

# METROPOLITAN COAL LONGWALLS 308-310

## EXTRACTION PLAN



MAIN TEXT

# METROPOLITAN COAL

## LONGWALLS 308-310



### EXTRACTION PLAN

#### Revision Status Register

Section/Page/ Annexure	Revision Number	Amendment/Addition	Distribution	DPE Approval Date
All	LW308-310 EP-R01-A	Original	DPE	-
Section 1, Attachment 1, Figures 2a and 2b	LW308-310 EP-R01-B	To Address DPE Comments on Version A of the Plan	DPE	-

November 2022

**TITLE BLOCK**

<b>Applicant</b>	Peabody Energy Australia Pty Ltd
<b>Mine</b>	Metropolitan Coal
<b>Project Approval</b>	Project Approval 08_0149
<b>Mining Leases</b>	Consolidated Coal Lease 703 Mining Lease 1610 Mining Lease 1702 Coal Lease 379 Mining Purpose Lease 320
<b>Title</b>	Metropolitan Coal Longwalls 308-310 Extraction Plan
<b>Date</b>	23 November 2022
<b>Document Reference Number</b>	EP-R01-B
<b>General Description</b>	Management of potential subsidence effects, subsidence impacts and environmental consequences during the mining of Longwalls 308-310 at Metropolitan Coal
<b>Name of Authorised Representative</b>	Jon Degotardi
<b>Title of Authorised Representative</b>	Technical Services Manager
<b>Signature of Authorised Representative</b>	
<b>Name of Mining Engineering Manager</b>	James Hannigan
<b>Signature of Mining Engineering Manager</b>	
<b>Name of General Manager</b>	James Hannigan
<b>Signature of General Manager</b>	
<b>Date of Signatures</b>	<b>23 November 2022</b>

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Appendix E Built Features Management Plan

Appendix F Public Safety Management Plan

Appendix G Subsidence Monitoring Program

Appendix H Coal Resource Recovery Plan

Appendix I Subsidence Report

## 1 OVERVIEW OF THE EXTRACTION PLAN

The Metropolitan Coal Mine (**Metropolitan Coal**) is owned and operated by Metropolitan Coal Pty Ltd which is a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (**Peabody**). It is located adjacent to the township of Helensburgh (Figure 1) and approximately 30 kilometres (**km**) north of Wollongong in New South Wales (**NSW**). Metropolitan Coal is located within Consolidated Coal Lease (CCL) 703, Mining Lease (**ML**) 1610 and ML 1702. Metropolitan Coal is one of the earliest established and longest continually running coal mining operations in Australia, with a history dating back to the 1880s.

Metropolitan Coal was granted approval for the Metropolitan Coal Project (the **Project**) by the Minister for Planning 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 and surface facilities at Metropolitan Coal.

The Project involves the extraction of coal by longwall mining methods from the Bulli Seam. The potential environmental consequences of the Project were assessed in the *Metropolitan Coal Project Environmental Assessment* (the **Project EA**) (Helensburgh Coal Pty Ltd [HCPL], 2008) and the *Metropolitan Coal Project Preferred Project Report* (the **Preferred Project Report**) (HCPL, 2009).

Longwalls 308-310 are situated to the west of Longwalls 301-304 and define the next mining sub-domain within the Project underground mining area (Figures 1 and 2a).

In accordance with Condition 5, Schedule 3 of Project Approval (08\_0149), Metropolitan Coal sought approval from the Planning Secretary on 20 October 2022 (i.e. following lodgement of the Extraction Plan application) to vary the first workings of Longwall 309 such that the installation face for Longwall 309 is established 1288 m south of the position put forward in the Extraction Plan application. DPE approved the variation to the first workings of Longwall 309 on 15 November 2022. The amended Longwalls 308-310 layout is shown on Figure 2b. The amended first workings are non-subsiding and therefore will not increase the subsidence effects considered in this Extraction Plan. The panel width, pillar width and panel orientation of the amended Longwall 309 are also consistent with the layout shown on Figure 2a, and therefore will not result in any new or increased impacts from those considered in this Extraction Plan. Figures showing the full length of Longwall 309 have been retained throughout the remainder of this Extraction Plan (i.e. as per the layout shown on Figure 2a).

