Seam.

These seams dip gently to the south-west at approximately 2 to 3 degrees with minor local variations due to varying thicknesses of inter-seam sediments and fault zones (WCPL, 2003). Faulting usually trends north or north-east to south-west with normal throws of up to 10 m with some low angle thrusts (i.e. reverse faults) of variable throw (MineConsult, 2001).

The North Wambo Underground Mine mines the Wambo Seam which produces a low ash thermal coal (WCPL, 2003). Run-of-mine (ROM) coal is crushed and washed at the Wambo Coal Mine coal handling and preparation plant. Product coal from the North Wambo Underground Mine is considered suitable for export and domestic markets.

2.2 OVERBURDEN LITHOLOGICAL AND GEOTECHNICAL CHARACTERISTICS

The overburden of the Longwalls 8 to 10A Application Area consists of gently, south-west dipping sedimentary strata comprising medium strength thin to medium interbedded sandstone and siltstone with some thickly bedded sandstone units (Ditton Geotechnical Services [DgS], 2012; Mine Subsidence Engineering Consultants [MSEC], 2014a; MSEC, 2014b).

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
			Milbrodale Formation	
			Mount Thorley Formation	***Arrowfield Seam*** [2]
				Bowfield Seam [2]
				Warkworth Seam [3]
			Fairford Formation	
			Burnamwood Formation	*Mount Arthur Seam*
				Piercefield Seam
				Vaux Seam
				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, previously and proposed to be mined at the Wambo Coal Mine.
[3] Coal reserves to be mined by the Wambo Coal Mine where the upper three plies of the Warkworth Seam combine with the two plies of the Bowfield Seam.

After: DMR (1993)

WAMBO COAL MINE

FIGURE 3
Stratigraphy of the
Wambo Coal Mine Area

Peabody ENERGY

The typical stratigraphy over the longwalls indicates the presence of several sandstone strata units that are 2 to 43 m thick and located 0.2 m to 185 m above the Wambo Seam (MSEC, 2014a). The sandstone unit that is most likely to reduce subsidence is approximately 25 m to 35 m thick and is 47 m to 61 m above the Wambo Seam (DgS, 2012).

Estimates of the range of material strength and stiffness properties present in the overburden materials are summarised in **Table 1**. A geotechnical model of the strata within the North Wambo Underground Mine area is presented in **Figure 4**.

Table 1
Strength Property Estimates for Lithology in the Vicinity of the North Wambo Underground Mine

Unit Lithology	Unit Thickness Range (m)	UCS Range (MPa)	Laboratory Elastic Modulus* Range (GPa) [mean]	Poisson's Ratio
Massive Sandstone Units	5 - 35	40 - 60	12 - 18 [15]	0.25
Interbedded Sandstone/ Siltstone Beds above and below the Coal Seams	5 - 20	20 - 40	6 - 12 [9]	0.25
Carbonaceous Mudstone Beds above and below the Coal Seams	1 - 2	2 - 20	0.6 - 6 [3]	0.25 - 0.30
Coal Seams	2 - 3	7 - 14	2.0 - 4.0 [3]	0.25 - 0.35

Source: After DgS (2012).

* Young's Modulus (E) derived from laboratory and sonic UCS data, E = 300 x UCS (units are in GPa).

Note: UCS = unconfined compressive strength.
MPa = megapascal.
GPa = gigapascal.

2.3 LITHOLOGICAL AND GEOTECHNICAL CHARACTERISTICS (ROOF AND FLOOR STRATA)

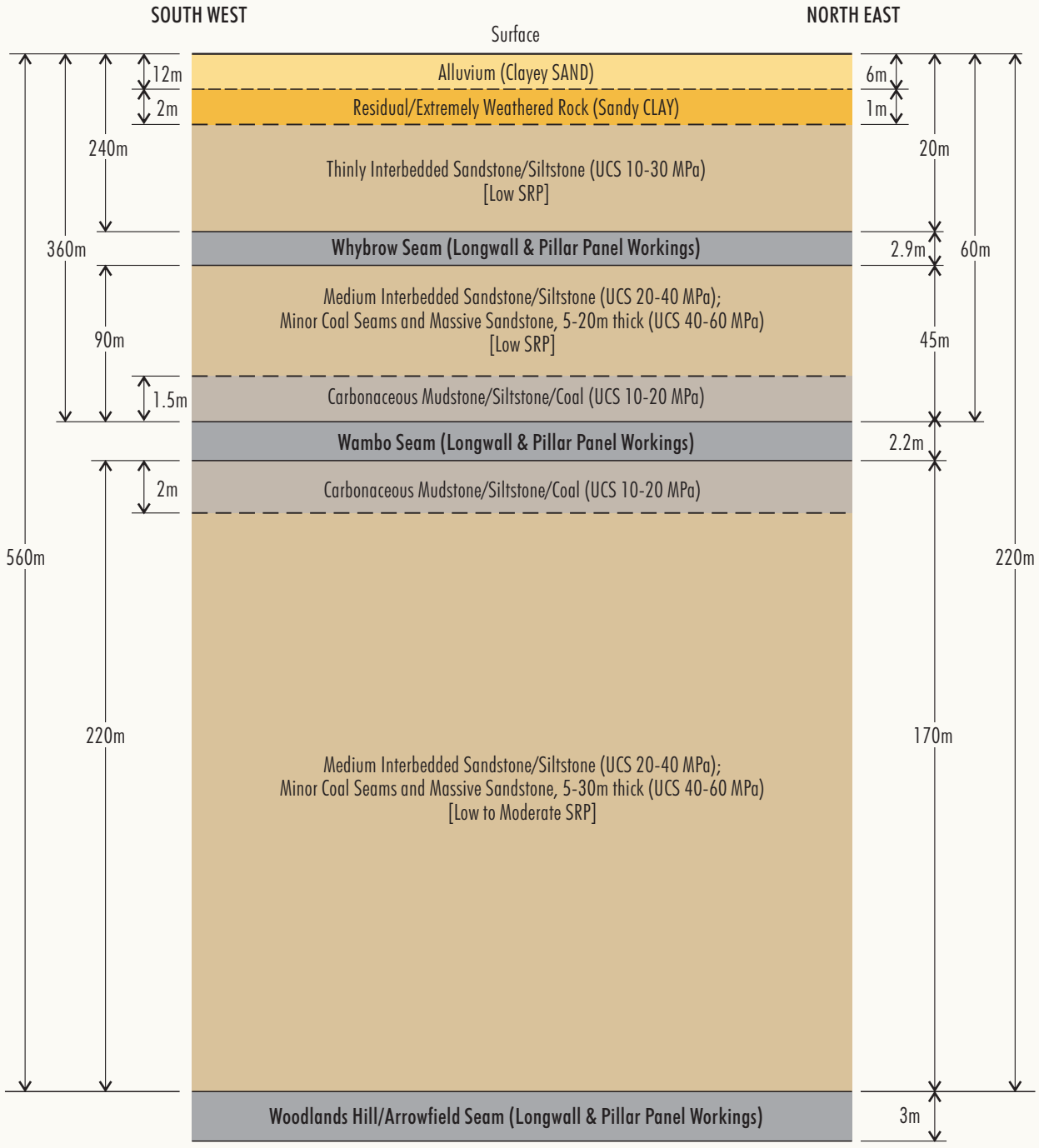
Low strength carbonaceous mudstone, mudstone and coal immediately overly and underlie the coal seams present in the overburden in the Wambo Coal Mine area (DgS, 2012). Previously mined seams in the vicinity of the North Wambo Underground Mine include (in descending order) the Whybrow Seam, Wambo Seam and Woodlands Hill/Arrowfield Seams.

