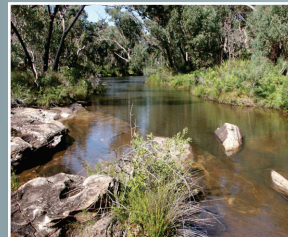


METROPOLITAN COAL LONGWALLS 308-310

COAL RESOURCE RECOVERY PLAN



METROPOLITAN COAL

LONGWALLS 308-310

COAL RESOURCE RECOVERY PLAN

Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DPE Approval Date
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February 2022

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Attachment 2 Risk Assessment on Geological Features with Potential to Affect Water Quantity Available to Woronora Reservoir and Aboriginal Heritage

1 INTRODUCTION

The Metropolitan Coal Mine is owned and operated by Metropolitan Coal Pty Ltd (Metropolitan Coal), which is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). The Metropolitan Coal Mine is located adjacent to the township of Helensburgh, approximately 30 kilometres (km) north of Wollongong in New South Wales (NSW) (Figure 1).

Metropolitan Coal was granted approval for the Metropolitan Coal Project (the Project) under section 75J of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) on 22 June 2009. A copy of the Project Approval is available on the Peabody website (<http://www.peabodyenergy.com>).

The Project comprises the continuation, upgrade and extension of underground coal mining operations (Longwalls 20-27 and Longwalls 301-317) and surface facilities at Metropolitan Coal. Longwalls 308-310 are situated to the west of Longwalls 301-307 and define the next mining sub-domain within the Project underground mining area (Figure 2). Longwall 311 on will be subject to future Extraction Plans.

1.1 PURPOSE AND SCOPE

In accordance with Condition 6(e), Schedule 3 of the Project Approval, this Coal Resource Recovery Plan (CRRP) has been prepared as a component of the Metropolitan Coal Longwalls 308-310 Extraction Plan to demonstrate effective recovery of the available resource.

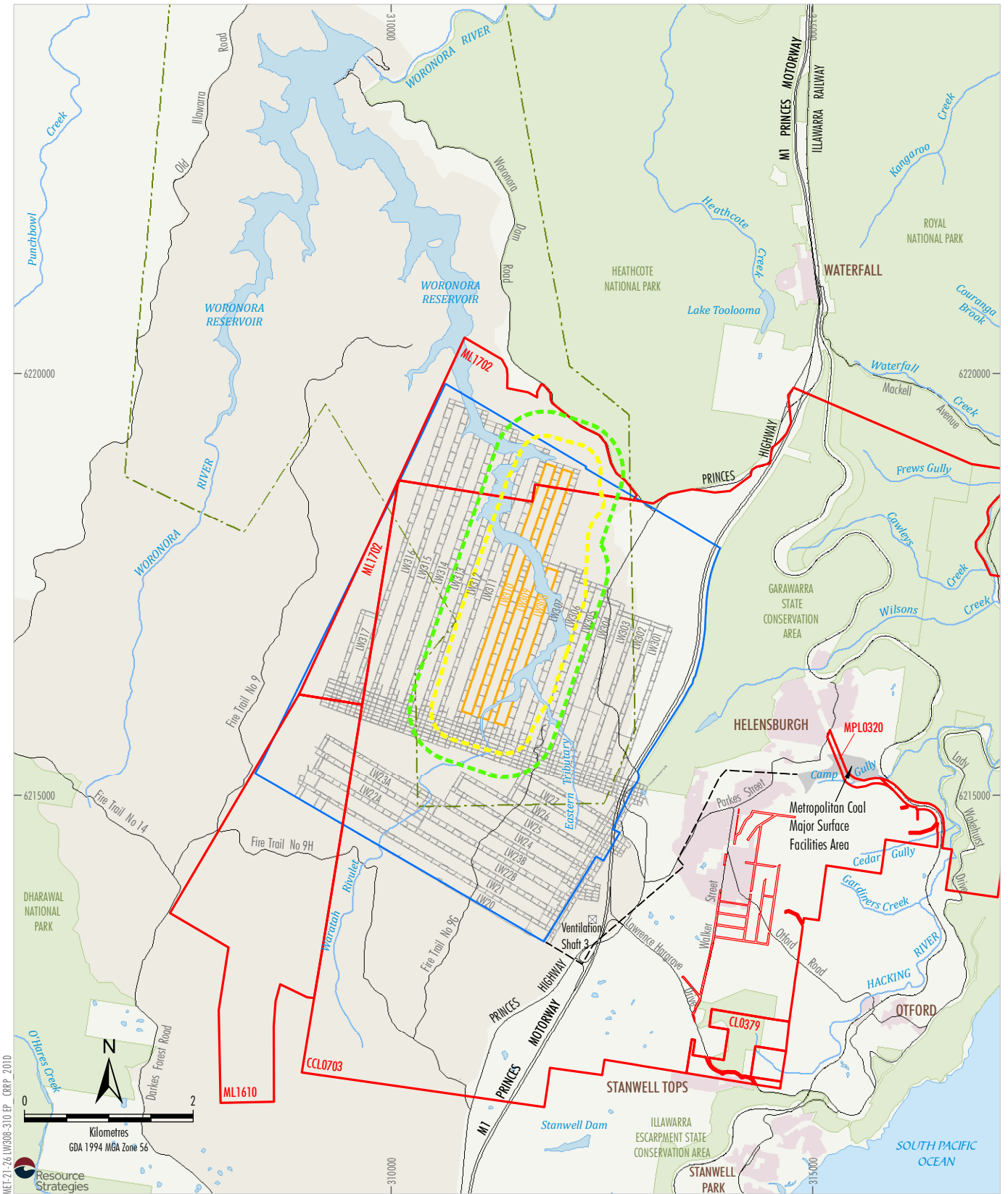
The relationship of this CRRP to the Metropolitan Coal Environmental Management Structure and to the Metropolitan Coal Longwalls 308-310 Extraction Plan is shown on Figure 4.

The following graphical plans (Attachment 1) have been prepared in accordance with Department of Planning and Environment (DP&E) and Division of Resources and Energy (DRE) (2015) *Guidelines for the Preparation of Extraction Plans*:

- Plan 1 Existing, Proposed and Future Workings.
- Plan 2 Longwalls 308-310 Surface Features.
- Plan 3 Geological and Seam Data.
- Plan 5 Mining Titles and Land Ownership.
- Plan 6 Geological Section and Geotechnical Logs.

As there are currently no existing and/or planned future workings in seams above and/or below the proposed workings, Plan 4 referred to in the DP&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans* has not been included in this CRRP. Plan 7 (Subsidence Monitoring Locations) is included in the Metropolitan Coal Longwall 308-310 Subsidence Monitoring Program.

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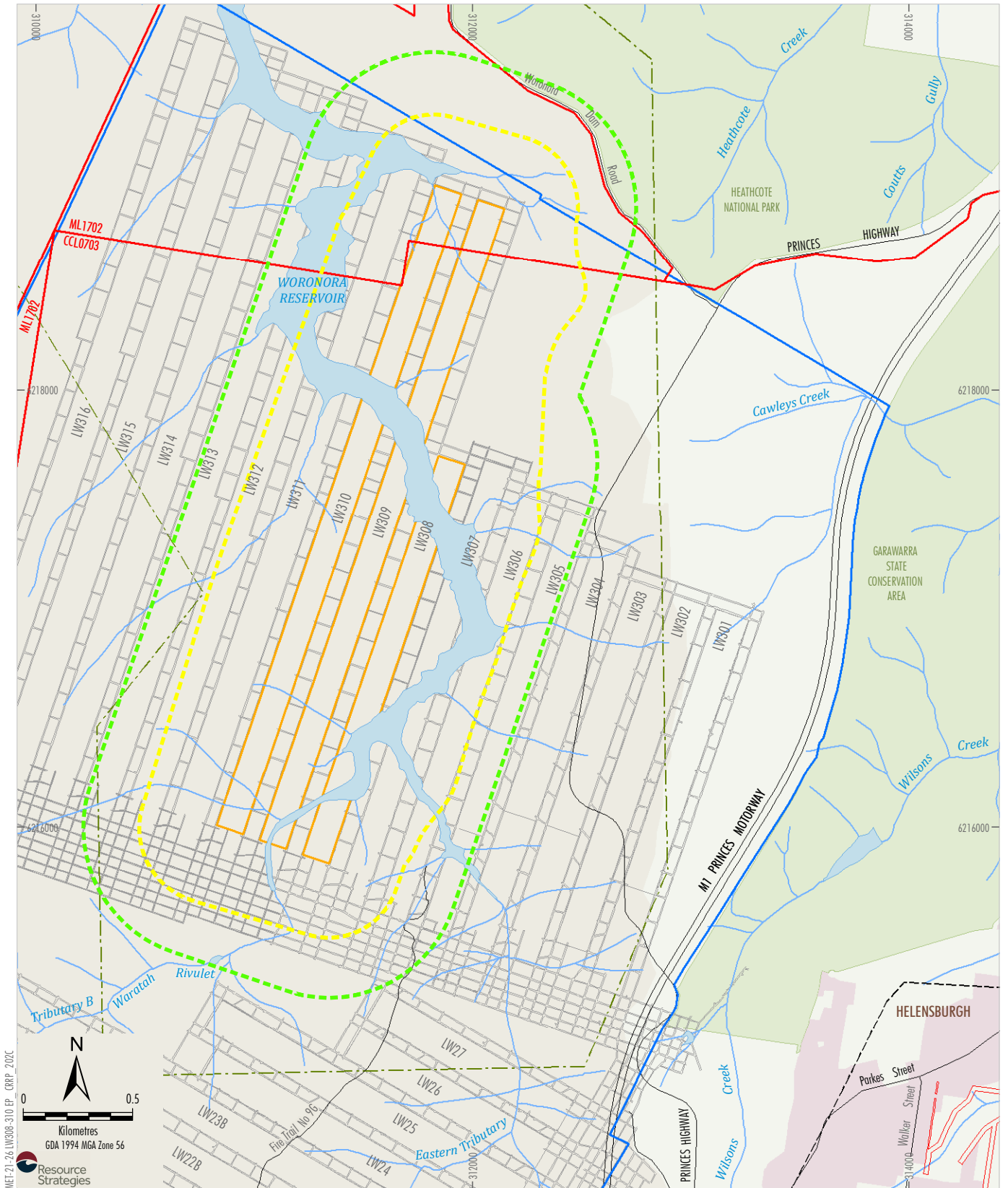
MET-21-26 LW308-310 EP - CRPP 2010
Resource Strategies

- LEGEND**
- Mining Lease Boundary
 - Woronora Special Area
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 308-310 Secondary Extraction
 - Longwalls 308-310 35° Angle of Draw and/or
Predicted 20 mm Subsidence Contour
 - 600 m from Longwalls 308-310
Secondary Extraction
 - Woronora Notification Area
 - Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015);
Metropolitan Coal (2021); MSEC (2021)

Peabody
METROPOLITAN COAL
Longwalls 308-310 and
Project Underground Mining Area

Figure 1



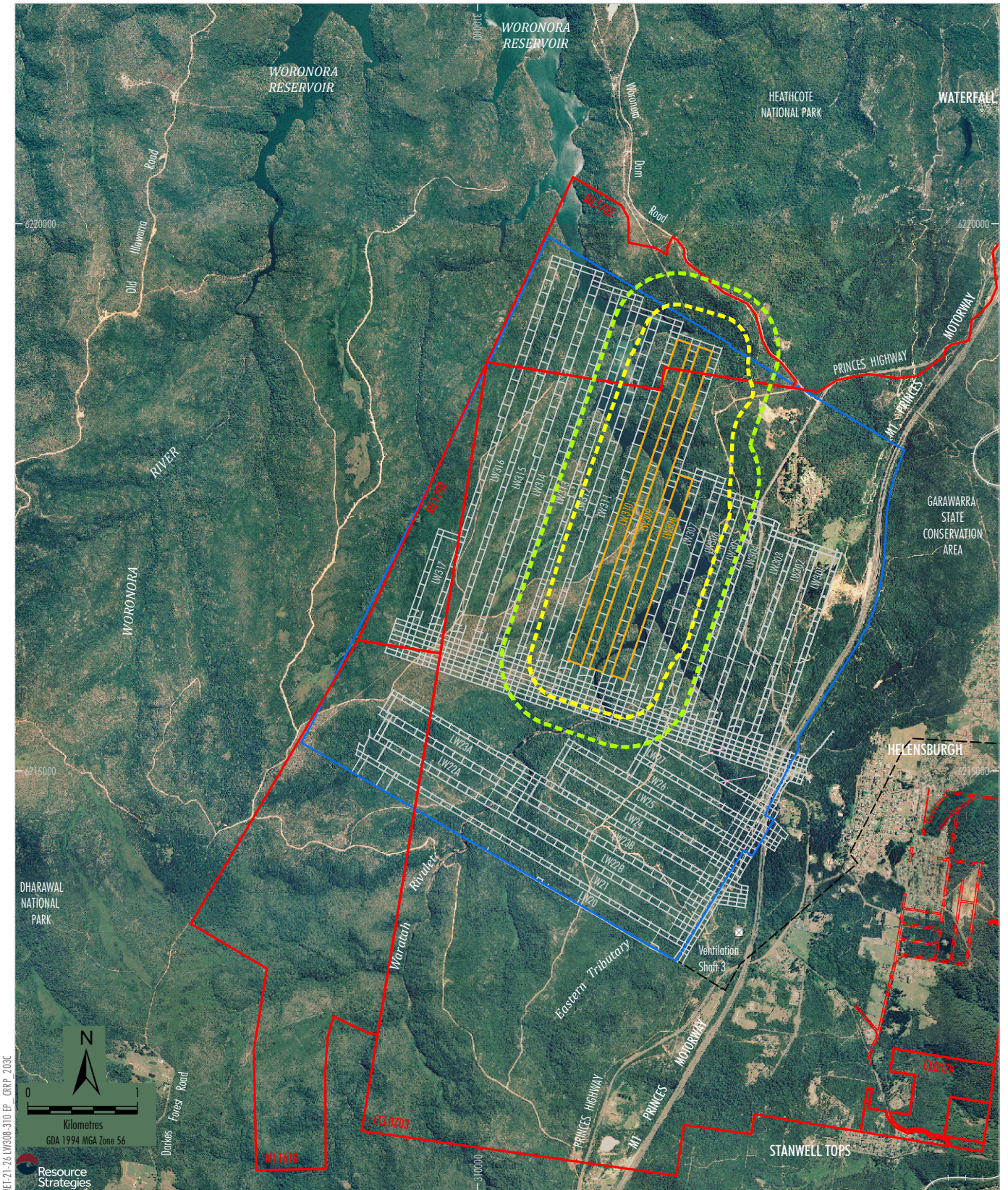
LEGEND

- Mining Lease Boundary
- Woronora Special Area
- Project Underground Mining Area
Longwalls 20-27 and 301-317
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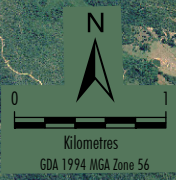
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2021); MSEC (2021)