### 1.1 PURPOSE AND SCOPE

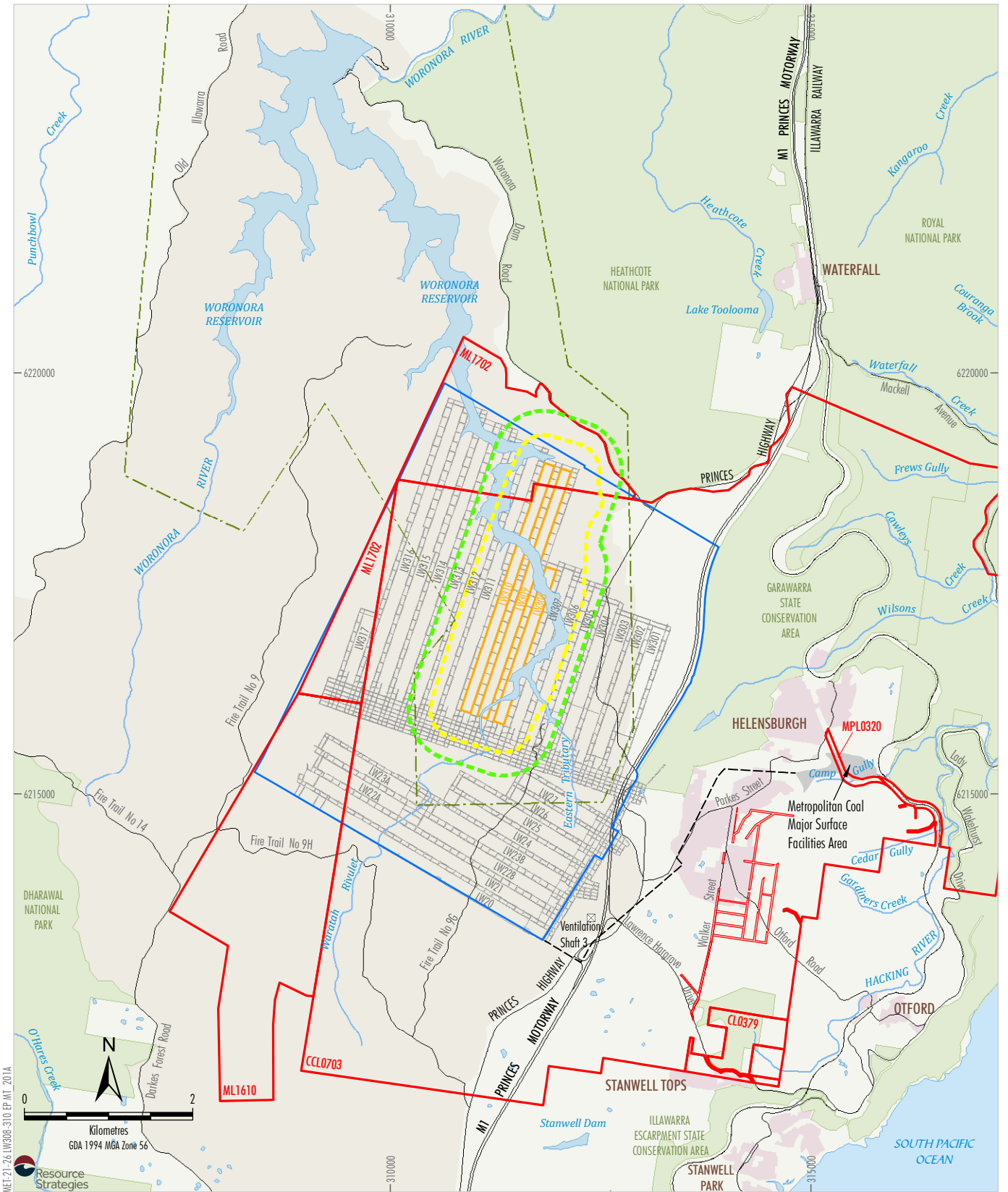
This Extraction Plan outlines the proposed management, mitigation, monitoring and reporting of potential subsidence impacts and environmental consequences in the Project underground mining area during the secondary extraction of Longwalls 308-310 at Metropolitan Coal.

This Extraction Plan has been prepared in consideration of the NSW Department of Planning and Environment (DP&E) (now the NSW Department of Planning and Environment [**DPE**]) and NSW Division of Resources and Energy (**DRE**) (now the Resources Regulator [**RR**]) (2015) *Guidelines for the Preparation of Extraction Plans*.

This Extraction Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences for Longwalls 20-22, 23-27, 301-303, 304 and 305-307. This Extraction Plan will supersede the previously approved Metropolitan Coal Longwalls 305-307 Extraction Plans consistent with the recommended approach in the DPE and DRE (2015) *Guidelines for the Preparation of Extraction Plans*.