Historical workings are discussed further in **Section 2.6**.

The coal seams mentioned above, generally have low strengths, with sonic derived UCS values ranging from 7 to 14 MPa, and some low to high strength stone bands up to 0.1 m thick are also present within these seams (DgS, 2012).

The immediate roof and floor of the mining horizons typically consist of medium strength, fine grained to medium grained sandstone (MSEC, 2014a).

Estimates of the range of material strength and stiffness properties present in the roof and floor of the mine workings coal seams are summarised in **Table 1**. A geotechnical model of the strata within the North Wambo Underground Mine area is presented in **Figure 4**.



Note: SRP = Subsidence Reduction Potential
UCS = Unconfined Compressive Strength

Source: Ditton Geotechnical Services (2012)

WAMBO COAL MINE

FIGURE 4
Geotechnical Model of the Strata within the North Wambo Underground Mine Area

Not to Scale

2.4 EXISTENCE AND CHARACTERISTICS OF GEOLOGICAL STRUCTURE

Regional geological structure in the study area consists of one major and minor fault. The major fault is a north to south trending fault which crosses the middle of Longwalls 9, 10 and 10A with a throw of approximately 1 m (see **Technical Reports 1 and 2** of the Extraction Plan [MSEC, 2014a; MSEC 2014b]). The minor fault is located in the northern section of Longwall 9, trending from the south-west to north-east with a throw of less than 0.3 m (MSEC, 2014a). The largest structure in the area is the Redmanvale Fault, which has a throw greater than 20 m. This fault is located more than 1.5 km south-west of the proposed longwalls (MSEC, 2014a).

2.5 STABILITY OF UNDERGROUND WORKINGS

The design intent of the workings and method of extraction is such that the first workings provide long-term stable access to the longwall blocks or pillar panels, and the second workings are mined such that the overburden collapses (i.e. "goafs") in a controlled manner as the coal is removed. All of the subsidence movements that occur at the surface are generally the result of a new equilibrium being achieved (i.e. chain pillars and overlying strata compress elastically and overburden caves and eventually ‘re-supports’ itself on bulked and broken ground).

The Division of Resources and Energy indicated it was satisfied WCPL would achieve the required outcomes of the first workings condition of the Development Consent (DA 305-7-2003, Condition 22E of Schedule 4) for Longwalls 9 and 10 on 6 September 2013 subject to the following condition:

> *The Mine Manager must undertake adequate monitoring of the stability of first workings in the subject area and to implement appropriate ground support of roadways in accordance with the results of the said monitoring, to ensure compliance with the outcome requirements of condition 22E of Schedule 4 of DA 305-7-2003.*

Subsequently, the Division of Resources and Energy indicated it was satisfied WCPL would achieve the required outcomes of the first workings condition of the Development Consent (DA 305-7-2003, Condition 22E of Schedule 4) for Longwall 10A on 26 May 2014 subject to the following condition:

> *The Mine Manager must undertake adequate monitoring of the stability of first workings in the subject area and to implement appropriate ground support of the roadways in accordance with the results of the said monitoring, to ensure compliance with the outcome requirements of condition 22E of Schedule 4 of DA 305-7-2003.*

The longwall blocks are also designed with barrier pillars at the ends of the blocks to protect the adjacent first workings pillars and remnant pillars left between the augered areas from any abutment loading. Adequate set-back from highwall crests is also provided.

The chain pillars are designed to provide serviceable gate roads for access and ventilation and may yield or crush out after mining is completed.

2.6 HISTORICAL MINING

There are a number of previous workings in the vicinity of Longwalls 8 to 10A including (**Figure 2**):

- Bord and pillar workings in the Wambo Seam to the south-east of Longwall 8.
- Bord and pillar workings and extracted longwall panels associated with the Homestead Mine and the Wollemi Mine in the Whybrow Seam, located approximately 45 to 95 m above the Wambo Seam.

- Extracted longwall panels associated with the United Mine in the Woodlands Hill/Arrowfield Seam (under a lease swap arrangement), located approximately 170 to 220 m below the Wambo Seam.

Longwall 8 is located within the inrush control zone associated with the historical bord and pillar workings in the Wambo Seam. Relevant monitoring and management measures are detailed in the Inrush Management Plan. Management measures include maintaining a geotechnically-stable barrier between Longwall 8 and the previous workings and inseam drilling to define the integrity of the barrier and dewatering of old workings to reduce inrush hazard to a level as low as reasonably practicable.

Longwalls 8 to 10A also underlie previous workings of the Homestead Mine in the Whybrow Seam. Water had accumulated in these overlying workings and therefore, the inrush of water to Longwalls 8 to 10A resulting from hydraulic connection with the previous workings is considered to be a potential hazard. For this reason dewatering of the previous workings in the Whybrow Seam is undertaken in advance of active mining as a safety measure and in accordance with Condition 5.3 of the *Clause 88(1) Coal Mine Health and Safety Regulation 2006 Approval to Extract Longwalls 7 to 10, Wambo Seam, North Wambo Coal Mine* (dated 27 May 2013).