Peabody
METROPOLITAN COAL
Longwalls 308-310 Layout

Figure 2



MET-21-26 LW308-310 EP - CRMP 2023



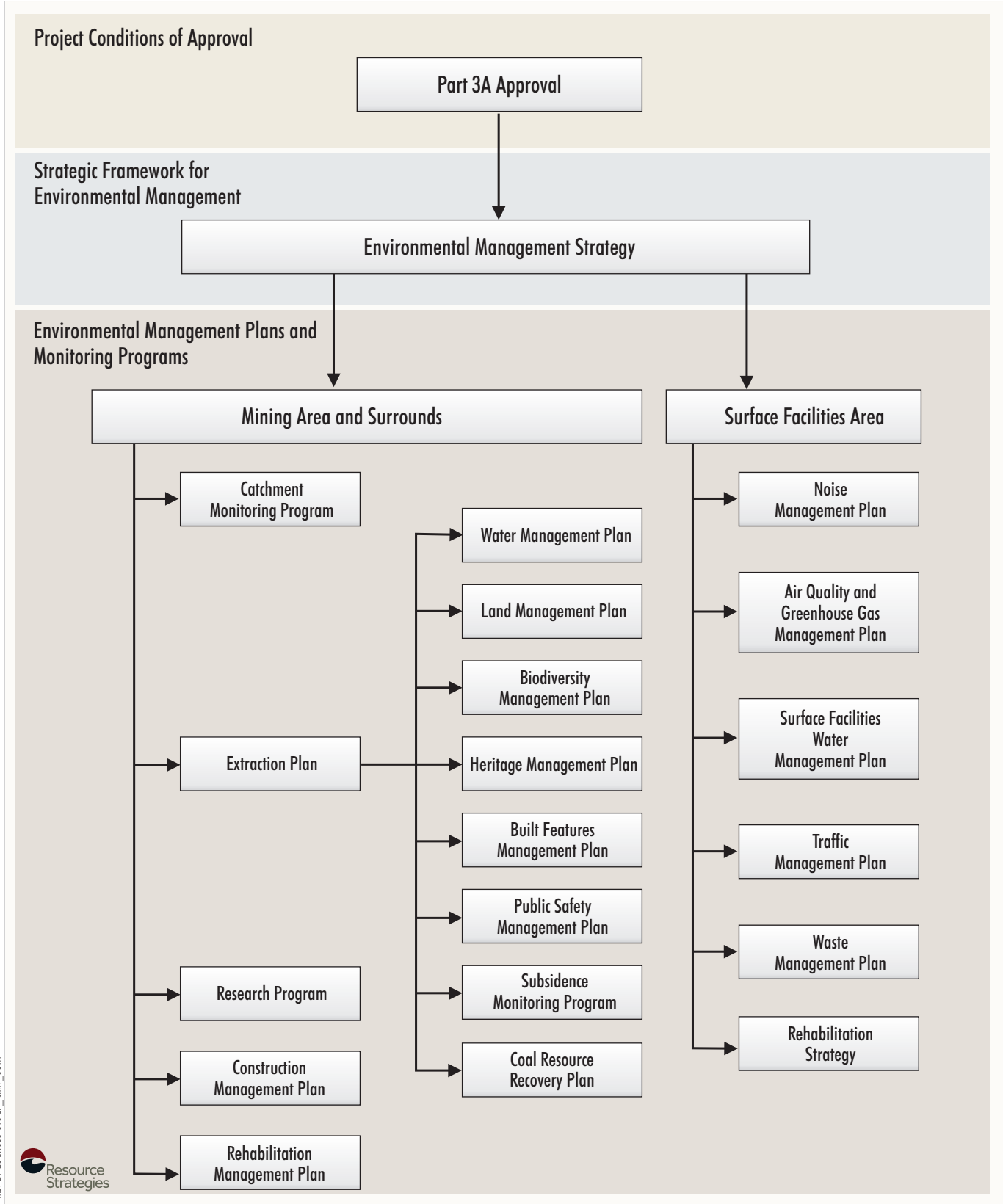
Resource Strategies

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 - 600 m from Longwalls 308-310
Secondary Extraction
 - Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Date of Aerial Photography 1998;
Department of Industry (2015); Metropolitan Coal (2021); MSEC (2021)

Peabody
METROPOLITAN COAL
Longwalls 308-310 and
Project Underground Mining Area -
Aerial Photograph

Figure 3



MEF-21-26 LW308-310 BP GRIP_001A



Figure 4

2 COAL RESOURCE RECOVERY PLAN REVIEW AND UPDATE

In accordance with Condition 4, Schedule 7 of the Project Approval, this CRRP will be reviewed within three months of the submission of:

- an audit under Condition 8, Schedule 7;
- an incident report under Condition 6, Schedule 7;
- an annual review under Condition 3, Schedule 7; and
- if necessary, revised to the satisfaction of the Director-General (now Secretary) of the Department of Planning, Industry and Environment (DPIE) (now the NSW Department of Planning and Environment¹ [DPE])

The CRRP will also be reviewed within three months of approval of any Project modification and if necessary, revised to the satisfaction of the DPIE.

The revision status of this CRRP is indicated on the title page of each copy. The distribution register for controlled copies of the CRRP is described in Section 2.1.

Revisions to any documents listed within this CRRP will not necessarily constitute a revision of this document.

2.1 DISTRIBUTION REGISTER

In accordance with Condition 10, Schedule 7 of the Project Approval 'Access to Information', Metropolitan Coal will make this CRRP publicly available on the Peabody website. A hard copy of the CRRP will also be maintained at the Metropolitan Coal site.

Metropolitan Coal recognises that various regulators have different distribution requirements, both in relation to whom documents should be sent and in what format.

An Environmental Management Plan and Monitoring Program Distribution Register has been established in consultation with the relevant agencies and infrastructure owners that indicates:

- to whom the Metropolitan Coal plans and programs, such as this CRRP, will be distributed;
- the format (i.e. electronic or hard copy) of distribution; and
- the format of revision notification.

Metropolitan Coal will make the Distribution Register publicly available on the Peabody website.

Metropolitan Coal will be responsible for maintaining the Distribution Register and for ensuring that the notification of revisions is sent by email or post as appropriate.

In addition, Metropolitan Coal employees with local computer network access will be able to view the controlled electronic version of this CRRP on the Metropolitan Coal local area network. Metropolitan Coal will not be responsible for maintaining uncontrolled copies beyond ensuring the most recent version is maintained on Metropolitan Coal's computer system and the Peabody website.

¹ The former Department of Planning, Industry and Environment (DPIE) was renamed to the Department of Planning and Environment (DPE) on 21 December 2021. References to DPIE have been retained throughout the remainder of this document.

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3 DESIGN PRINCIPLES

3.1 APPROVAL CONSIDERATIONS

During the NSW Government’s assessment phase of the Metropolitan Coal Project Environmental Assessment (Project EA) (Helensburgh Coal Pty Ltd [HCPL], 2008), and in recognition of concerns raised by key stakeholders during the formal Planning Assessment Commission (PAC) assessment process, Metropolitan Coal (previously HCPL) considered it appropriate to reduce the proposed extent of the original Project longwall mining area (i.e. Longwalls 20-44).

Metropolitan Coal was granted Project Approval (08_0149) by the Minister for Planning on 22 June 2009. The Project Approval included a layout for Longwalls 301 to 317 referred to as the Preferred Project Layout (as described in the Preferred Project Report [HCPL, 2009]). Longwalls 301-317 included in the Preferred Project Layout (PPL) comprised 163 metres (m) panel widths (void) with 45 m pillars (solid) beyond 500 m from the Woronora Reservoir, and 138 m panel widths (void) with 70 m pillars (solid) within 500 m of the Woronora Reservoir.

3.2 LAYOUT OPTIMISATION FOR 300 SERIES LONGWALLS

Following further mine planning investigations, Metropolitan Coal identified that significant operational efficiencies and consequently a significant economic benefit would be achieved by rotating the first workings of Longwalls 301-317 to be square with the 300 Mains (a rotation of approximately six degrees). The Secretary of the DP&E approved the revised first workings in accordance with Condition 5, Schedule 3 of the Project Approval in April 2015.

Subsequently, Metropolitan Coal proposed to consolidate the panel and chain pillar widths of Longwalls 301-304 to 163 m (void) panel widths and 45 m wide pillars (solid). Changes to the first workings of Longwalls 301-303 and Longwall 304 were approved by the DP&E in May 2016 and November 2018, respectively.

Following submission of the Longwalls 305-307 Extraction Plan in October 2019, Metropolitan Coal requested approval from the Secretary of the DPIE for a revision of the Longwalls 305 and 306 first working layout. The revised layout included a reduction to the panel (void) lengths of Longwall 305 (from 1,596 metres [m] to 1,547 m) and Longwall 306 (from 1,956 m to 1,907 m) and associated changes to the cut-through positions for the Longwalls 305 and 306 maingates. The revised layout of Longwalls 305 and 306 did not change the panel widths, pillar widths or panel orientation.

In January 2021, Metropolitan Coal submitted an application to the DPIE requesting a 50 m extension to the panel (void) length of Longwall 307 at the commencing end (from 1,956 m to 2,006 m). The 50 m extension of Longwall 307 was approved by the DPIE in August 2021.

3.3 LONGWALLS 308-310 EXTENT

3.3.1 Commencing Position – Northern Extent

The commencing positions (i.e. the northern end) of Longwall 309 and Longwall 310 are consistent with the PPL. The commencing position of Longwall 308 is consistent with recent mining experience and is adjacent to the commencing positions of the prior longwalls 301-307. The position is approximately 1,162 m south of the PPL position (shorter) due to a geological structure located in the coal seam and a deterioration in coal quality and thickness evident in the northern portion of the lease.

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3.3.2 Finishing Position – Southern Extent

The finishing positions (i.e. the southern end) of Longwalls 308, 309 and 310 are consistent with the PPL.

3.3.3 Longwall Width and Length

Longwall extraction will occur from north to south. A summary of the longwall dimensions for Longwalls 308-310 is provided in Table 1. The layout of Longwalls 308 and 309 include 138 m panel widths (void) and 70 m pillar widths (solid), consistent with the PPL. The layout of Longwall 310 includes a 138 m panel width (void) and a 70 m tailgate pillar width. Approximately 1,370 m from the commencing end of Longwall 310, the maingate pillar width of Longwall 310 decreases from 70 m to 45 m until the finishing end of Longwall 310 (Figure 2).

Table 1
Summary of Longwall Dimensions for Longwalls 308-310

Longwall	Longwall Length (m)	Total Void Width (m)	Tailgate Chain Pillar Width (m)
LW308	1,948	138	70
LW309	3,118	138	70
LW310	3,118	138	70

m = metres.

The commencing and finishing position changes represent a reduction in longwall extraction meters of 1,162 m, (~816 kilotonnes [kt] of coal), from the PPL. A summary of changes by longwall is provided in Table 2.

Table 2
Summary of Longwall Dimension Reductions for Longwalls 308-310

Longwall	Reduction in length from PPL (m)	Reduction in Raw Coal from PPL (kt)	Reduction Reason
LW308	1,170	774	Coal quality and in seam geological feature
LW309	0	42	PPL widening for 358 m not economic
Total	1,170	816	

m = metres.

kt = kilotonnes.

Plan 1 in Attachment 1 shows existing Metropolitan Coal longwalls located within 500 m of Longwalls 308-310, as well as future longwalls (i.e. Longwalls 311 on).

Longwalls 308-310 and the area of land within 600 m of Longwalls 308-310 secondary extraction is shown on Figures 1 to 3. Plan 2 in Attachment 1 shows the natural and man-made surface features proximal to Longwalls 308-310.

4 GEOLOGICAL DETAILS

4.1 SYDNEY BASIN AT METROPOLITAN COAL

Metropolitan Coal is located within the Southern Coalfield, within the southern part of the Sydney Basin, which is infilled with sedimentary rocks of Permian age (<270 million years ago) and of Triassic age (<225 million years ago) (HCPL, 2008).