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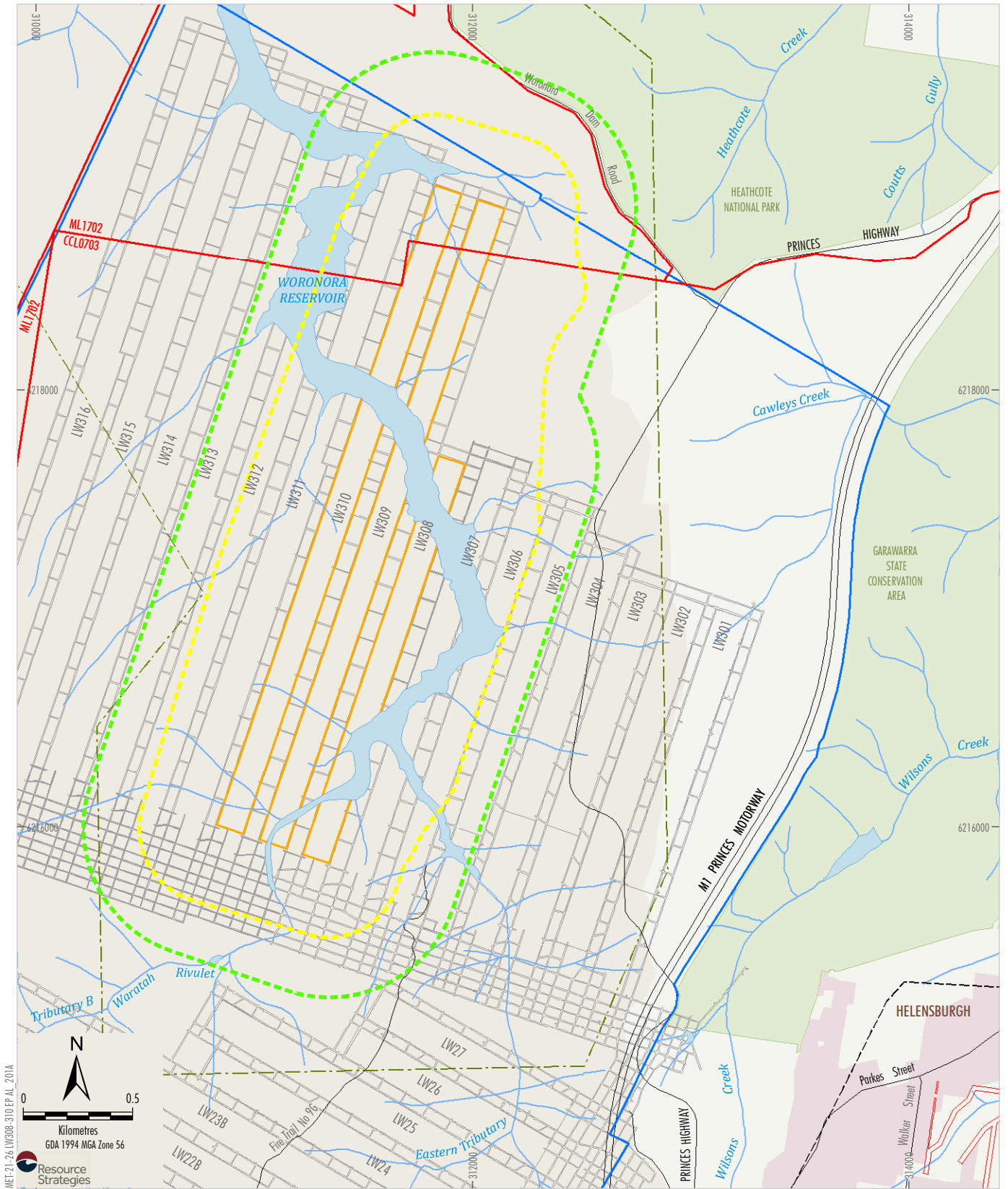
MET-21-26 LW308-310 EP INT. 2014  
Resource Strategies