The extraction of Longwalls 8 to 10A is expected to result in goaf reactivation of the previous workings of the Homestead Mine in the overlying Whybrow Seam. Multi-seam interaction potential associated with the extraction of Longwalls 8 to 10A has been assessed by DgS (2012), MSEC (2014a) and MSEC (2014b).

DgS (2012) found that it is unlikely that multi-seam interaction effects will cause instability of the existing standing pillars. Notwithstanding, sections of the previous workings of the Homestead Mine in the Whybrow Seam above Longwall 8 will be bulk filled with low strength grout. This grouting is proposed primarily as a mitigation measure to minimise the potential for flooding due to chimney failure and pot hole development resulting from failure of remnant pillars within the Homestead Mine workings. The bulk filling/grouting will be undertaken within historical workings of the Homestead Mine which underlie alluvium above Longwall 8. The bulk filling/grouting will be completed prior to secondary extraction of Longwall 8 within these areas. Further detail regarding the bulk filling/grouting is provided in the main report of the Extraction Plan.

3 RESOURCE RECOVERY

3.1 MINING GEOMETRY

The currently approved orientation and footprint of the North Wambo Underground Mine was assessed as part of the North Wambo SEE (WCPL, 2005), the North Wambo Modification EA (WCPL, 2012), and the North Wambo Longwall 10A Modification EA (WCPL, 2014).

Longwalls 8 to 10A are the four remaining longwalls within the North Wambo Underground Mine extent.

The layout of Longwalls 8 to 10A is presented in **Plan 1** (**Attachment 1**) and a summary of the key panel dimensions for Longwalls 8 to 10A is presented in **Table 2**.

Table 2
Key Longwall Panel Dimensions

Dimension	Longwall 8	Longwall 9	Longwall 10	Longwall 10A
Gate Road Width (m)	5.4	5.4	5.4	5.4
Gate Road Height (m)	2.5 – 2.8	2.5 – 2.8	2.5 – 2.8	2.5 – 2.8
Maingate Chain Pillar Width (m)	16.8 (for single abutment loading) 26.2 (for double abutment loading)[1]	26.2	26.2	26.2
Tailgate Chain Pillar Width (m)	26.2	26.2	26.2	26.2
Tailgate Chain Pillar Length (m)	94.6	94.6	94.6	94.6
Longwall Void Width (m)	262.8	262.8	262.8	262.8
Longwall Void Length (m)	Longwall 8a – 1,782 Longwall 8b – 812.5[2]	1,748.5	1,763.7	1,508.8
Extraction Height (m)	2.2 – 2.5	2.3 – 2.6	2.3 – 2.6	2.2 – 2.6

[1] A portion of the Longwall 8 maingate pillar has been designed for double abutment loading for Longwall 9.

[2] Excludes the Wambo Homestead Exclusion Zone (WHEZ) as shown in **Figures 1 and 2** and discussed in **Section 3.7**.

3.2 COVER DEPTH

The cover depth above the proposed Longwalls 8 to 10A in the Wambo Seam ranges from 60 m to 240 m (DgS, 2012; MSEC, 2014a; MSEC, 2014b). The cover depth increases to the south-west, consistent with the seam dip. In comparison, the cover depth above Longwalls 1 to 6 as described in the SMP for Longwalls 1 to 6 ranges from 50 m to 360 m.

3.3 MINING METHOD

Longwalls 8 to 10A will be extracted using retreating longwall mining methods for secondary extraction of 263 m wide panels. Construction of development main headings, maingates and tailgates are undertaken using continuous miners.

3.4 MINING SCHEDULE

The North Wambo Underground Mine operates seven days a week, 24 hours a day on a rotating shift basis. At the date of this document, extraction of Longwalls 1 to 7, 8a and 9 is complete, with extraction of Longwall 10 underway. The proposed sequence of mining under the Extraction Plan and anticipated start and completion dates are summarised in **Table 3**.

Table 3
Proposed Mining Schedule (Secondary Extraction)

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
Longwall 8a	February 2014 (actual)	5 months	July 2014 (actual)
Longwall 9	August 2014 (actual)	5 months	January 2015 (actual)
Longwall 10	January 2015 (actual)	4 months	June 2015
Longwall 10A	June 2015	5 months	October 2015
Longwall 8b	November 2015	3 months	January 2016

3.5 FUTURE MINING

A SMP for Longwalls 1 to 6 at the North Wambo Underground Mine (WCPL, 2006) was approved by the Department of Primary Industries – Mineral Resources on 11 December 2006. The Extraction Plan for Longwalls 7 and 8 was revised in February 2014 to include Longwalls 9 and 10. The approved Extraction Plan has been revised further to incorporate Longwall 10A within the North Wambo Underground Mine.

In addition to the North Wambo Underground Mine, the Development Consent (DA 305-7-2003) provides consent for underground mining by longwall methods in the Whybrow, Arrowfield and Bowfield Seams (**Figure 1**). The approved future workings in the Arrowfield and Bowfield Seams underlie the North Wambo Underground Mine workings as shown on **Figures 1 and 4** and **Plan 1**. Approved future mining in the Whybrow Seam is located more than 2 km north-west of Longwalls 8 to 10A. The approved future underground longwall workings are described in the Wambo Development Project EIS (WCPL, 2003).

A Preliminary Environmental Assessment for a modification of the Development Consent (DA 305-7-2003) including the realignment and extension/relocation of the Arrowfield and Bowfield Seam Underground Mines (referred to as the South Wambo Underground Mine Modification) was lodged on 10 September 2012. Director-General's Requirements for the South Wambo Underground Mine Modification Environmental Assessment were issued by the DP&I on 25 October 2012. The South Wambo Underground Mine Modification Environmental Assessment would include justification of a modification to the currently approved layout of the Arrowfield and Bowfield Seam Underground Mines.

Further to underground mining activities the Development Consent (DA 305-7-2003) provides consent for open cut mining. The seams approved for open cut mining include the Whybrow, Redbank Creek, Wambo and Whynot Seams.

Mining of the Wambo Seam by open cut mining methods in the North Wambo Underground Mine area is not economically viable due to past removal of the overlying Whybrow Seam (WCPL, 2006).