Underlying the Sydney Basin sedimentary rocks is the Palaeozoic granite basement rock. A borehole located at Metropolitan Coal by the Australian Oil and Gas (AOG) Corporation in 1963, *AOG Woronora PDH and RDH 1* (Figure 5), intersected the Bulli Coal Seam at 1,710 feet (0.5 kilometres [km]) and the granitic basement rock at 7,470 feet (2.3 km) (AOG Corporation, 1963). At Metropolitan Coal the inter-burden between the Bulli Coal Seam and the basement rock is 1.8 km, and the total depth of Sydney Basin sedimentation is 2.3 km.

Three formally named coal seams of the Illawarra Coal Measures are present in the Southern Coalfield, namely the Bulli, Balgownie and Wongawilli Seams (HCPL, 2008). Thermal Ionisation Mass Spectrometry (TIMS) dating of a tuff from the lower part of the Bulli Coal in the Metropolitan Colliery has yielded an age of 252.60 ± 0.04 million years (Fielding, 2019).

Immediately overlying the Bulli Coal unit of the Illawarra Coal Measures are sandstones and claystones of the Narrabeen Group. The Narrabeen Group contains the Newport Formation (sometimes referred to as the Gosford Formation), the Bald Hill Claystone (also referred to as Chocolate Shale and formed as a result of laterite weathering Gerringong Volcanics), the Bulgo Sandstone, the Stanwell Park Claystone/Shale, the Scarborough Sandstone, the Wombarra Shale and the Coal Cliff Sandstone. At the top of the sequence in the area of interest is the Hawkesbury Sandstone.

4.2 STRATIGRAPHIC SECTION

The sedimentary stratigraphic section at Borehole S225 is shown on Plan 6 in Attachment 1. The location of the borehole is also shown on Plan 6 in Attachment 1. The sandstone and shale units vary in thickness from a few metres to over 160 m. The major sandstone units are interbedded with other rocks and, though shales and claystones are quite extensive in places, the sandstone predominates. A generalised stratigraphic column of the Southern Coalfields is provided in Figure 6 with geological epochs.

4.3 BULLI SEAM

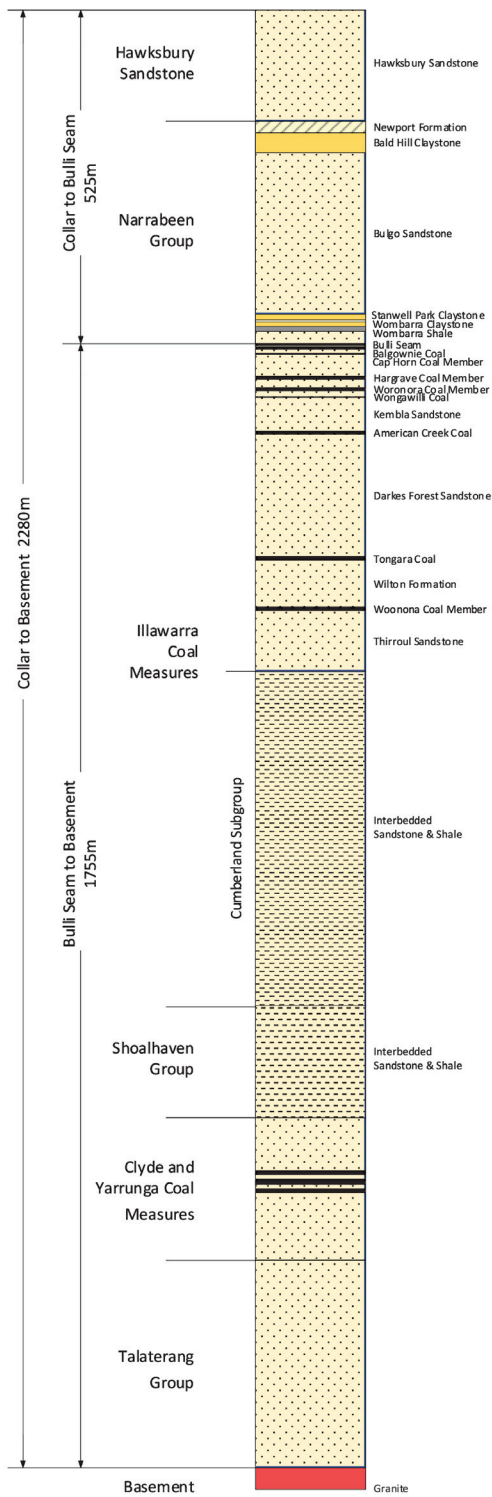
The seam floor within the Longwalls 308-310 35 degree (°) angle of draw and/or 20 mm subsidence contour area generally dips from the south-east to the north-west. The Bulli Seam thickness within the Longwalls 308-310 goaf area varies between approximately 2.6 m to 2.9 m. Longwalls 308-310 will extract the full height of the seam, with localised extraction up to 3.2 m around development headings and longwall install and takeoff points. The seam floor contours and seam thickness contours are shown on Plan 3 in Attachment 1.

4.4 TOPOGRAPHY

The topography consists of Hawkesbury Sandstone dip slopes falling to the north-west. The southern slopes tend to be more rugged, consisting of joint controlled escarpments of Hawkesbury Sandstone. These plateau areas are deeply incised by the Woronora River, Waratah Rivulet and other unnamed streams.

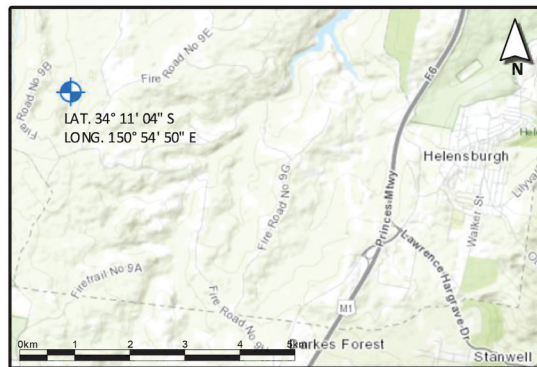
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Metropolitan Colliery – Depth of Basement Rock



County: Cumberland
 Parish: Heathcote
 District: Wollongong
 Hole Name: AOG Woronora PDH & RDH 1
 Collar: R.L. 355.092
 Total Depth: 2315.52m
 Date Commenced: 9-6-1963
 Logged By: A.O.G. Geologists

BORE HOLE LOCATION



MET-21-26 LW308-310 BP - CRPP - 0102A

Source: after Australian Oil and Gas Corporation Ltd (1963)



METROPOLITAN COAL

Depth to Basement
 (2.3 km at Metropolitan Colliery),
 AOG Woronora Hole

Figure 5

AGE	GROUP	SUB-GRP	CODE	FORMATION & MEMBERS		
TRIASSIC	WIANAMATTA GROUP		WMSH	BRINGELLY SHALE MINCHINBURY SANDSTONE ASHFIELD SHALE		
				MITTAGONG FORMATION		
			HBSS	HAWKSBURY SANDSTONE		
	NARRABEEN GROUP	GOSFORD		GRFM	NEWPORT FORMATION GARIE FORMATION	
				BACS	BALD HILL CLAYSTONE	
		CLIFTON		BGSS	BULGO SANDSTONE	
				SPCS	STANWELL PARK CLAYSTONE	
				SBSS	SCARBOROUGH SANDSTONE	
				WBCS	WOMBARRA CLAYSTONE	
				CCSS	COAL CLIFF SANDSTONE	
	PERMIAN	ILLAWARRA COAL MEASURES	SYDNEY	BUSM	BULLI COAL	
				UNM1	LODDON SANDSTONE	
				BASM	BALGOWNIE COAL	
LRSS				LAWRENCE SANDSTONE		
				BURRAGORANG CLAYSTONE		
			CHSM		CAPE HORN	
			UNM2		UNNAMED MEMBER 2	
				ECKERSLEY FORMATION	HARGRAVE COAL	
					WORONORA COAL	
					NOVICE SANDSTONE	
				WW01-11	WONGAWILLI COAL	
				KBSS	KEMBLA SANDSTONE	
				ACSM	ALLANS CREEK FORMATION	AMERICAN CK. COAL
				APFM	DARKES FOREST SANDSTONE (APPIN FORMATION)	HUNTLEY CLAYST.
					BARGO CLAYSTONE	AUSTIMER SANDST.
				TGSM	TONGARRA COAL	
				WTFM	WILTON FORMATION	
					WOONONA COAL MEMBER	
				ERINS VALE FORMATION		
	CUMBERLAND			FIGTREE COAL		
			PHEASANTS NEST FORMATION	UNANDERRA COAL		
				BERKELEY LATITE		
				MINNAMURRA LATITE		
				CALDERWOOD LATITE		
				FIVE ISLANDS LATITE		
	SHOALHAVEN GROUP			BROUGHTON FORMATION		
				BERRY SILTSTONE		
				NOWRA SANDSTONE		
				WANDRAWANDIAN SILTSTONE		
				SNAPPER POINT FORMATION		
				PEBBLEY BEACH FORMATION		
	TALATERANG			CLYDE COAL MEASURES		
UNDIFFERENTIATED PALAEOZOIC (DEVONIAN, SILURIAN & ORDOVICIAN)						
ROCKS OF THE BASIN BASEMENT						
Information Sourced From - "Geological Survey Report No. GS1998/277 - R.S. Moffitt"						

MEF21-26 LW308-310 BP GRIP_003A

Source: Moffitt, R.S and Geological Survey of New South Wales (1998)

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METROPOLITAN COAL

Generalised Stratigraphic Column of
Southern Coal Field

Figure 6

4.5 DEPTH OF COVER

The surface level contours and depth of cover contours to the Bulli Seam are shown on Plan 3 in Attachment 1. The depth of cover within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour varies between a minimum of 410 m and a maximum of 550 m.

4.6 LINEARS

Surface lineaments are linear features in the surface landscape, preferentially eroded, that may be the surface expression of an underlying geological structure, fault or dyke or simply a result of surface joint sets. Lineaments are identified from aerial photography, LiDAR and from digital topographic sets. By far the most common linears are features developed on the prevailing joint sets in the surface rock (Doyle and Newland, 2008). Lineament analysis aims to identify features that may be of greater geological significance, recognised by association with known geology or focussed field investigation.

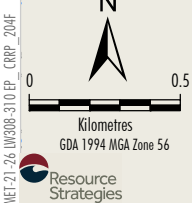
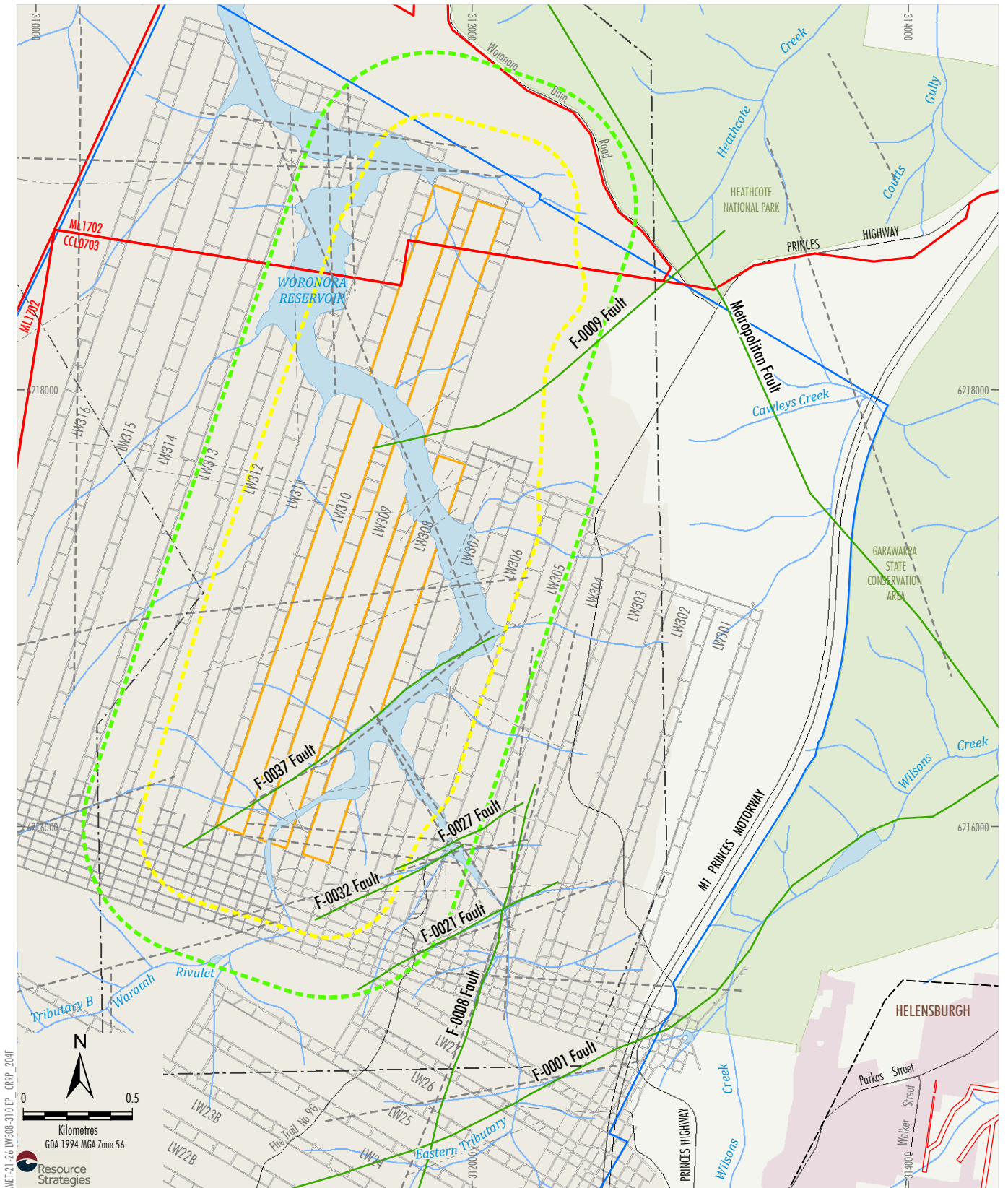
Lineaments mapped by Metropolitan Coal over Longwalls 308-310 and surrounds are shown on Figure 7. The lineament that runs north-south across Longwalls 20-27 extends over Longwall 304. Over Longwalls 20-27 and through Longwall 304, this lineament is associated with an underground fault (F 008). Longwalls 20-27 and Longwall 304 mined through this fault structure and did not intercept water (i.e. the fault did not act as a conduit at depth).