- 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**



MET-21-26 LW308-310 EP AL 201A  
 Resource Strategies

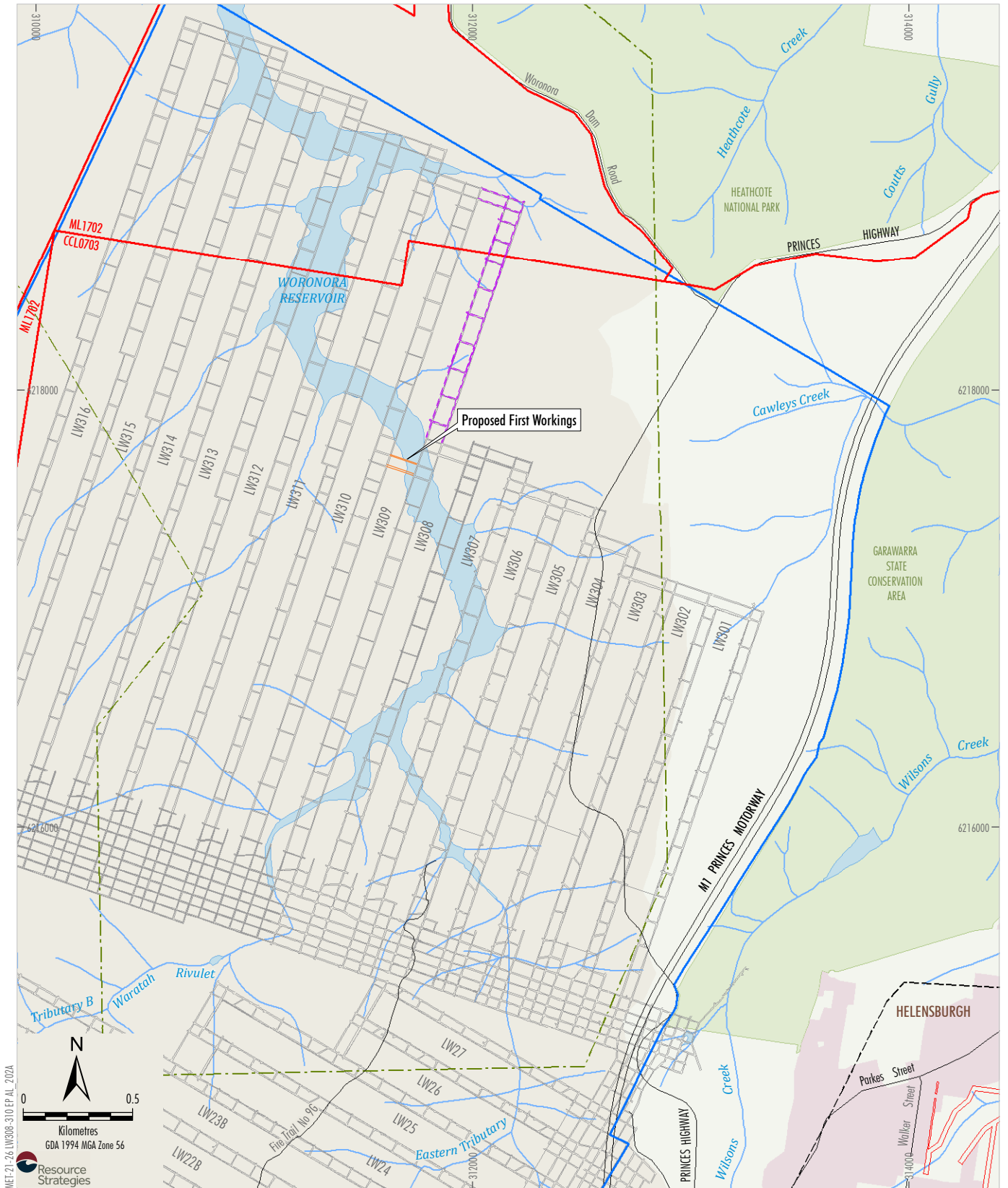
**LEGEND**

- Mining Lease Boundary
- Woronora Special Area
- 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 Layout

**Figure 2a**



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

**LEGEND**

- Mining Lease Boundary
- Woronora Special Area
- Project Underground Mining Area Longwalls 20-27 and 301-317
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)
- First Workings Amendment
- First Workings not to be Developed\*

\* Note: Metropolitan Coal sought approval from the Planning Secretary to vary the first workings of Longwall 309 on 20 October 2022 (i.e. following lodgment of the Extraction Plan application). The Planning Secretary approved the variation to Longwall 309 on 15 November 2022.

**Peabody**  
METROPOLITAN COAL  
Longwall 309 First Workings  
Amendment Area

**Figure 2b**

The objectives of this Extraction Plan are to:

- provide detailed plans of Longwalls 308-310;
- outline potential subsidence effects, subsidence impacts and environmental consequences of Longwalls 308-310;
- describe the measures that will be implemented to manage, mitigate and remediate potential subsidence impacts and environmental consequences during the mining of Longwalls 308-310;
- detail the monitoring of subsidence effects, subsidence impacts and environmental consequences during the mining of Longwalls 308-310; and
- provide a contingency plan for subsidence impacts and environmental consequences in relation to the Project's subsidence impact performance measures

The Extraction Plan area for Longwalls 308-310, based on a 35 degree (°) angle of draw and/or predicted 20 millimetre (mm) subsidence contour, is shown on Figures 1 and 2.

This Extraction Plan has been prepared by Metropolitan Coal with assistance from a team of suitably qualified and experienced persons including Mine Subsidence Engineering Consultants (MSEC), SLR Consulting, Hydro Engineering & Consulting, Associate Professor Barry Noller, Ecoplanning, Cenwest Environmental Services, Niche Environment and Heritage, and Resource Strategies.

This Extraction Plan forms part of Metropolitan Coal's Environmental Management Strategy. The relationship of this Extraction Plan to the Metropolitan Coal Environmental Management Structure is shown on Figure 3.

### 1.1.1 Statutory Requirements

This Extraction Plan has been prepared in accordance with the conditions of the Project Approval (08\_0149) and in consideration of the DPE and DRE (2015) *Guidelines for the Preparation of Extraction Plans*.