3.6 RESOURCE RECOVERY

Resource estimates and proposed recovery for Longwalls 8 to 10A are summarised in **Table 4**. The proposed mining layout for Longwalls 8 to 10A maximises resource recovery within the approved layout. The recovery of available resource of the proposed Longwalls 8 to 10A layout is estimated to be approximately 81% excluding the resource sterilised by the Wambo Homestead Exclusion Zone (WHEZ).

Table 4
Estimated Resource Recovery from Longwalls 8 to 10A

Aspect	Million Tonnes
Available Resource (including WHEZ)	10.919
Available Resource (excluding WHEZ)	10.727
Development ROM Coal	0.567
Longwall ROM Coal	8.052
Total ROM Coal Recovered	**8.619 (80.3%)**

WHEZ – Wambo Homestead Exclusion Zone.

The Development Consent (DA 305-7-2003) provides for underground mining in three seams in addition to the Wambo Seam: the proposed South Bates Underground Mine (in the Whybrow Seam); and the underlying Arrowfield and Bowfield Seam Underground Mines.

The extraction of Longwalls 8 to 10A will result in subsidence impact on the overlying strata. The overlying strata includes historical workings in the Whybrow Seam. The sequence and orientation of the North Wambo Underground Mine has been adopted to minimise the impact on resource recovery from the approved South Bates Underground Mine which is located more than 2 km north-west of Longwalls 8 to 10A and approximately 300 m from Longwall 1 at its closest point (**Figure 1**). In addition, the extraction of Longwalls 8 to 10A is not expected to impact the ability of future extraction of the lower Arrowfield and Bowfield Seams.

Extraction of the Redbank Creek Seam above the North Wambo Underground Mine is constrained within the extent of the approved open cut limit (**Figure 1**) as recovery of the Redbank Creek Seam outside of this extent is not considered to be economically viable.

The mine plan design of the North Wambo Underground Mine (including Longwalls 1 to 10A) included consideration of multi-seam extraction.

3.7 MINE PLAN JUSTIFICATION

The proposed sequence of underground mining at the Wambo Coal Mine has been adopted to minimise the potential for sterilisation of coal reserves. The **Approved Plan** (**Attachment 1**) presents the Longwalls 8 and 10A layout which has been developed in consideration of detailed exploration drilling and key environmental studies as described in the Wambo Development Project EIS, the North Wambo SEE, the North Wambo Modification EA, and the North Wambo Longwall 10A Modification EA.

The Wambo Development Project EIS and the North Wambo SEE sought approval to extract the full lengths of Longwalls 7 and 8 as part of the Development Consent (DA 305-7-2003). However, in accordance with Condition 57 of Schedule 4 of the Development Consent (DA 305-7-2003) an approval of an application under section 60 of the NSW *Heritage Act, 1977* is required prior to mining within the curtilage of the Wambo Homestead Complex[1]. Approval of the application under section 60 of the *Heritage Act, 1977* for longwall mining within the curtilage of the Wambo Homestead Complex included the exclusion of longwall mining within the WHEZ located above the proposed Longwall 8 (**Figure 1**). The WHEZ is discussed further in Section 1.6.1 of the Extraction Plan.

The monitoring of subsidence impacts associated with the extraction of Longwalls 8 to 10A is described in the Subsidence Monitoring Program for Longwalls 8 to 10A (Appendix H of the Extraction Plan) and the relevant management plans summarised in Section 3 of the Extraction Plan.

[1] The Wambo Homestead Complex curtilage is the boundary of the State Heritage Register of NSW listing.

4 REFERENCES

Department of Mineral Resources (1993) *Hunter Coalfield Regional Geology 1:100 000 Sheet*. New South Wales.

Department of Planning and Environment and NSW Trade & Investment – Division of Resources and Energy (2015) *Guidelines for the Preparation of Extraction Plans Required under Conditions of Development Consents, Project Approvals and Mining Lease Conditions for Underground Coal Mining.* Version 5. Draft.

Ditton Geotechnical Services (2012) *Revised Predictions of Subsidence Effects and Subsidence Impacts for Longwalls 7 and 8 at North Wambo Underground Mine, Warkworth*.

MineConsult (2001) *Wambo Strategic Mine Plan Vol 1*. Report prepared for Wambo Mining Corporation Ltd.

Mine Subsidence Engineering Consultants (2014a) *North Wambo Underground Longwalls 7 – 10 Extraction Plan Subsidence Assessment.*

Mine Subsidence Engineering Consultants (2014b) *North Wambo Underground Longwall 10A Subsidence Assessment.*

Wambo Coal Pty Limited (2003) *Wambo Development Project Environmental Impact Statement.*

Wambo Coal Pty Limited (2005) *Wambo Development Project – Wambo Seam Underground Mine Modification Statement of Environmental Effects.*

Wambo Coal Pty Limited (2006) *Wambo Development Project – North Wambo Underground Mine Subsidence Management Plan*.

Wambo Coal Pty Limited (2012) *North Wambo Underground Mine Modification Environmental Assessment.*

Wambo Coal Pty Limited (2014) *North Wambo Underground Mine Longwall 10A Modification Environmental Assessment.*

ATTACHMENT 1

LONGWALLS 8 TO 10A
PLANS 1 TO 7

[A0 PLANS AVAILABLE ON REQUEST]

Plan 1 – Proposed and Existing Workings
Plan 2 – Surface Features
Plan 2a – Surface Features (Aerial Photo)
Plan 3 – Wambo Seam Structure
Plan 4a – Proposed Arrowfield Seam Workings
Plan 4b – Proposed Bowfield Seam Workings
Plan 4c – Proposed Whybrow Seam Workings
Plan 5 – Mining Titles and Land Ownership
Plan 6 – Geological Sections (Boreholes)
Plan 7 – Proposed and Existing Monitoring

I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.

....
Manager of Mining Engineering Date

I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.