As described in the Longwall 304 CRRP, a key outcome of the Geological Features Risk Assessment (GFRA) that was undertaken for the Longwall 304 Extraction Plan was the further correlation of updated linear mapping with underground geological mapping (Metropolitan Coal, 2019a). Surface field mapping of lineaments occurred prior to Longwall 304, however little value was achieved in reviewing the lineaments on the ground with mapping of joint sets being the only outcome.

As described in the Longwalls 305-307 CRRP, the Longwalls 305-307 GFRA considered lineaments as a possible indicator of underlying geological structures and an action arising from the Longwalls 305-307 GFRA was to reanalyse the Longwalls 305-307 study area (Metropolitan Coal, 2019b). A new LiDAR scan of the landscape was commissioned and in August 2019 the landscape was examined for any new lineaments in the Longwalls 305-307 35° angle of draw and/or predicted 20 mm subsidence contour. The 2019 LiDAR review confirmed the existing lineament mapping analysis with additional lineaments added to the dataset. Lineaments were examined for possible correlation to underground geological mapping in the study area of Longwalls 305-307. Including structure F-0027 coincident with a surface lineament passing through the body of the reservoir. F-0027 was mined through by Maingate 305 and Maingate 306 without evidence of moisture.

A specific GFRA was completed for the Longwalls 308-310 Extraction Plan (Metropolitan Coal, 2021). Lineaments were also considered in the Longwalls 308-310 GFRA and an action arose to undertake targeted surface mapping above Longwalls 308-310 (Metropolitan Coal, 2021). A feature was identified correlating with F0037 structure underground (similar to F0027) existing as a discernible lineament intercepting the reservoir. F0037 was mined through by Longwall 306, Maingate 306 and Maingate 307 with no evidence of moisture. A mapped underground feature F0009 located north of Longwall 308 has been targeted for any coincident surface lineament. To date, no corresponding lineament has been identified through surface mapping.

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- LEGEND**
- Mining Lease Boundary
 - Woronora Special Area
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 308-310 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Longwalls 308-310
Secondary Extraction
 - Woronora Notification Area
 - Existing Underground Access Drive (Main Drift)
 - Faults and Dykes (lateral extent > 1 km)
 - Lineament (prominent)
 - Lineament (minor)

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2021); MSEC (2021); after NPWS (2003)

Peabody
METROPOLITAN COAL
Mapped Faults and Lineaments over
Longwalls 308-310 and Surrounds

Figure 7

4.7 IGNEOUS INTRUSIONS

The presence of igneous plugs at Metropolitan Coal has not been detected at the surface. Examination of linears and residuals on the topographic surface has failed to identify any such features. Similarly, aeromagnetic surveys made no positive identification of igneous plugs. Aeromagnetic surveys have identified the Maddocks Diatreme to the south of Longwall 1 in 1995 and a possible zone of dykes loosely associated with the Madden Fault zone on the western edge of the Metropolitan Coal lease boundary. A diatreme is an explosive igneous vent that has little or no igneous material associated with the vent. At coal level the diatreme may be represented by an igneous plug, a dyke, sill or induration of the coal by steam and other vapours. No diatremes have been identified in the Metropolitan Coal 300 series longwall area (Doyle and Newland, 2008).

4.8 SYNCLINE/ANTICLINE

The general Bulli Seam structure in the Metropolitan Coal area is a broad syncline trending north to north-west. Geological structures in synclinal areas in the Southern Coalfield are typically more benign than in anticlinal areas (Doyle and Newland, 2008).

4.9 FAULTS

The major geological features at seam level are shown on Plan 3 in Attachment 1. For the Longwalls 308-310 Extraction Plan, in seam faults have been further delineated on the plans by highlighting structures with greater than 1km strike length. This delineation is to better highlight what are more persistent structures at seam level and potentially correlate these with surface lineaments. Many faults mapped at seam level are minor in nature and only exist locally about the coal seam.

Longwalls 308-310 are located approximately 600 m south-west of the Metropolitan Fault, at its closest point. The Metropolitan Fault is a normal fault trending with other regional faults in a north-northwest to south-southeast strike. Displacement in the historical workings is 70 to 90 m, downthrow to the east. Seismic investigations have identified a series of reverse faults, 600 m northeast of Longwall 309, projecting in line from the known position of the Metropolitan Fault. Nearby the 300 series longwalls, the displacement at Bulli Seam level has reduced to 18 to 20 m with limited vertical extension and the Bald Hill Claystone is not displaced (Velseis, 2018).

A strike slip fault, F0008, with up to 1.2 m vertical displacement occurs over Longwalls 20-27, and this fault extends partially through Longwall 304. This fault is associated with a surface linear that aligns with the Eastern Tributary and then passes east of the Woronora Reservoir full supply level dissipating into the landscape. Longwalls 20-27 and Longwall 304 were extracted through this feature directly under the Eastern Tributary with no moisture evident at seam level and no change in mine water balance during the several years of extraction in the area.

A strike slip fault, F0027, with zero vertical displacement, has been mapped in the gate roads leading into Longwalls 304 and 305. The associated surface linear is located approximately 250 m west of the end of the Eastern Tributary arm of Woronora Reservoir full supply level. No moisture has been evident where F0027 structures intersects the seam.

A strike slip fault, F0037, with zero vertical displacement, has been mapped in the gate roads leading into Longwalls 306 and 307. The associated surface linear is aligned with the Waratah Rivulet arm of Woronora Reservoir. Similar to previous experience of mining through these features no moisture has been evident from F0037 structure in the seam. The Longwalls 308-310 Geological Features Risk Assessment participants were shown images of F0037 during longwall extraction with the structure displaying dry and dusty conditions.

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F0009 is a normal fault with a displacement of 10-15 m located north of Longwall 308 and with a south-west strike bisecting Longwall 309. The displacement of F0009 combined with coal quality north of the structure led to an economic decision to reposition the Longwall 308 face line from the PPL to the Extraction Plan Layout. Longwall 309 and Longwall 310 are anticipated to be able to ramp through the structure.

A detailed seismic assessment of F0009 was commissioned to determine the vertical extent of the structure with multiple dedicated seismic lines installed to provide a suitable resolution throughout the stratigraphy. The Velseis (2018) report concluded:

The large normal fault F0009 can be seen to impact the Bulli Seam only, and there is no evidence from available seismic data that this normal fault extends to the shallower Bald Hill Claystone level in the stratigraphy

From the detailed seismic report, the fault is not vertically extensive, residing at depth about the Illawarra Coal Measures. Whilst not vertically extensive, horizontally the structure extends north-west away from the extraction area towards the Metropolitan Fault. From the point where F0009 bisects Longwall 309 to the Metropolitan fault, the horizontal distance is approximately 1.5 km.

To demonstrate the structure poses negligible effects to the groundwater systems, a surface to seam borehole (2020EX02) was approved and installed in 2020. This hole, located along strike, approximately 500 m north-west of the intercept with Longwall 309, was designed to measure the horizontal permeability characteristics of F0009 by coring through the structure at depth. An assessment of the permeability characteristics found (Golder Associates Pty Ltd, 2020):

Hydraulic conductivities measured across the fault were comparable to those recorded for the unfractured host rock... there is negligible variance in horizontal flow characteristics associated with the fault measured at this location.

Detailed surface mapping has not identified any associated surface linear with this feature. Given the available data, it is highly unlikely that this feature would provide hydraulic connectivity either vertically or horizontally as a result of the extraction of Longwalls 308-310, similar to previous experiences of mining through other structures such as F0008, F0021, F0027 and F0037. The risk posed by F0009 was carefully considered and reviewed during the Longwalls 308-310 Geological Features Risk Assessment, with an additional control being specified to undertake water make monitoring specifically for F0009 with further delineation to occur on roadway advancement (similar to controls previously used for structures passed through by mining).

4.10 RISK ASSESSMENT ON GEOLOGICAL FEATURES WITH POTENTIAL TO AFFECT WATER QUANTITY AVAILABLE TO WORONORA RESERVOIR AND ABORIGINAL HERITAGE

The Independent Expert Panel for Mining in the Catchment (IEPMC)² Initial Report recommended that the potential implications for water quantity of faulting, basal shear planes and lineaments be carefully considered, and risk assessed at all mining operations in the Catchment Special Areas (IEPMC, 2018).

² The IEPMC was established in November 2017 by the NSW Government to provide expert advice to the DP&E on the impact of mining activities in the Greater Sydney Water Catchment Special Areas, with a particular focus on risks to the quantity of water in the catchment.

In relation to the Metropolitan Coal Mine, the IEPMC Initial Report concluded (pg. 127):

In the case of Metropolitan Mine:

-
- *the potential for water be diverted out of Woronora Reservoir and into other catchments through valley closure shear planes and geological structures including lineaments will require careful assessment in the future because it is planned that most of the remaining longwall panels in the approved mining area will pass beneath the reservoir.*

A GFRA workshop for Longwalls 308-310 was held on 6 October 2021. The workshop participants³ identified and assessed the potential for mining effects on lineaments, joints, faulting, shear planes and dykes to impact on the quantity of water to the Woronora Reservoir, including the potential for water to be diverted out of Woronora Reservoir and into other catchments. Participants also assessed the impacts to Aboriginal heritage sites as a result of mining effects on geological features.

Additional controls arising from the risk assessment workshop included targeted surface mapping above Longwalls 308-310 for further correlation of updated linear mapping with underground geological mapping, a specific underground water monitoring program for F0009 and F0037, implementation of targeted, post-mining, groundwater monitoring sites above Longwall 305 to investigate the height of fracture zone, permeability and presence of shear on bedding planes, development of a post-mining review strategy for Aboriginal heritage sites above Longwall 306, conduct a detailed pre-mining geological mapping of sites with high cultural significance and/or high archaeological significance for Longwalls 308-310, and develop a plan which overlays geological features and Aboriginal heritage sites to identify those at a higher risk of impact (Metropolitan Coal, 2021).

The participants considered the risk control measures and procedures to be reasonable to manage the identified risks.

The outcomes of the risk assessment are provided in Attachment 2.

5 RESOURCE RECOVERY

5.1 MINING METHOD

Longwalls 308-310 will be extracted using retreating longwall mining methods for secondary extraction of a panel with a 138 m void width. The longwall panel will be formed by driving two sets of gate roads (the tailgate and maingate roads). Each gate road requires two roadways (headings) to be driven parallel to each other. The two roadways will be used for ventilation purposes, with one of the roadways utilised as a transport road and the other roadway used to convey the coal that will be mined back to the main conveyors. Construction of development main headings and gate roads are mined using continuous miners.

³ Participants included Dr Noel Merrick (HydroAlgorithmics, Groundwater), Ines Epari (SLR Consulting, Principal Hydrology & Hydrogeology) Peter DeBono (Mine Subsidence Engineering Consultants, Subsidence), Shane Kornek (Metropolitan Coal, Senior Geotechnical Engineer), Jon Degotardi (Metropolitan Coal, Technical Services Manager), Christian Mans (Strata Control, Director & Principal Geotechnical Engineer), Roger Byrnes (Byrnes Geotechnical, Principal Geotechnical Engineer) and Stephen Love (Metropolitan Coal, Environment & Community Superintendent). The risk assessment was facilitated by Mr Nate Bain (Peabody Senior Mining Engineer).

The dimensions of the headings will be approximately 5.2 m wide and 3.2 m in height. The headings are connected approximately every 120 m by driving a cut-through from one heading to another which forms pillars of coal along the length of the gate road. The tailgate and maingate roads are separated by the 133 m wide longwall panel (measured between roadway centrelines). The maingate roads and tailgate roads are then linked together by driving an installation road and bleeder road at the top end of the longwall panels. Run-of-mine (ROM) coal will be conveyed by the maingate conveyor to the main conveyor which will carry coal to the surface of the mine.

5.2 MINE PLAN

5.2.1 Justification

As described in Section 3.2, the seam thickness within the Longwalls 308-310 goaf area varies from approximately 2.6 m to 2.9 m. Longwalls 308-310 will extract the full height of the seam. Using the proposed mining method, the recovery of ROM coal from the Bulli Seam in Longwalls 308-310 is estimated to be 59 percent (%). The total amount of ROM coal anticipated to be extracted is estimated to be approximately 4.9 million tonnes (Mt).

Metropolitan Coal considers the layout of Longwalls 308-310 to provide the most efficient resource recovery given the constraints.

5.2.2 Mining Schedule

Metropolitan Coal operates seven days a week, 24 hours a day on a rotating shift basis. The extraction of Longwalls 1 to 305 is complete, with extraction of Longwall 306 underway.

The provisional extraction schedule for Longwalls 308-310 is provided in Table 3.