The statutory requirements relevant to this Extraction Plan are summarised below.

#### **Project Approval (08\_0149)**

This Extraction Plan has been prepared in accordance with Conditions 6 and 7, Schedule 3 of the Project Approval. The requirements of Conditions 6 and 7, Schedule 3 of the Project Approval are summarised in Table 1, along with the relevant section of this Extraction Plan in which the requirements are addressed.

Further detail on the requirements of the Project Approval is provided in Attachment 1.

**Table 1  
Extraction Plan Requirements**

Project Approval (08_0149) Condition	Extraction Plan Reference
<p><b>Condition 6, Schedule 3</b></p> <p>6. The Proponent shall prepare and implement an Extraction Plan for all second workings in the mining area to the satisfaction of the Director-General<sup>[1]</sup>. This plan must:</p> <p>(a) be prepared by a team of suitably qualified experts whose appointment has been endorsed by the Director-General;</p>	<p>This document</p> <p>Section 1.1</p>

**Table 1 (Continued)**  
**Extraction Plan Requirements**

Project Approval (08_0149) Condition	Extraction Plan Reference
<b>Condition 6, Schedule 3 (Continued)</b>	
(b) be approved by the Director-General before the Proponent is allowed to carry out the second workings covered by the Extraction Plan;	Section 1.1
(c) include a detailed plan for the second workings, which has been prepared to the satisfaction of DRE <sup>[2]</sup> , and provides for adaptive management (from Longwall 23 onwards);	Section 1.3 and Appendix H
(d) include detailed plans of any associated surface construction works;	N/A
(e) include the following to the satisfaction of DRE <sup>[2]</sup> :	
• a coal resource recovery plan that demonstrates effective recovery of the available resource;	Appendix H
• revised predictions of the conventional and non-conventional subsidence effects and subsidence impacts of the extraction plan, incorporating any relevant information that has been obtained since this approval; and	Appendix I
• a Subsidence Monitoring Program to:	Appendix G
- validate the subsidence predictions; and	
- analyse the relationship between the subsidence effects and subsidence impacts of the Extraction Plan and any ensuing environmental consequences;	
(f) include a:	
• Water Management Plan, which has been prepared in consultation with OEH, SCA <sup>[3]</sup> and NOW <sup>[4]</sup> , to manage the environmental consequences of the Extraction Plan on watercourses (including the Woronora Reservoir), aquifers and catchment yield;	Appendix A
• Biodiversity Management Plan, which has been prepared in consultation with OEH and DRE (Fisheries) <sup>[5]</sup> , to manage the potential environmental consequences of the Extraction Plan on aquatic and terrestrial flora and fauna, with a specific focus on swamps;	Appendix C
• Land Management Plan, which has been prepared in consultation with SCA <sup>[3]</sup> , to manage the potential environmental consequences of the Extraction Plan on cliffs, overhangs, steep slopes and land in general;	Appendix B
• Heritage Management Plan, which has been prepared in consultation with OEH and the relevant Aboriginal groups, to manage the potential environmental consequences of the Extraction Plan on heritage sites or values;	Appendix D
• Built Features Management Plan, which has been prepared in consultation with the owner of the relevant feature, to manage the potential environmental consequences of the Extraction Plan on any built features; and	Appendix E
(g) include a Public Safety Management Plan, which has been prepared in consultation with DRE <sup>[2]</sup> (for any mining within the DSC notification area), to ensure public safety in the mining area.	Appendix F
<i>Note: In accordance with condition 12 of schedule 2, the preparation and implementation of Extraction Plans for second workings may be staged, with each plan covering a defined area of second workings. In addition, these plans are only required to contain management plans that are relevant to the specific second workings that are being carried out.</i>	
<b>Condition 7, Schedule 3</b>	
7. In addition to standard requirements for management plans (see condition 2 of schedule 7), the Proponent shall ensure that the management plans required under condition 6(f) above include:	
(a) a program to collect sufficient baseline data for future Extraction Plans;	Appendices A to E, Attachment 2
(b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;	Appendices A to F, Appendix I
(c) a detailed description of the measures that would be implemented to remediate predicted impacts; and	Appendices A to F, Section 3
(d) a contingency plan that expressly provides for adaptive management.	Appendices A to F, Section 4.1

<sup>1</sup> The Director-General of the DPE is now the Secretary of the DPE.

<sup>2</sup> The DRE is now the RR.

<sup>3</sup> The Sydney Catchment Authority (SCA) is now WaterNSW.

<sup>4</sup> The NSW Office of Water (NOW) is now the Department of Planning and Environment – Water (DPE – Water).

<sup>5</sup> DRE (Fisheries) is now the Department of Primary Industries – Fisheries (DPI-Fisheries).