....
Mine Surveyor Date

🟨	Proposed Bowfield Seam Workings (MOD 12)
▨	Previously Arrowfield Seam Workings (MOD 12)
🟪	Current Open Cut Extraction Approval Area
🟥	Full Extraction Boundary Application Area
╪	North Wambo Underground Existing Workings (Wambo Seam)
┼	North Wambo Underground Proposed Workings (Wambo Seam)
■	Auger Workings Wambo Seam
🟩	Auger Workings Whynot Seam
╪	Wollemi - Homestead Underground Workings (Whybrow Seam)
╪	United Collieries Underground Workings (Woodlands Hill Seam)
▨	Ridge Underground Workings (Whybrow Seam)
╪	Old Wambo No.1 Underground Workings (Wambo Seam)
30 40	Wambo Opencut Void 5m Contours (AHD) (Whybrow/Wambo Seam)

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	31/3/2015	MJW	For Submission	MM/TB					

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

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 1 - Proposed and Existing Workings

Date	Scale:	Drawn	Checked	Approved	Sheet Size
31/3/2015	1: 4000	MJW	MM/MA	MW	A0

Drawing No. 1468
Revision No. A


LONGWALL 4
LONGWALL 5
LONGWALL 6
LONGWALL 7
LONGWALL 8a
LONGWALL 8b
LONGWALL 9
LONGWALL 10
LONGWALL 10a
North Wambo Creek
Stony Creek
Wambo Creek
Wollombi Brook
40m Bank Offset
Application Area
Wambo South Water Dam DSC Notification Area
North East Tailings Dam DSC Notification Area
Farm Dams
Farm Dam
Remnant Homestead UG Sheds
Remnant Homestead UG Boxcut
Wambo Homestead Exclusion Zone
Homestead Pit
Store / Workshop
Wambo Seam Underground Workings
Wambo Opencut Homestead Pit Access Ramp
Wambo Admin.
Opencut Extraction Approval Area
Wambo South Water Dam
11kV AERIAL
E 309 000
E 310 000
E 311 000
E 312 000
E 313 000
N 6 390 000
N 6 391 000
N 6 392 000
N 6 393 000
N 6 394 000
MGA
0 250 500 750 1000 1250
All measurements are in metres
NOTE: ALL PROPOSED WORKINGS ARE WITHIN THE PATRICK PLAINS MINE SUBSIDENCE DISTRICT
I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.
Manager of Mining Engineering
Date
I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the survey and accuracy standards required by the Survey and Drafting Directions NSW.
Mine Surveyor
Date

Legend	
Current Open Cut Extraction Approval Area	Dam Notification Area (DSC approx. 1km)
Full Extraction Boundary Application Area	North Wambo Underground Existing Workings
North Wambo Underground Proposed Workings	85 Surface Contours
Buildings	Tracks
Water pipelines	Fences
Powerlines	

REV.	DATE	BY	DESCRIPTION	CHK.
A	31/3/2015	MW	For submission	MM/TB

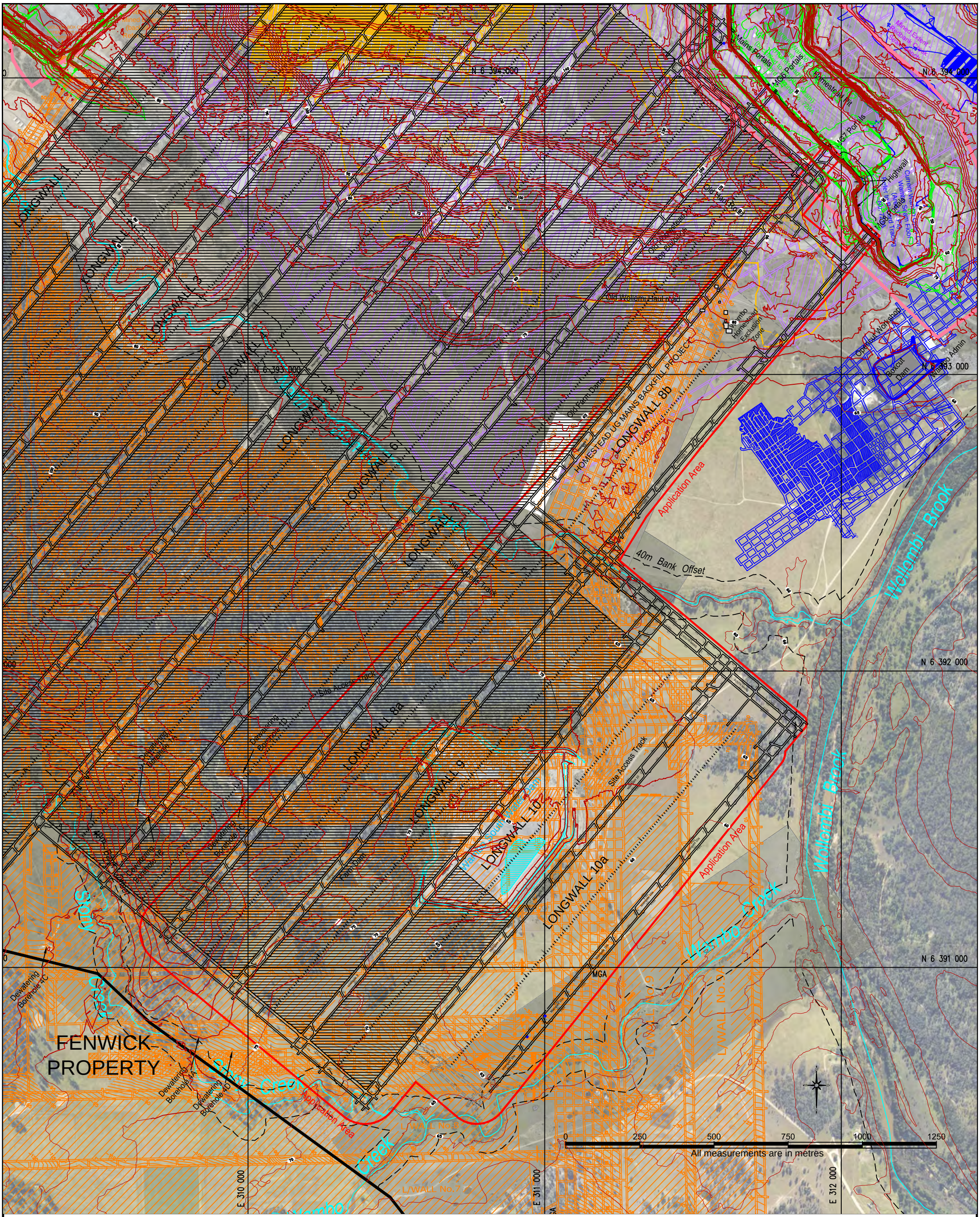
REVISIONS

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

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 2 - Surface Features

Date	Scale:	Drawn	Checked	Approved
31/3/2015	1:4000	MJW	MM/TB	MW

Drawing No. 1469
Revision No. A
Sheet Size A0



North Wambo Underground Existing Workings

United Underground Underlaying Workings

Homestead Underground Shallow Overlying Workings

North Wambo Underground Proposed Workings

Ridge Underground Shallow Overlaying Workings

Old Wambo No.1 Underground (Wambo Seam)

Full Extraction Boundary Application Area

Creeks

85 Surface Contours

30 Wambo Opencut Void Contours (Generally Whynot Seam Floor)

Current Open Cut Extraction Approval Area

I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.