**Table 3
Provisional Extraction Schedule**

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
Longwall 308	February 2023	7 Months	August 2023
Longwall 309	September 2023	11 Months	July 2024
Longwall 310	August 2024	12 Months	July 2025

5.2.3 Future Mine Plans

The current layout of Longwalls 311-317 is shown on Figures 1 and 3, on Plan 1 in Attachment 1 and includes narrow longwalls (138 m wide) beneath and within 500 m of the Woronora Reservoir.

The layouts of Longwalls 311-317 will however be subject to further review for future Extraction Plans in consideration of potential subsidence impacts and environmental consequences.

5.2.4 Effects on Future Resource Recovery

The Bulli Seam is the upper seam of the Illawarra Coal Measures of the Southern Coalfields. The interburden thickness between the base of the Bulli Seam and the top of the seam below (Balgownie Seam) varies between 7.9 m and 13.9 m. The planned mining of Longwalls 308-310 is not expected to impede on any future mining of the lower seams. Currently there are no plans for mining of these seams within the Longwalls 308-310 mining area.

6 REFERENCES

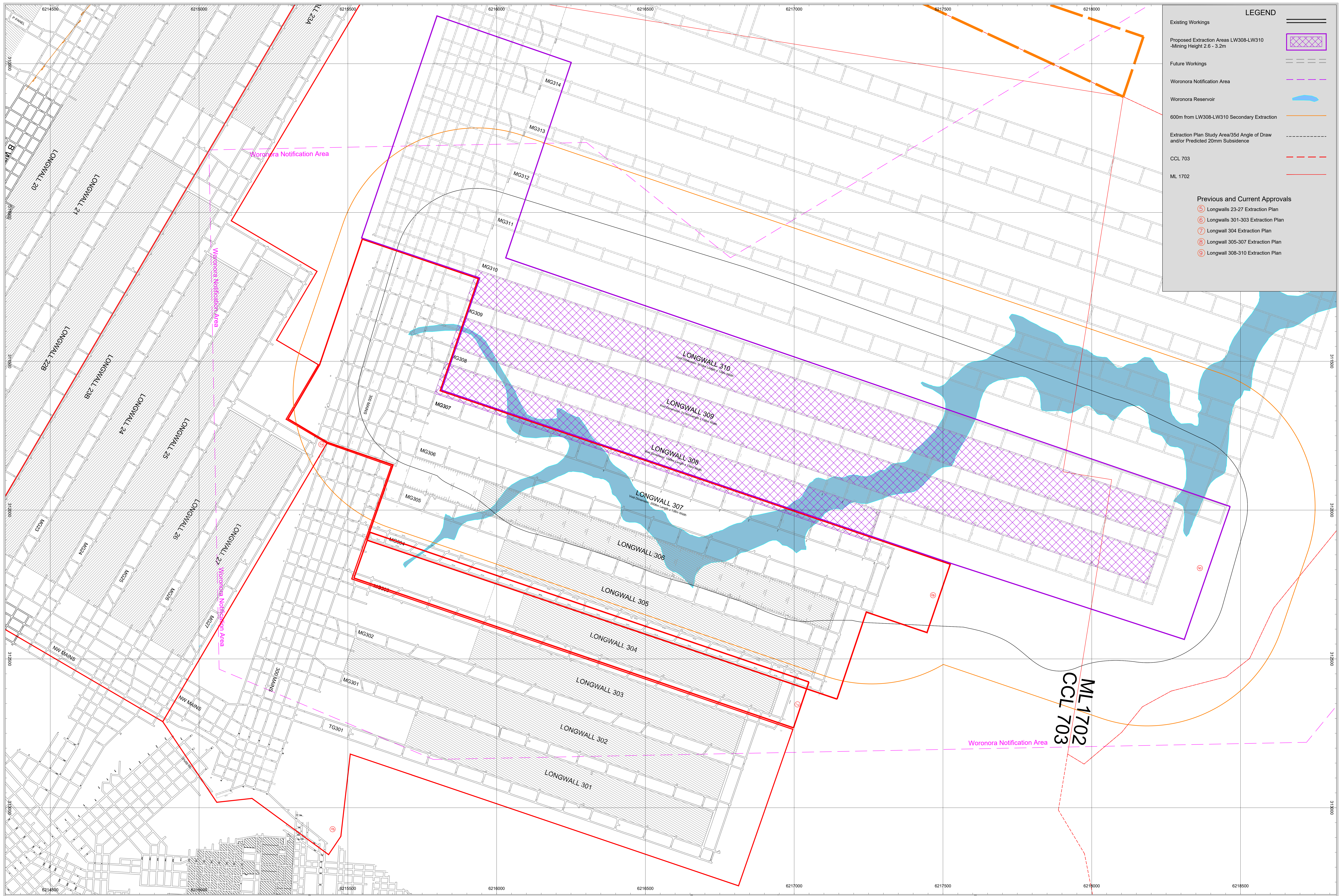
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ATTACHMENT 1

PLANS 1, 2, 3, 5 AND 6 IN ACCORDANCE WITH THE
DEPARTMENT OF PLANNING AND ENVIRONMENT AND
DIVISION OF RESOURCES AND ENERGY (2015)
GUIDELINES FOR THE PREPARATION OF EXTRACTION PLANS

Metropolitan Coal – Coal Resource Recovery Plan		
Revision No. CRRP-R01-A		
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LEGEND

- Existing Workings: Solid black line
- Proposed Extraction Areas LW308-LW310 - Mining Height 2.6 - 3.2m: Purple hatched area
- Future Workings: Dashed black line
- Woronora Notification Area: Dashed purple line
- Woronora Reservoir: Blue shaded area
- 600m from LW308-LW310 Secondary Extraction: Orange line
- Extraction Plan Study Area/35d Angle of Draw and/or Predicted 20mm Subsidence: Dashed black line
- CCL 703: Dashed red line
- ML 1702: Solid red line

Previous and Current Approvals

- 5 Longwalls 23-27 Extraction Plan
- 6 Longwalls 301-303 Extraction Plan
- 7 Longwall 304 Extraction Plan
- 8 Longwall 305-307 Extraction Plan
- 9 Longwall 308-310 Extraction Plan

Mining Engineering Manager Date
 Registered Mine Surveyor Date

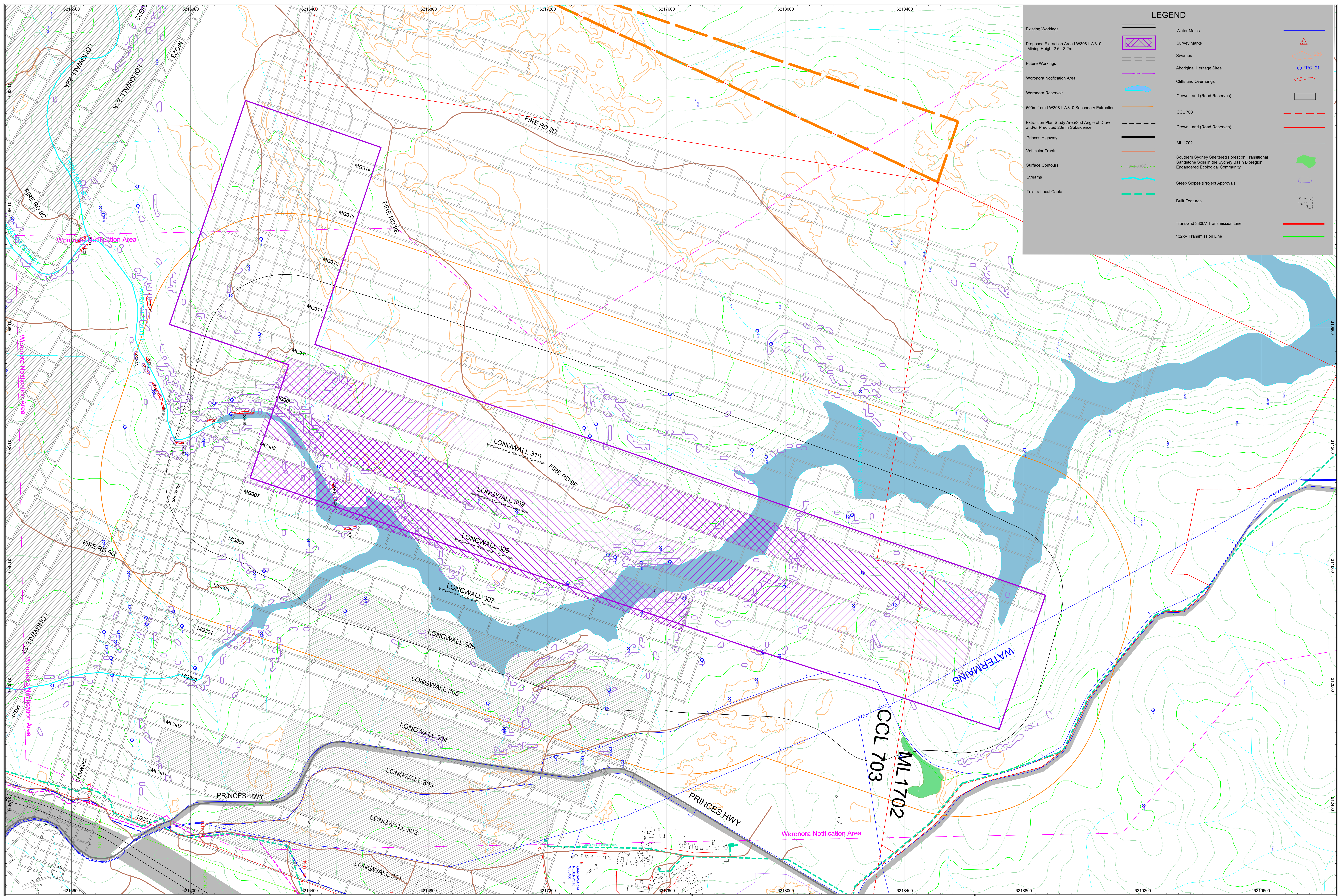
CLIENT/PROJECT
Peabody
 SURV/D/DES/GD

METROPOLITAN COAL PTY LTD
 METROPOLITAN MINE
 PO BOX 402
 HELENSBURGH 2508
 CHECKED
 AUTHORISED

DRAWING No M211220 FW_Rev1

DATE	DRAWN	SHEET	OF	SCALE
02/02/2022	Survey Dept.	1	1	1:5000

METROPOLITAN MINE
 Longwalls 308-310 Extraction Plan:
 Plan 1 - Existing, Proposed and Future Workings

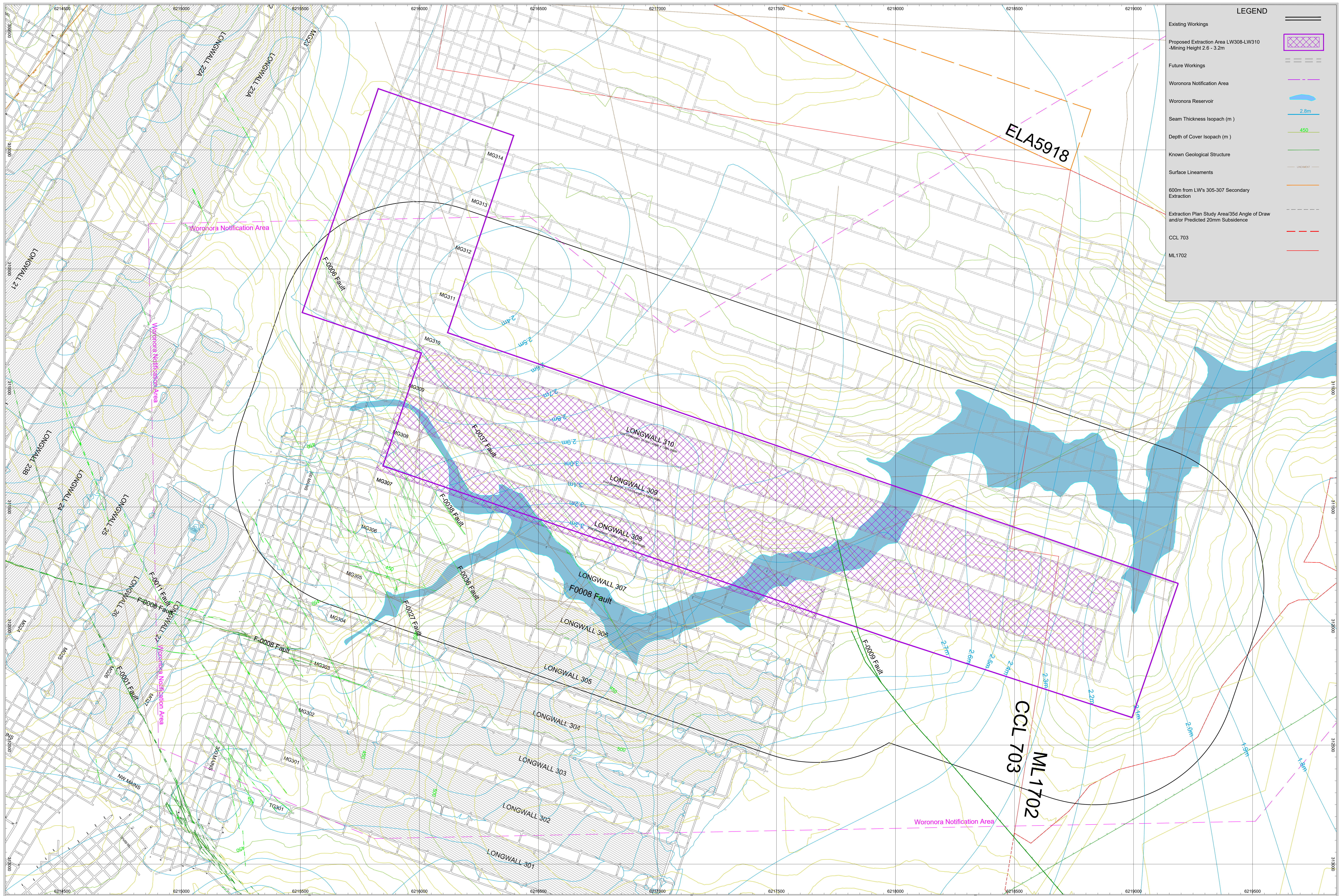


LEGEND	
Existing Workings	Water Mains
Proposed Extraction Area LW308-LW310 - Mining Height 2.6 - 3.2m	Survey Marks
Future Workings	Swamps
Woronora Notification Area	Aboriginal Heritage Sites
Woronora Reservoir	Cliffs and Overhangs
600m from LW308-LW310 Secondary Extraction	Crown Land (Road Reserves)
Extraction Plan Study Area 35d Angle of Draw and/or Predicted 20mm Subsidence	CCL 703
Princes Highway	Crown Land (Road Reserves)
Vehicular Track	ML 1702
Surface Contours	Southern Sydney Sheltered Forest on Transitional Sandstone Soils in the Sydney Basin Bioregion Endangered Ecological Community
Streams	Steep Slopes (Project Approval)
Telstra Local Cable	Built Features
	TransGrid 330kV Transmission Line
	132kV Transmission Line