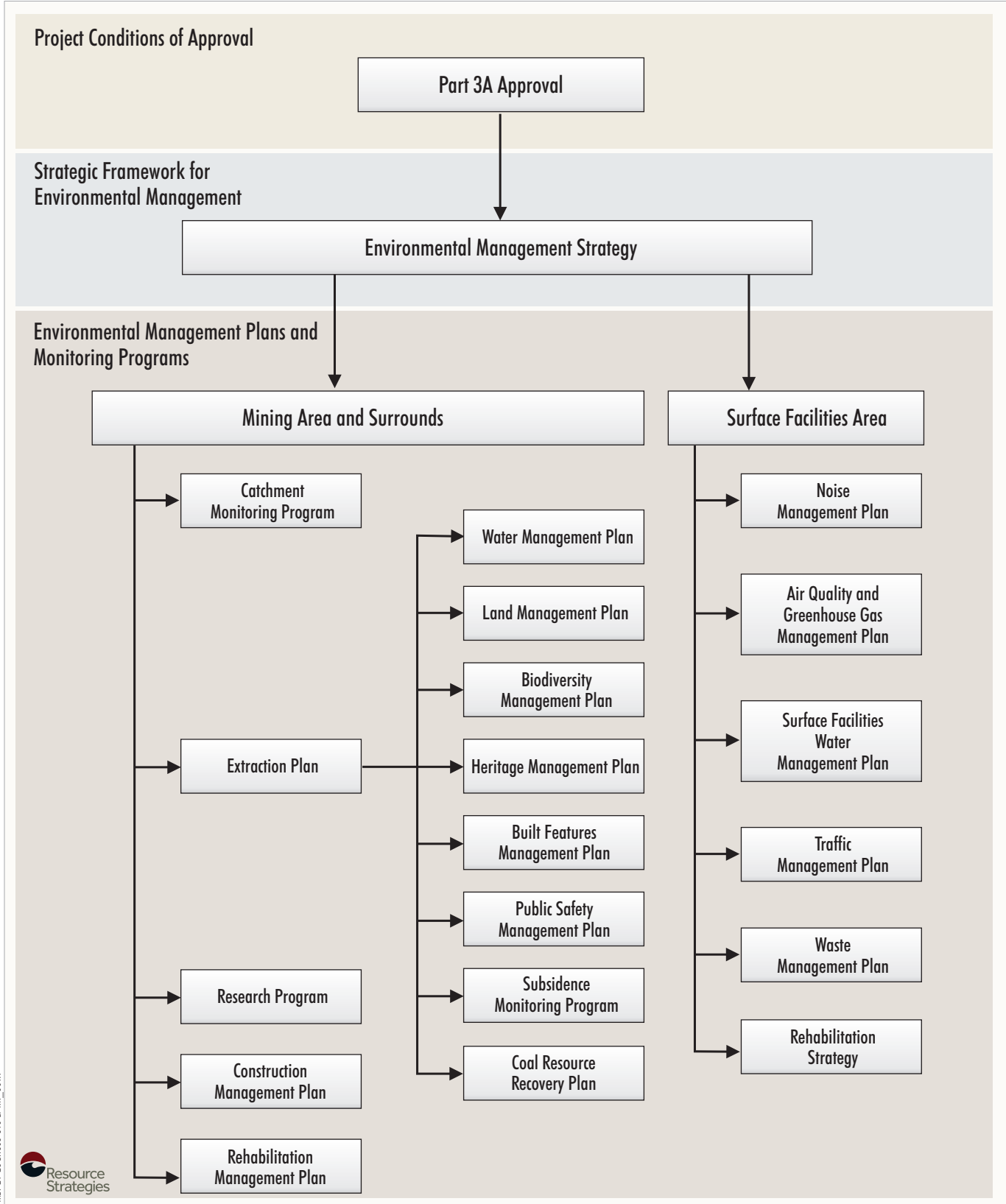


Figure 3

## Licences, Permits and Leases

In addition to the Project Approval, all activities at or in association with Metropolitan Coal will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending.

- The conditions of mining leases issued by the NSW Division of Resources and Geoscience (DRG) (now Mining, Exploration and Geoscience [MEG]), under the NSW *Mining Act 1992* (e.g. CCL 703, ML 1610, ML 1702, Coal Lease [CL] 379 and Mining Purpose Lease [MPL] 320).
- The *Metropolitan Coal Mining Operations Plan 1 October 2021 to 30 September 2023* approved by the Resources Regulator.
- The conditions of Environment Protection Licence (EPL) No. 767 issued by the NSW Environment Protection Authority (EPA) under the NSW *Protection of the Environment Operations Act 1997*. Revision of the EPL will be required prior to the commencement of Metropolitan Coal activities that differ from those currently licensed.
- The prescribed conditions of specific surface access leases within CCL 703 for the installation of surface facilities as required.
- Water Access Licences (WALs) issued by the NSW Department of Industry – Water (now DPE – Water) under the NSW *Water Management Act 2000*, including WAL 36475 under the *Water Sharing Plan for the Greater Metropolitan Region Groundwater Sources 2011* and WAL 25410 under the *Water Sharing Plan for the Greater Metropolitan Region Unregulated River Water Sources 2011*.
- Mining and workplace health and safety related approvals granted by the NSW Resources Regulator and WorkCover NSW.
- Supplementary approvals obtained from WaterNSW for surface activities within the Woronora Special Area (e.g. fire road maintenance activities).