Manager of Mining Engineering ..... Date .....

I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.

Mine Surveyor ..... Date .....

Rev.	Drawn	Description	Checked
A	MJW	For Submission	MM,TB

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

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 2a - Surface Features (Aerial Photo)

Drawing No.	Revision No.	Date	Scale:	Drawn	Checked	Approved	Sheet Size
1470	A	31/3/2015	1: 4000	MJW	MM/TB	MW	A0

LONGWALL 4

LONGWALL 5

LONGWALL 6

LONGWALL 7

LONGWALL 8a

LONGWALL 8b

LONGWALL 9

LONGWALL 10

LONGWALL 10a

Wambo Homestead Exclusion Zone

Application Area

Application Area

Application Area

E 309 000

E 310 000

E 311 000

E 312 000

E 313 000

N 6 391 000

N 6 392 000

N 6 393 000

N 6 394 000

MGA

0 250 500 750 1000 1250

All measurements are in metres

Full Extraction Boundary Application Area

North Wambo Underground Existing Workings

North Wambo Underground Proposed Workings

Wambo Seam Faults

Wambo Seam Dykes

220 Wambo Seam Overburden Thickness Isopach

1.8 Wambo Seam Thickness Isopach

Inseam drill holes

I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.

Manager of Mining Engineering ..... Date .....

I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.

Mine Surveyor ..... Date .....

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	31/03/2015	MJW	For submission	MM/TB					

WAMBO COAL PTY LIMITED
ABN 13 000 668 057

Jerry's Plains Rd, Warkworth
Via Singleton, NSW, 2330

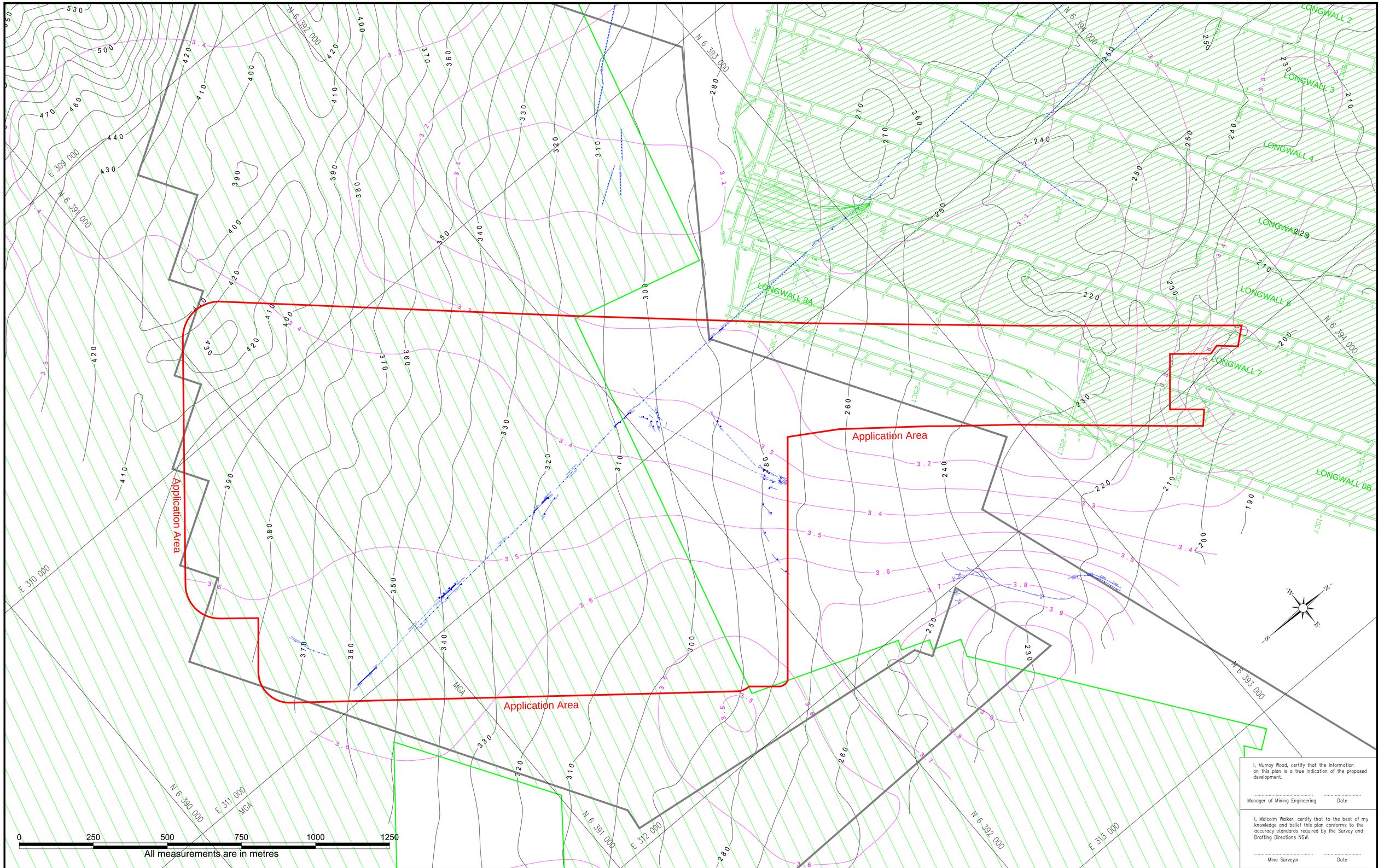
Phone: 02 65 702200
Fax: 02 65 702290

Prepared by NWU Survey Ph: 02 65 702318

Peabody ENERGY

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 3 - Wambo Seam Structure

Drawing No.	Revision No.	Date	Scale:	Drawn	Checked	Approved	Sheet Size
1471	A	31/03/2015	1:4000	MJW	MM/TB	MW	A0



Legend

- Full Extraction Boundary / Application Area
- Proposed Arrowfield Seam Workings (MOD 12)
- Currently Approved Arrowfield Seam Workings
- Existing Arrowfield Seam Workings (United Colliery - Woodlands Hill Seam)
- 350 — Arrowfield Seam Overburden Thickness Isopach
- 3.2 — Arrowfield Seam Thickness Isopach
- Faults / Dykes

I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.