	CLIENT/PROJECT		METROPOLITAN COAL PTY LTD METROPOLITAN MINE
	Mining Engineering Manager Date Registered Mine Surveyor Date		PO BOX 402 HELENSBURGH 2508
SURV/D/DES/GD	CHECKED	AUTHORISED	

DRAWING No M220202-Plan 2			
DATE	DRAWN	SHEET	OF
02/02/2022	Survey Dept.	1	1
			SCALE
			1:5,000

METROPOLITAN MINE
 Longwalls 308-310 Extraction Plan:
 Plan 2 - Surface Features

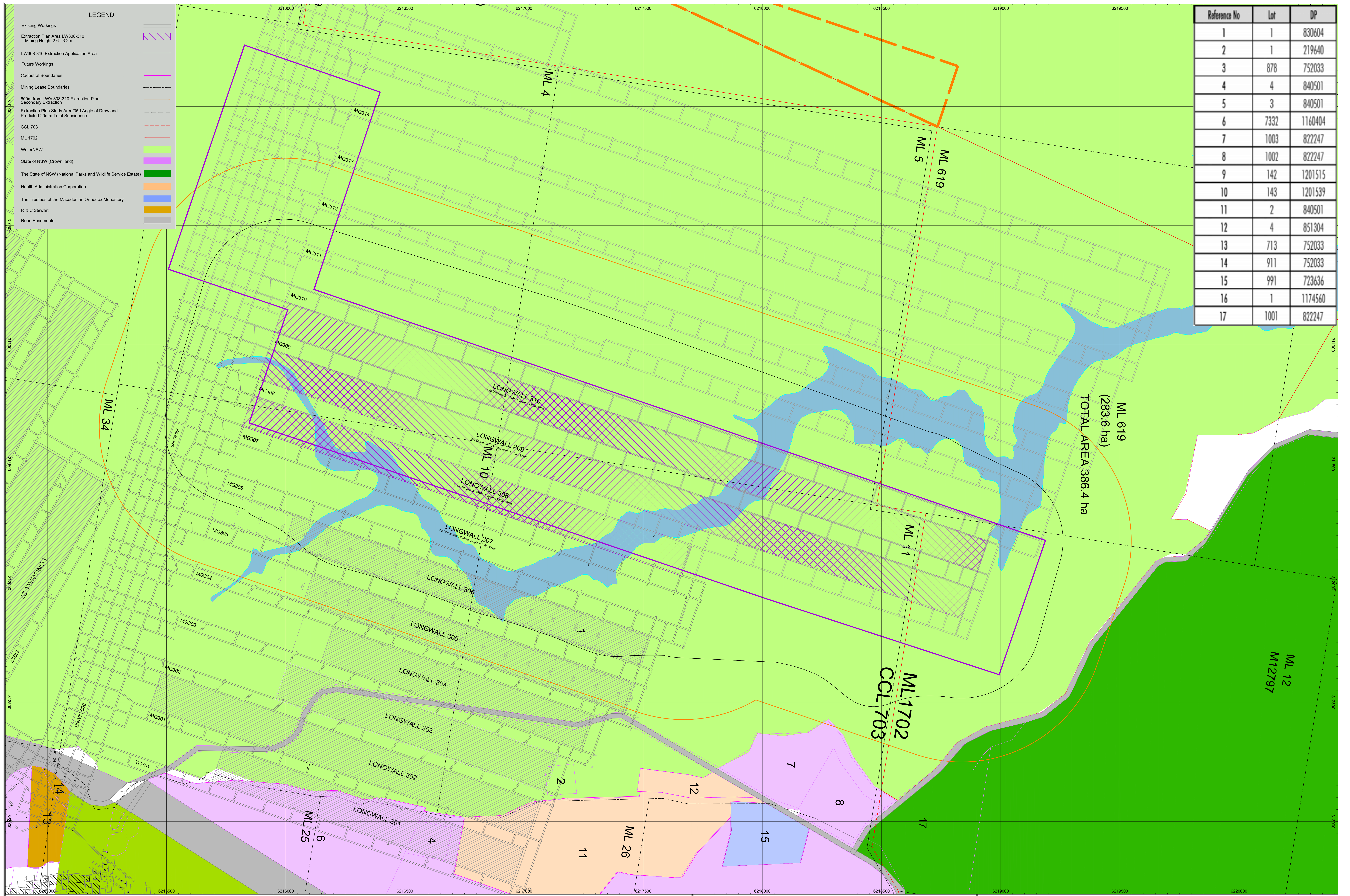


LEGEND	
Existing Workings	
Proposed Extraction Area LW308-LW310 -Mining Height 2.6 - 3.2m	
Future Workings	
Woronora Notification Area	
Woronora Reservoir	
Seam Thickness Isopach (m)	
Depth of Cover Isopach (m)	
Known Geological Structure	
Surface Lineaments	
600m from LW's 305-307 Secondary Extraction	
Extraction Plan Study Area/35d Angle of Draw and/or Predicted 20mm Subsidence	
CCL 703	
ML1702	

	CLIENT/PROJECT Peabody METROPOLITAN COAL PTY LTD METROPOLITAN MINE <small>PO BOX 402 HELENSBURGH 2508</small>	DRAWING No M220202- Plan 3 <small>S:\Metropolitan Drawing File\WGA_PLANS\Extraction Plans\220201-LW308-310\220202-Plan 3 - Geology And Seam Data Extraction LW308-LW310.dwg</small>	METROPOLITAN MINE Longwalls 308-310 Extraction Plan: Plan 3 - Geological and Seam Data
	Mining Engineering Manager Date Registered Mine Surveyor Date	DATE DRAWN SHEET OF SCALE 06/02/2022 Survey Dept. 1 1 1:5000	

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SURV/D/DES/GD CHECKED AUTHORIZED	DATE DRAWN SHEET OF SCALE 06/02/2022 Survey Dept. 1 1 1:5000
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4	4	840501
5	3	840501
6	7332	1160404
7	1003	822247
8	1002	822247
9	142	1201515
10	143	1201539
11	2	840501
12	4	851304
13	713	752033
14	911	752033
15	991	723636
16	1	1174560
17	1001	822247

LEGEND

- Existing Workings
- Extraction Plan Area LW308-310 - Mining Height 2.6 - 3.2m
- LW308-310 Extraction Application Area
- Future Workings
- Cadastral Boundaries
- Mining Lease Boundaries
- 600m from LW's 308-310 Extraction Plan Secondary Extraction
- Extraction Plan Study Area/35d Angle of Draw and Predicted 20mm Total Subsidence
- CCL 703
- ML 1702
- WaterNSW
- State of NSW (Crown land)
- The State of NSW (National Parks and Wildlife Service Estate)
- Health Administration Corporation
- The Trustees of the Macedonian Orthodox Monastery
- R & C Stewart
- Road Easements

MCA Mining Engineering Manager Date Registered Mine Surveyor Date

SURV/D/DES/GD CHECKED AUTHORIZED

CLIENT/PROJECT **Peabody** METROPOLITAN COAL PTY LTD METROPOLITAN MINE

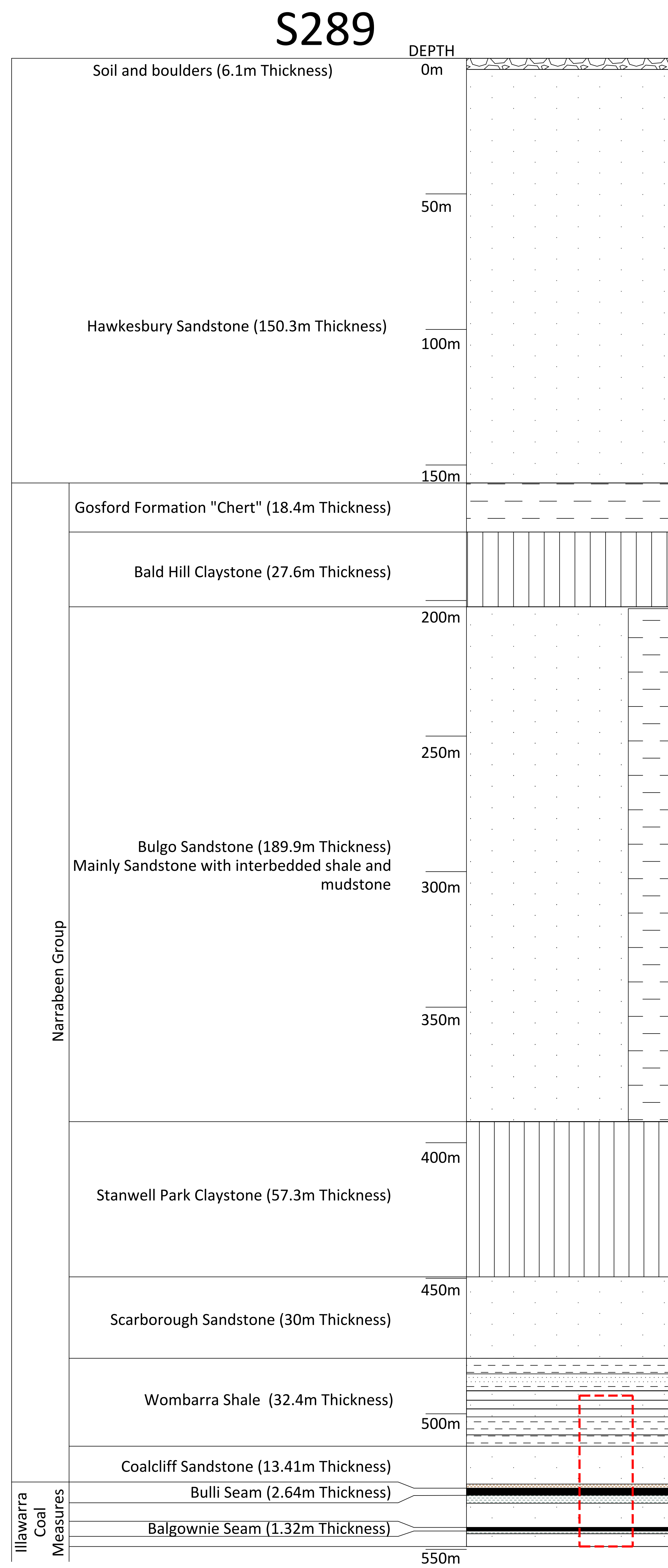
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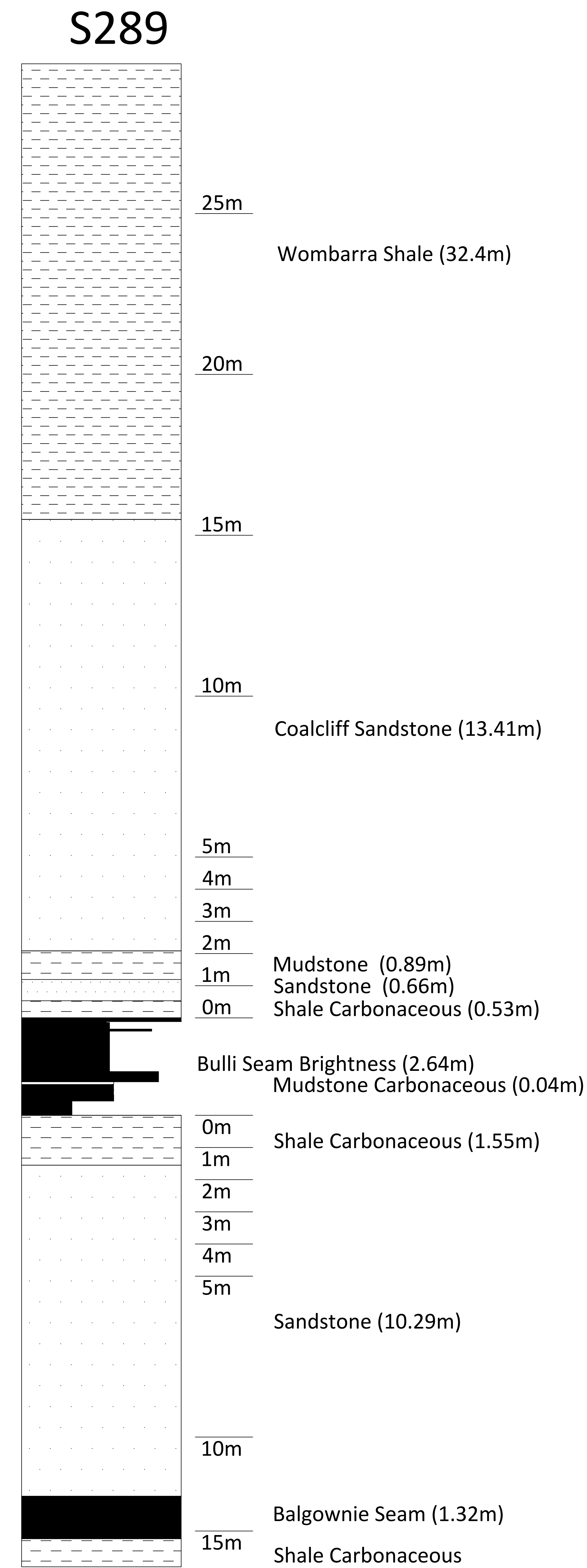
METROPOLITAN MINE
 Longwalls 308-310 Extraction Plan:
 Plan 5 - Mining Titles and Land Ownership