## 1.2 STRUCTURE OF THE EXTRACTION PLAN

This Extraction Plan comprises a main text component (with Attachments) and supporting management plans and studies, which include Appendices A through to I. An overview of the Extraction Plan main text sections and Attachments is presented below:

Section 1	Provides an overview of the Extraction Plan, including a description of the purpose and scope of the Extraction Plan and a summary of the mine plan and design, subsidence predictions, subsidence impact performance measures and subsidence management approach.
Section 2	Describes the process of development of the Extraction Plan, including the conduct of risk assessments, the review of relevant information obtained since Project Approval, the update and review of predicted subsidence effects and potential subsidence impacts and environmental consequences, and a summary of consultation conducted with key stakeholders.
Section 3	Describes the measures that will be implemented to manage, mitigate, remediate and monitor potential subsidence impacts and environmental consequences on natural and built features.
Section 4	Outlines the key elements of plan implementation, including reporting, regular review and key responsibilities.
Section 5	Lists the references cited in Sections 1 to 4 of this Extraction Plan.

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- Attachment 1 Outlines the relevant requirements under the Project Approval and provides the relevant section of this Extraction Plan where the requirements are addressed.
- Attachment 2 Provides details of a program to collect baseline data for the next Extraction Plan.
- Attachment 3 Provides a key contact register for the Extraction Plan.

Appendices A to H contain component management and monitoring plans of the Extraction Plan, and Appendix I contains the MSEC (2021) *Metropolitan Mine – Longwalls 308-310 Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan*. Appendices A to I are listed below:

- Appendix A Water Management Plan (WMP).
- Appendix B Land Management Plan (LMP).
- Appendix C Biodiversity Management Plan (BMP).
- Appendix D Heritage Management Plan (HMP).
- Appendix E Built Features Management Plan (BFMP).
- Appendix F Public Safety Management Plan (PSMP).
- Appendix G Subsidence Monitoring Program (SMP).
- Appendix H Coal Resource Recovery Plan (CRRP).
- Appendix I Subsidence Report.

The following graphical plans have been prepared in accordance with the DPE and 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.
- Plan 7 Subsidence Monitoring Locations.

Plans 1, 2, 3, 5 and 6 are provided in Attachment 1 of the CRRP (Appendix H).

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 DPE and DRE (2015) *Guidelines for the Preparation of Extraction Plans*) has not been prepared.

Plan 7 is provided in Attachment 1 of the SMP (Appendix G).



### 1.3 MINE PLANNING AND DESIGN

#### 1.3.1 Geology and Stratigraphy

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).

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).

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 (HCPL, 2008).

The Independent Expert Panel for Mining in the Catchment (IEPMC)<sup>1</sup> *Initial Report on Specific Mining Activities at the Metropolitan and Dendrobium Coal Mines* (IEPMC, 2018) (herein referred to as the IEPMC Initial Report) indicates that in recent years it has been identified in the Western Coalfield that surface subsidence, groundwater and surface water responses to longwall mining can be significantly modified in the vicinity of lineaments. Drawing comparisons of lineament behaviour between two geographically separated regions is problematic given the degree of variables potentially present. Depth to the basement rock is a variable with likely substantive influence on behaviour of lineaments and markedly different between the Western and Southern Coalfields (Appendix H).

Many features of the NSW Coalfields surface topography are directly correlated to the basement structure, the depth of the basement from the surface through many sedimentary epochs and the deformational episodes of the basement rock. The Palaeozoic granite basement rock underlies the Sydney Basin sedimentary rocks. At Metropolitan Coal the total depth of Sydney Basin sedimentation is 2.3 km (Appendix H). The major geological features mapped at seam level are shown on Figure 4.

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. Lineaments mapped by Metropolitan Coal are shown on Figure 5. Additional LiDAR mapping was conducted by Metropolitan Coal in July/August 2019 to identify any new linear features within 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.

Longwalls 308-310 are located approximately 600 metres (m) south-west of the Metropolitan Fault, at its closest point. The Metropolitan Fault has a north-northwest to south-southeast strike and dips to the south-west (Appendix H).