Manager of Mining Engineering ..... Date .....

I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.

Mine Surveyor ..... Date .....

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	31/03/2015	MJW	For Submission	MM/TB					

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

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan4a - Proposed Arrowfield Seam Workings

Drawing No.	Revision No.	Sheet Size
1473	A	A0

Date	Scale:	Drawn	Checked	Approved
31/03/2015	1: 4000	MJW	MM/TB	MW

Application Area

Application Area

Application Area

E 310 000

E 311 000 MGA

E 312 000

E 313 000

N 6 390 000

N 6 391 000

N 6 392 000

N 6 393 000

N 6 394 000

0 250 500 750 1000 1250

All measurements are in metres

I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.

Manager of Mining Engineering ..... Date .....

I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.

Mine Surveyor ..... Date .....

Legend

- Full Extraction Boundary Application Area
- Proposed Bowfield Seam Workings (MOD 12)
- Currently Approved Bowfield Seam Workings
- 350 Bowfield Seam Overburden Thickness Isopach
- 3.2 Bowfield Seam Thickness Isopach
- Faults / Dykes (mapped in Wambo Seam)

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	31/03/2015	MJW	For submission	MM/TB					

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

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 4b - Proposed Bowfield Seam Workings

Drawing No.	Revision No.	Date	Scale:	Drawn	Checked	Approved	Sheet Size
1474	A	31/03/2015	1: 4000	MJW	MM/TB	MW	A0

There are currently no proposed Whybrow seam workings in this plan window. The newly commenced South Bates (Whybrow) Underground Mine is to the to the North West of this plan window

Application Area

Application Area

Application Area

Wollemi UG Workings - Whybrow Seam Refer to Record Tracing No. 746

Homestead UG Workings - Whybrow Seam Refer to Record Tracing No. 746

Western Open Cut Mined Extent - Whybrow Seam (Spoil Backfilled - Partially Rehab) Refer to Record Tracing No. 728

Ridge Open Cut Mined Extent - Whybrow Seam (Backfilled - Partially Rehab) Refer to Record Tracing No. 728

Eastern Open Cut Mined Extent - Whybrow Seam (Backfilled - Partially Rehab) Refer to Record Tracing No. 728

1 SOUTH
2 SOUTH
3 SOUTH
1 WEST
2 WEST
3 WEST
4 WEST
MAIN WEST
7 WEST
8 WEST
11 WEST
L/WALL No.1
L/WALL No.2
L/WALL No.3
L/WALL No.4
L/WALL No.5
L/WALL No.6
L/WALL No.7
L/WALL No.8
L/WALL No.9
L/WALL No.9A

N 6 394 000
N 6 393 000
N 6 392 000
N 6 391 000
N 6 390 000
E 310 000
E 311 000
E 312 000
E 313 000
MGA

0 250 500 750 1000 1250
All measurements are in metres

I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.

Manager of Mining Engineering ..... Date .....

I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.

Mine Surveyor ..... Date .....

Legend

- Full Extraction Boundary Application Area
- No Proposed Whybrow Seam Workings in this area
- 350 Whybrow Seam Overburden Thickness Isopach
- 3.2 Whybrow Seam Thickness Isopach
- Wollemi - Homestead Underground Workings (Whybrow Seam)
- Ridge Underground Workings (Whybrow Seam)
- Opencut Extents (Whybrow Seam)
- 10 Homestead Pit Opencut Void Contours

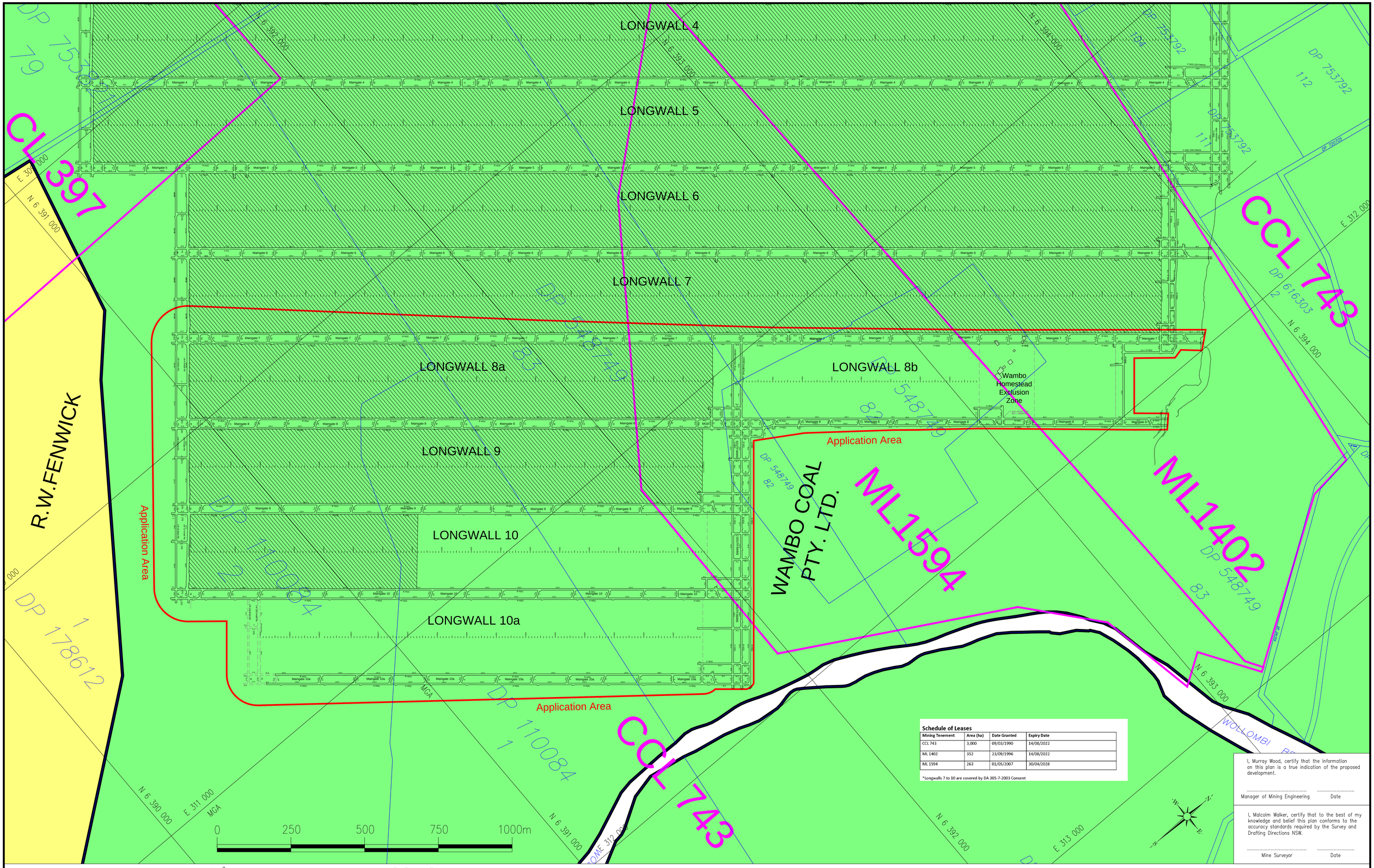
REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	31/12/2014	MJW	For submission	MM/TB					