Vertical Log of Bore S289



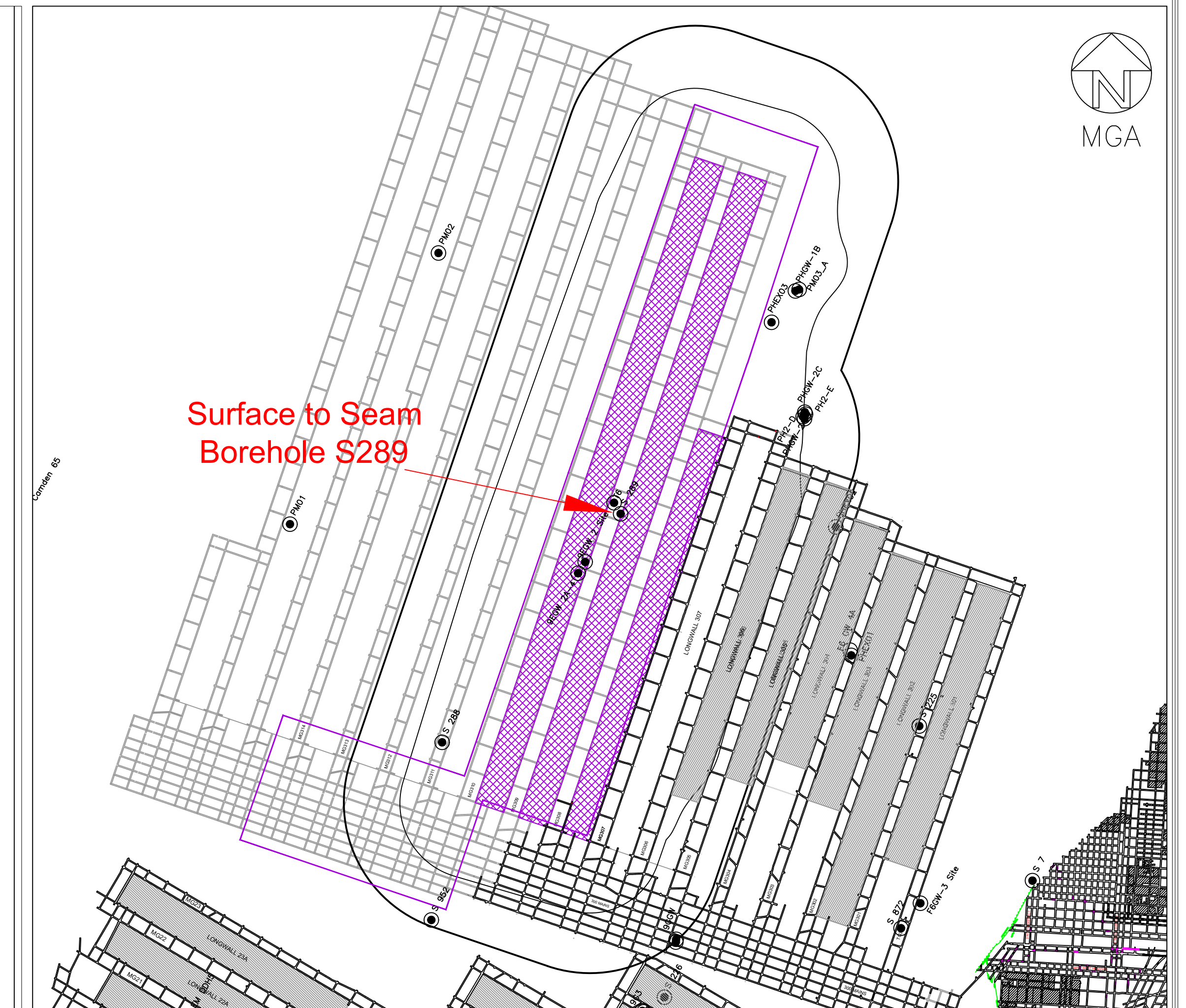
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Inset of Vertical Log Bore S289

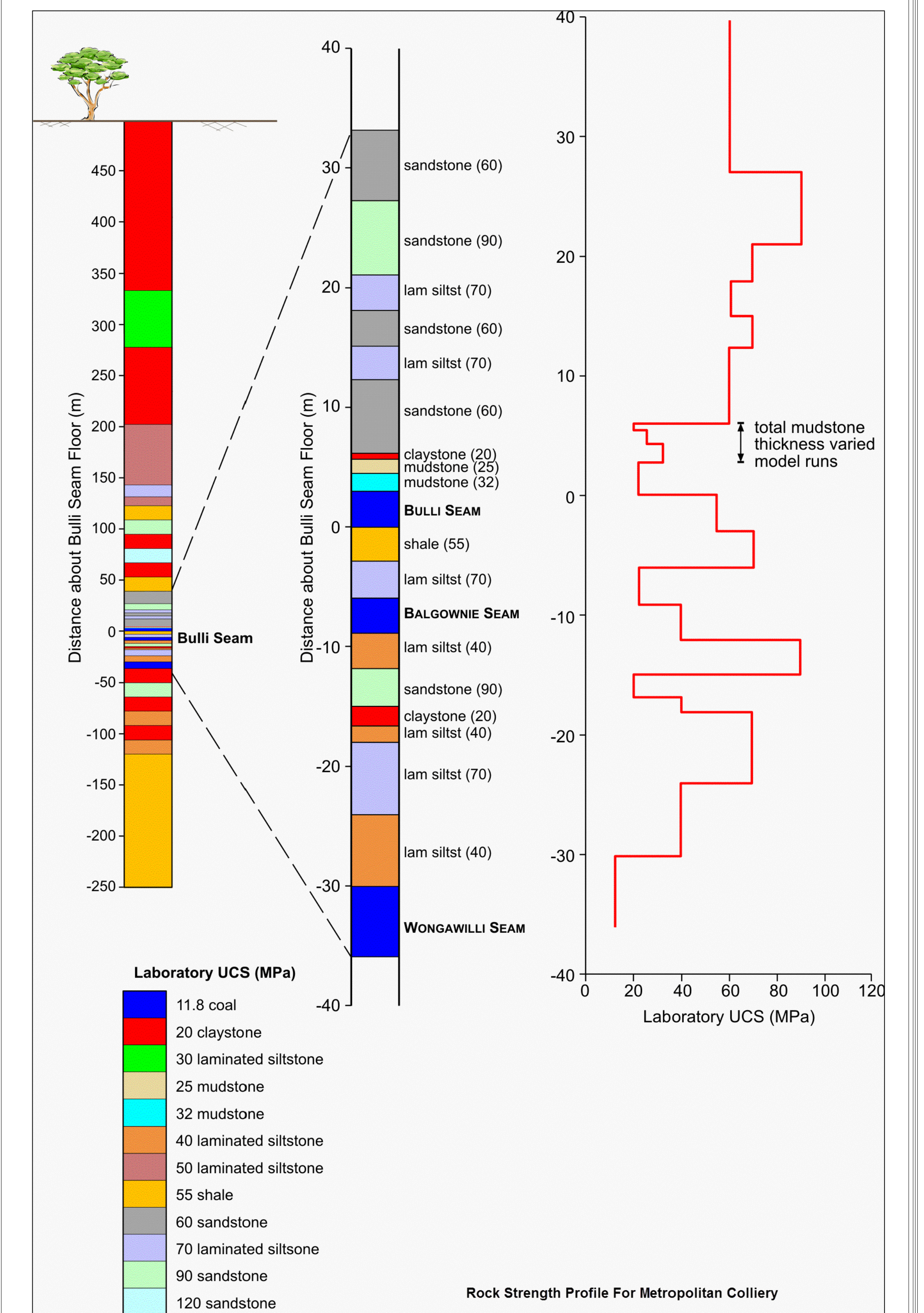


Inset

Location Plan



Geotechnical Log



CLIENT/PROJECT



METROPOLITAN COAL PTY LTD
METROPOLITAN MINE

PO BOX 402
HELENSBURGH 2508

DRAWING No M220202-Plan 6

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METROPOLITAN MINE

Longwalls 308-310 Extraction Plan:
Plan 6 - Geological Section and Geotechnical Logs

Mining Engineering Manager Date

SURV'D/DES'GD

CHECKED

AUTHORISED

ATTACHMENT 2

RISK ASSESSMENT ON GEOLOGICAL FEATURES WITH POTENTIAL TO AFFECT WATER
QUANTITY AVAILABLE TO WORNORA RESERVOIR

Metropolitan Coal – Coal Resource Recovery Plan		
Revision No. CRRP-R01-A		
Document ID: Coal Resource Recovery Plan		

WORKPLACE RISK ASSESSMENT AND CONTROL (WRAC)



Title / ID number	ME-ENV-RSK-0445 Potential geological features that may be affected by LW 308 - LW 310 mining and affect water quantity available to Woronora Reservoir and subsidence impacts to aboriginal heritage		
Site	Metropolitan Coal	Date	6th October 2021
Purpose and objectives	Assess the risks and hazards of potential geological features that may be affected by extracting LW308 - LW310. Consider hazards that may affect water quantity available to Woronora Reservoir or loss of groundwater from the catchment. To assess the risks and hazards to aboriginal heritage from subsidence impacts.		
Scope / context	This risk assessment is a recommendation arising from the Independent Expert Panel into Mining in Catchments, IEPMC, that all future Extraction Plan applications are to be accompanied by a Risk Assessment considering potential outcomes from geological features.		
Activity	This Risk Assessment was carried out in the offices at Metropolitan Colliery and via Web dial in		
Assumptions	<p>The following assumptions and limitations were applied to this risk assessment:</p> <ul style="list-style-type: none"> - Current mine plan for LW308 - LW310 - Existing natural groundwater system pathways in place. - SharePoint Document Kiosk is available and provides access to site documentation and procedures - Supervision Arrangements are in place for all activities carried out at the operation - Inspection Program Principal Control Plan is in place and followed - All existing Management Plans, Systems and Procedures are available and understood - Pre-shift and toolbox talks are completed at the start of every shift - Job Hazard Analysis is performed for all tasks where procedures are not available or when changes to the task occur - SLAM process is utilised for tasks - Incident and Hazard Reporting Procedure exist - Defect Management System is used for all defect reporting - Cardinal Rules have been developed and are communicated to the workforce and contractors - All personnel performing tasks have completed all relevant inductions - All personnel performing tasks are trained and competent in their field of expertise - All monitoring equipment is maintained to acceptable levels as determined by the mine site and the OEM - Mine water make monitoring is in place and monthly reporting conducted - Geological mapping underground occurs monthly (at a minimum) as per the Outburst Prevention Management plan - Geological mapping on surface has been completed for current mining area and will be updated as required - Overall exploration program is in place. This includes the following items: stratigraphic units - variations in nature and thickness, and lateral continuity, presence of structures and defects in overburden, permeability of overburden, stress regime 		
Reference / related documents <i>(including Change Management number reference if applicable)</i>	<p>IEPMC panel report Metropolitan Geological Plan as of 06/10/21 [ME-ENV-RSK-0333] Geological features affected by mining LW304 regarding Woronora reservoir [ME-ENV-RSK-0364] Geological features affected by mining LW305-307 regarding Woronora reservoir [ME-TSE-HMP-0011] Subsidence [ME-MIN-HMP-0006] Inundation or inrush of a substance PHMP [ME-TSE-HMP-0031] Ground or Strata Failure [ME-TSE-MNP-0002] Survey and drafting arrangements [ME-MIN-HMP-0013] Outburst Prevention [ME-MIN-HMP-0063] Contingency Mine Water Sealing [ME-MIN-MNP-0010] - Inspection Program Principal Control Plan [ME-TSE-MNP-0078] - Longwalls 308 - 310 Water Management Plan [ME-TSE-HMP-0031] - Heritage Management Plan Tarrant Geomechanics MET 027 Longwall 304-310 Geological Report Oct 2018 Surface levels with 1m contours SC201905 - Geotech evaluation of Laminated Sandstones r2 MSEC1199_ALL DRAWINGS_DRAFT_R01_210820 2018_Helensburgh-Metropolitan_2D_Repro_Processing_Interp_Report-Final 19117168-001-R-RevA 2020EX02 (Full) MDG1010 - Risk Management Handbook for the Mining Industry. Dated. May 1997 MDG1014 - Guide to Reviewing a Risk Assessment of Mine Equipment and Operations Dated. July 1997 AS NZS ISO 31000-2009 - Risk management - Principles and guidelines Work Health and Safety Act 2011 Work Health and Safety Regulation 2017 New South Wales - Work Health and Safety (Mines and Petroleum Sites) Act 2013 New South Wales - Work Health and Safety (Mines and Petroleum Sites) Regulation 2014</p>		

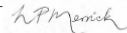


Approved by:	Name	Jon Degotardi	Signature		Date	
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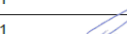

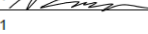
Participants - ME-ENV-RSK-0445 Potential geological features that may be affected by LW 308 - LW 310 mining and affect water quantity available to Woronora Reservoir and subsidence impacts to aboriginal heritage

Name	Title	Company	Experience (years / detail)	Consensus (Qld)	Signature and date
Peter DeBono	Mine Subsidence Engineer	MSEC	16		6/10/2021
Noel Merrick	Technical Director Hydrogeology	SLR	50 (Groundwater)		6/10/2021
Ines Epari	Principal Hydrology & Hydrogeology	SLR	18 (Groundwater)		6/10/2021
Jon Degotardi	Technical Services Manager	Peabody	20		6/10/2021
Nate Bain	Facilitator / Senior Mining Engineer	Peabody	10		6/10/2021
Stephen Love	Environmental & Community Superintendent	Peabody	11		6/10/2021
Christian Mans	Director Principal Engineer	Strata Control	18		6/10/2021
Roger Byrnes	Principal Geotechnical Engineer	Byrnes Geotechnical	30		6/10/2021
Shane Kornek	Senior Geotechnical Engineer	Peabody	20		6/10/2021
Patrick Illingworth	Environmental Project Manager	Resource Strategies	1		6/10/2021

Participants - ME-ENV-RSK-0XXX Potential geological features that may be effected by LW 308 - LW 310 mining and affect water quantity available to Woronora Reservoir and subsidence impacts to aboriginal heritage					
Name	Title	Company	Experience (years / detail)	Consensus (Qld)	Signature and date
Peter DeBono	Mine Subsidence Engineer	MSEC	16		6/10/2021
Noel Merrick	Technical Director Hydrogeology	SLR	50 (G'water)		6/10/2021
Ines Epari	Principal Hydrology & Hydrogeology	SLR	18 (Groundwater)		6/10/2021 <i>Ines Epari</i>
Jon Degotardi	Technical Services Manager	Peabody	20		6/10/2021 <i>Jon Degotardi</i>
Nate Bain	Facilitator / Senior Mining Engineer	Peabody	10		6/10/2021 <i>Nate Bain</i>
Stephen Love	Enviornmental & Community Superintendent	Peabody	11		6/10/2021
Christian Mans	Director Principal Engineer	Strata Control	18		6/10/2021
Roger Byrnes	Principal Geotechnical Engineer	Byrnes Geotechnical	30		6/10/2021
Shane Komek	Senior Geotechnical Engineer	Peabody	20		6/10/2021
Patrick Illingworth	Environmental Project Manager	Resource Strategies	1		6/10/2021

Participants - ME-ENV-RSK-0XXX Potential geological features that may be effected by LW 308 - LW 310 mining and affect water quantity available to Woronora Reservoir and subsidence impacts to aboriginal heritage					
Name	Title	Company	Experience (years / detail)	Consensus (Qld)	Signature and date
Peter DeBono	Mine Subsidence Engineer	MSEC	16		6/10/2021
Noel Merrick	Technical Director Hydrogeology	SLR	50 (G'water)		6/10/2021
Ines Epari	Principal Hydrology & Hydrogeology	SLR	18 (Groundwater)		6/10/2021
Jon Degotardi	Technical Services Manager	Peabody	20		6/10/2021 <i>Jon Degotardi</i>
Nate Bain	Facilitator / Senior Mining Engineer	Peabody	10		6/10/2021 <i>Nate Bain</i>
Stephen Love	Enviornmental & Community Superintendent	Peabody	11		6/10/2021
Christian Mans	Director Principal Engineer	Strata Control	18		6/10/2021
Roger Byrnes	Principal Geotechnical Engineer	Byrnes Geotechnical	30		6/10/2021
Shane Komek	Senior Geotechnical Engineer	Peabody	20		6/10/2021 <i>Shane Komek</i>
Patrick Illingworth	Environmental Project Manager	Resource Strategies	1		6/10/2021

Participants - ME-ENV-RSK-0XXX Potential geological features that may be effected by LW 308 - LW 310 mining and affect water quantity available to Woronora Reservoir and subsidence impacts to aboriginal heritage					
Name	Title	Company	Experience (years / detail)	Consensus (Qld)	Signature and date
Peter DeBono	Mine Subsidence Engineer	MSEC	16		6/10/2021
Noel Merrick	Technical Director Hydrogeology	SLR	50 (G'water)		6/10/2021
Ines Epari	Principal Hydrology & Hydrogeology	SLR	18 (Groundwater)		6/10/2021 
Jon Degotardi	Technical Services Manager	Peabody	20		6/10/2021 
Nate Bain	Facilitator / Senior Mining Engineer	Peabody	10		6/10/2021 
Stephen Love	Enviornmental & Community Superintendent	Peabody	11		6/10/2021
Christian Mans	Director Principal Engineer	Strata Control	18		6/10/2021
Roger Byrnes	Principal Geotechnical Engineer	Byrnes Geotechnical	30		6/10/2021
Shane Komek	Senior Geotechnical Engineer	Peabody	20		6/10/2021
Patrick Illingworth	Environmental Project Manager	Resource Strategies	1		6/10/2021

Participants - ME-ENV-RSK-0XXX Potential geological features that may be effected by LW 308 - LW 310 mining and affect water quantity available to Woronora Reservoir and subsidence impacts to aboriginal heritage					
Name	Title	Company	Experience (years / detail)	Consensus (Qld)	Signature and date
Peter DeBono	Mine Subsidence Engineer	MSEC	16		6/10/2021
Noel Merrick	Technical Director Hydrogeology	SLR	50 (G'water)		6/10/2021
Ines Epari	Principal Hydrology & Hydrogeology	SLR	18 (Groundwater)		6/10/2021
Jon Degotardi	Technical Services Manager	Peabody	20		6/10/2021 
Nate Bain	Facilitator / Senior Mining Engineer	Peabody	10		6/10/2021 
Stephen Love	Enviornmental & Community Superintendent	Peabody	11		6/10/2021
Christian Mans	Director Principal Engineer	Strata Control	18		6/10/2021 
Roger Byrnes	Principal Geotechnical Engineer	Byrnes Geotechnical	30		6/10/2021
Shane Komek	Senior Geotechnical Engineer	Peabody	20		6/10/2021
Patrick Illingworth	Environmental Project Manager	Resource Strategies	1		6/10/2021

Ref ID	Risk / threat	Work area or exposure group	Consequence category (use a separate row if multiple reasonably foreseeable consequences of the same threat as shown in examples)	Impact	Act / Object or System Current controls in place	Detection Factor - Monitoring and Support to Address (Relevant specification documents, inspection and monitoring, training, systems or procedures, etc.)	Risk evaluation (with current control measures)			Proposed additional controls (if required)	Ownership (Position / role of person(s) accountable for the risk)	Peabody Notification level	Action to address (SM 2526M Action Number)
							Maximum reasonable consequence	Likelihood	Risk score				
1. LINEAMENTS													
1.1	Mining effects geological feature - known and unknown LINEAMENTS and affects water quantity available to the Woronora reservoir and / or ground water. LINEAMENTS - Definition Linear feature in the surface landscape that may be the surface expression of an underlying geological structure - (faults, joints, dyke)	Water NSW and Dam Safety Committee for all	Compliance / regulatory Considered other consequence categories - Financial, Reputation, Strategic, Environmental	Breach of approval	System - Water management plan includes ground water monitoring and assessment Act - Lineament analysis prior to mine design System - Regular underground mapping of geological features in development panel Act - Correlation of surface lineaments with potential underground structures (inseam drilling , mapping) Act - Seismic surveying to assess continuity and extent of structure System - Mine water balance - monitoring and monthly reporting System - Regular review and update of MP's System - [ME-TSE-HMP-0031] Ground or Strata Failure System - [ME-TSE-HMP-0002] Survey and drafting arrangements System - [ME-TSE-HMP-0011] Subsidence System - [ME-MIN-HMP-0006] Inundation or intrush of a substance PHMP System - Mining approvals System - Geometry, Narrow Extraction / depth of cover ratios System - Wide chain pillars System - End of panel subsidence monitoring programme - LIDAR plus aerial photography Object - Previous experience at Metropolitan, and other operations within the southern coalfields, mining near Lineaments Act - Review in seam drilling Act - Correlation of underground structures (inseam drilling , mapping) with surface lineaments	Limited coverage of all survey and monitoring techniques, due to vegetation and topography impacting accessibility. Inadequate application of Management Plans. Inaccuracies in water balance monitoring.	4 Significant	1 Rare	10	Act - Potential for LW step around Act - Potential for LW standoff - environmental pillar Object - Potential for additional or replacement ground water monitoring sites Act - Targeted surface mapping above LW308 - LW310 Act - Review at end of panel the outcomes of LW306 when mining beneath lineaments for any evidence of water quantity available to Woronora Reservoir being affected	SK SK	Crew/Team	Targeted surface mapping above LW308 - LW310 Review at end of panel the outcomes of LW306 when mining beneath lineaments for any evidence of water quantity available to Woronora Reservoir being affected
2. JOINTS													
2.1	Mining effects geological feature - JOINTS and affects water quantity available to the Woronora reservoir and / or ground water. <i>The Assessment Team deemed the risk from joints to be the same as lineaments above. Joints may contribute to the formation of a lineament but are not likely to be vertically connective with underground workings.</i>												
3. FAULTING													
3.1	Mining effects geological feature - FAULTING re-activates a structure resulting in effect to water quantity available to the Woronora reservoir and / or ground water.	Water NSW	Compliance / regulatory Considered other consequence categories - Financial, Reputation, Strategic, Environmental	Breach of approval	System - Water management plan includes ground water monitoring and assessment Act - Lineament analysis prior to mine design System - Regular underground mapping of geological features in development panel Act - Correlation of surface lineaments with potential underground structures (inseam drilling , mapping) Act - Seismic surveying to assess continuity and extent of structure System - Mine water balance - monitoring and monthly reporting System - Regular review and update of MP's System - [ME-TSE-HMP-0031] Ground or Strata Failure System - [ME-TSE-HMP-0002] Survey and drafting arrangements System - [ME-TSE-HMP-0011] Subsidence System - [ME-MIN-HMP-0006] Inundation or intrush of a substance PHMP System - Mining approvals Act - Ground water modelling to predict ground water flow behaviour System - Conceptual model - ground water and geotechnical, faults not necessarily contiguous System - Narrow Extraction / depth of cover ratios + geometry System - End of panel subsidence monitoring programme - LIDAR plus aerial photography	Limited coverage of all survey and monitoring techniques, due to vegetation and topography impacting accessibility. Inadequate application of MP Inaccuracies in water balance model	4 Significant	2 Unlikely	20	Act - Potential for LW step around Act - Potential for LW standoff - environmental pillar Object - Potential for additional ground water monitoring sites Act - Targeted surface mapping above LW308 - LW310 Act - Potential for additional surface drilling to characterise a faulting feature	SK	Supervisor	Targeted surface mapping above LW308 - LW310 Targeted, post mining, groundwater monitoring site above LW305 to investigate height of fracture zone and permeability and presence of shear on bedding planes

WORKPLACE RISK ASSESSMENT AND CONTROL (WRAC)



Site	Metropolitan Coal
Date	6th October 2021
Title	ME-ENV-RSK-0445 Potential geological features that may be affected by LW 308 - LW 310 mining and affect water quantity available to Woronora Reservoir and subsidence impacts to aboriginal heritage

Treatment plan					
Ref ID	Additional controls	Action to address	SAP action no:	Responsible person	Due date
1	Targeted surface mapping above LW308 - LW310	Targeted surface mapping above LW308- LW310		SK	Dec-21
2	Correlation of surface lineaments with potential underground structures (inseam drilling , mapping)	Correlation of surface lineaments with potential underground structures (inseam drilling , mapping)		JD	Dec-21
3	Underground water make monitoring specific to F9 and F37 during mining, and further delineation with roadway advancement and inseam drilling.	Underground water make monitoring specific to F9 and F37 during mining, and further delineation with roadway advancement and inseam drilling.		JD	Dec-22
4	Review at end of panel the outcomes of LW306 when mining beneath lineaments for any evidence of water quantity available to Woronora Reservoir being affected	Review at end of panel the outcomes of LW306 when mining beneath lineaments for any evidence of water quantity available to Woronora Reservoir being affected		SK	Jun-22
5	Targeted, post mining, groundwater monitoring site above LW305 to investigate height of fracture zone and permeability and presence of shear on bedding planes	Targeted, post mining, groundwater monitoring site above LW305 to investigate height of fracture zone and permeability and presence of shear on bedding planes		JD	Jun-22
6	Develop a post mining review strategy for heritage sites above LW306	Develop a post mining review strategy for heritage sites above LW306		SL	Jun-22
7	Detailed pre-mining geological mapping of sites with high cultural significance and/or high archaeological significance for LW308 - LW310	Detailed pre-mining geological mapping of sites with high cultural significance and/or high archaeological significance for LW308 - LW310		JD	Dec-21
8	Overlay plan of geological features with heritage sites to assist with identifying those at higher risk	Overlay plan of geological features with heritage sites to assist with identifying those at higher risk		JD	Dec-21