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

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan4c - Proposed Whybrow Seam Workings

Drawing No.	Revision No.	Date	Scale:	Drawn	Checked	Approved	Sheet Size
1475	A	31/12/2014	1: 4000	MJW	MM/TB	MW	A0



Schedule of Leases

Mining Tenement	Area (ha)	Date Granted	Expiry Date
CCL 743	3,000	09/03/1990	14/08/2022
ML 1402	352	23/09/1996	14/08/2022
ML 1594	263	01/05/2007	30/04/2028

*Longwalls 7 to 10 are covered by DA 305-7-2003 Consent

I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.

Manager of Mining Engineering ..... Date .....

I, Malcolm Walker, certify that to the best of my knowledge and belief this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.

Mine Surveyor ..... Date .....

Full Extraction Boundary Application Area

North Wambo Underground Existing Workings

North Wambo Underground Proposed Workings

DP 73823 Digital Cadastral Database (DCDB)

R.W. Fenwick

Wambo Coal Pty. Ltd

Wambo Mining Lease

REVISIONS									
REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	31/03/2015	MJW	For submission	MM/TB					

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

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 5 - Mining Titles and Land Ownership

Drawing No.	Revision No.	Date	Scale:	Drawn	Checked	Approved	Sheet Size
1476	A	31/03/2015	1: 4000	MJW	MM/TB	MW	A0

Symbol	Meaning
(red outline)	Full Extraction Boundary Application Area
(solid workings)	North Wambo Underground Existing Workings
(dashed workings)	North Wambo Underground Proposed Workings
WA19 ●	Borehole

Whybrow Seam = WH
Wambo Seam = WMA
Woodlands Hill Seam = WH
Wambo Seam = WMA
Arrowfield Seam = AF
Bowfield / Warkworth Seam = BF/WK

REV.	DATE	BY	DESCRIPTION	CHK.	REV.	DATE	BY	DESCRIPTION	CHK.
A	31/03/2015	MW	For Submission	MM/TB					

REVISIONS

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

Peabody ENERGY

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 6 - Geological Sections (Boreholes)

Date	Scale:	Drawn	Checked	Approved
31/03/2015	1:4000	MJW	MM/TB	MW

Drawing No. 1477
Revision No. A
Sheet Size A0


LONGWALL 5
LONGWALL 6
LONGWALL 7
LONGWALL 8a
LONGWALL 8b
LONGWALL 9
LONGWALL 10
LONGWALL 10a
LINE CPLA
LINE CL5A
LINE CPLB
LINE 4XL
LINE XL5
LINE 2XL
LINE 3XL
LINE 1XL
LINE 6XL
LINE CPLC
LINE CL9A
LINE CL9B
LINE SD
LINE DL10C
CL7A
CL7B
Application Area
Wambo Homestead Exclusion Zone
Wambo Seam Underground Workings
Wambo Opencut Void Contours
North Wambo Creek
Wambo Creek
Stony Creek
Bank of Brook
Wollombi Brook
Farm Dam
Wambo UG Workings - Wambo Seam Refer to Record Tracing No. 728
L/WALL No.9
L/WALL No.9A
L/WALL No.8
L/WALL No.7
L/WALL No.6
L/WALL No.5
L/WALL No.4
0 250 500 750 1000 1250
All measurements are in metres
I, Murray Wood, certify that the information on this plan is a true indication of the proposed development.
Manager of Mining Engineering
Date
I, Malcolm Walker, certify that to the best of my knowledge and this plan conforms to the accuracy standards required by the Survey and Drafting Directions NSW.
Mine Surveyor
Date
NWU Only Subsidence Monitoring Marks
Old Multi Seam Subsidence Monitoring Marks
Depth of Cover Contours

Current Open Cut Extraction Approval Area	Full Extraction Boundary Application Area	North Wambo Underground Existing Workings (Wambo Seam)	North Wambo Underground Proposed Workings (Wambo Seam)
Auger Workings Wambo Seam	Auger Workings Whynot Seam	Wollemi - Homestead Underground Workings (Whybrow Seam)	United Collieries Underground Workings (Woodlands Hill Seam)
Ridge Underground Workings (Whybrow Seam)	Old Wambo No.1 Underground Workings (Wambo Seam)	Wambo Opencut Void 5m Contours (AHD) (Whybrow/Wambo Seam)	

REVISIONS

REV.	DATE	BY	DESCRIPTION	CHK.
A	31/03/2015	MJW	For Submission	MM/TB

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

Peabody Energy

North Wambo Underground Mine
Extraction Plan - Longwalls 8 to 10A
Plan 7 - Proposed and Existing Subsidence Monitoring

Date	Scale:	Drawn	Checked	Approved	Drawing No.	Revision No.	Sheet Size
31/03/2015	1:4000	MJW	MM/MA	MW	1468x	A	A0