<sup>1</sup> The IEPMC was established in November 2017 by the NSW Government to provide expert advice to the DPE on the impact of mining activities in the Greater Sydney Water Catchment Special Areas, with a focus on risks to the quantity of water in the catchment.

**msec**  
mine subsidence  
ENGINEERING CONSULTANTS

Suite 402, 13 Spring Street, Chatswood NSW 2067  
PO Box 302, Chatswood NSW 2057  
Tel +61 2 9413 3777  
www.minesubsidence.com

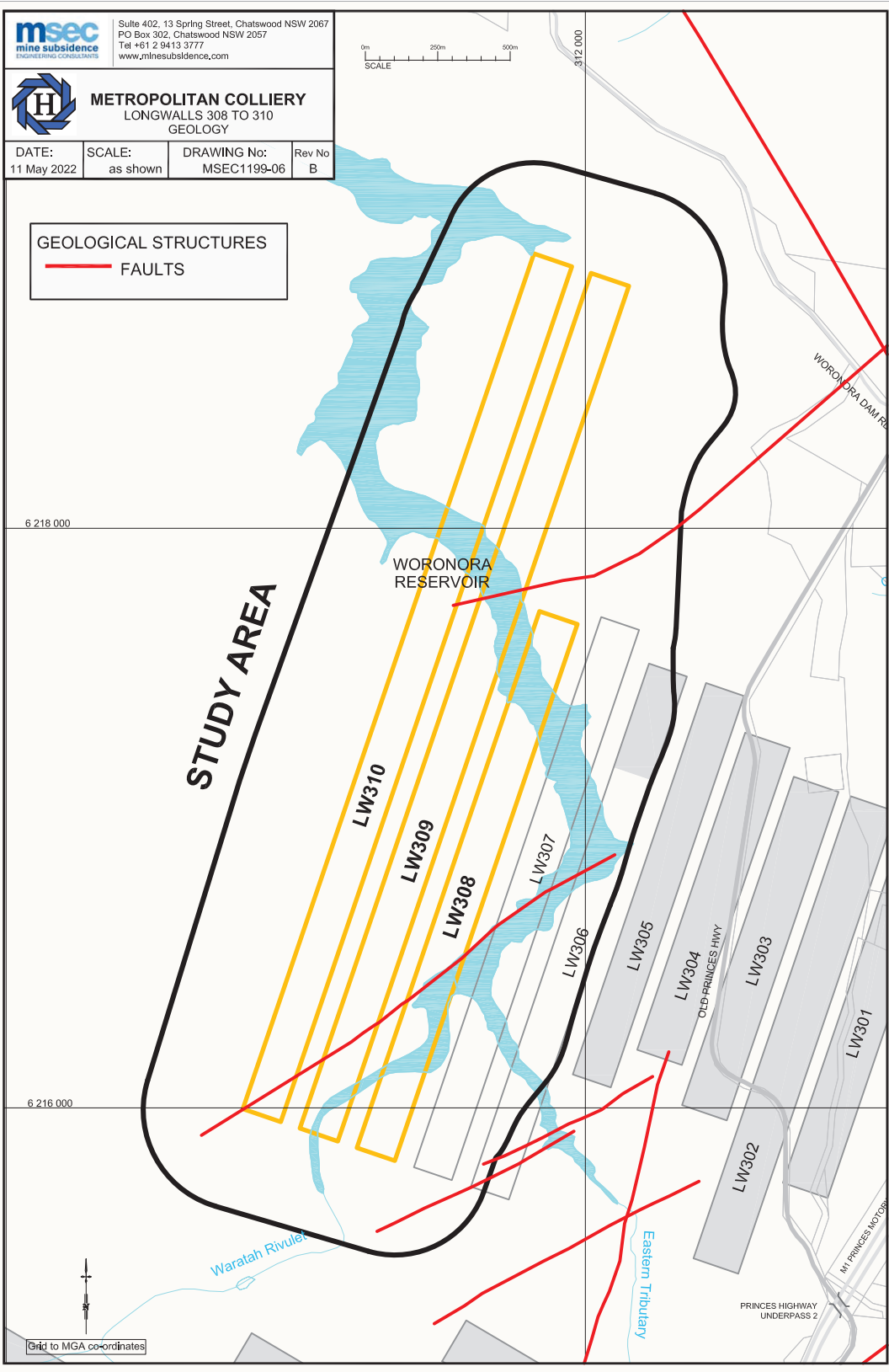
**METROPOLITAN COLLIERY**  
LONGWALLS 308 TO 310  
GEOLOGY

DATE: 11 May 2022	SCALE: as shown	DRAWING No: MSEC1199-06	Rev No B
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**GEOLOGICAL STRUCTURES**

— FAULTS



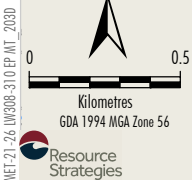
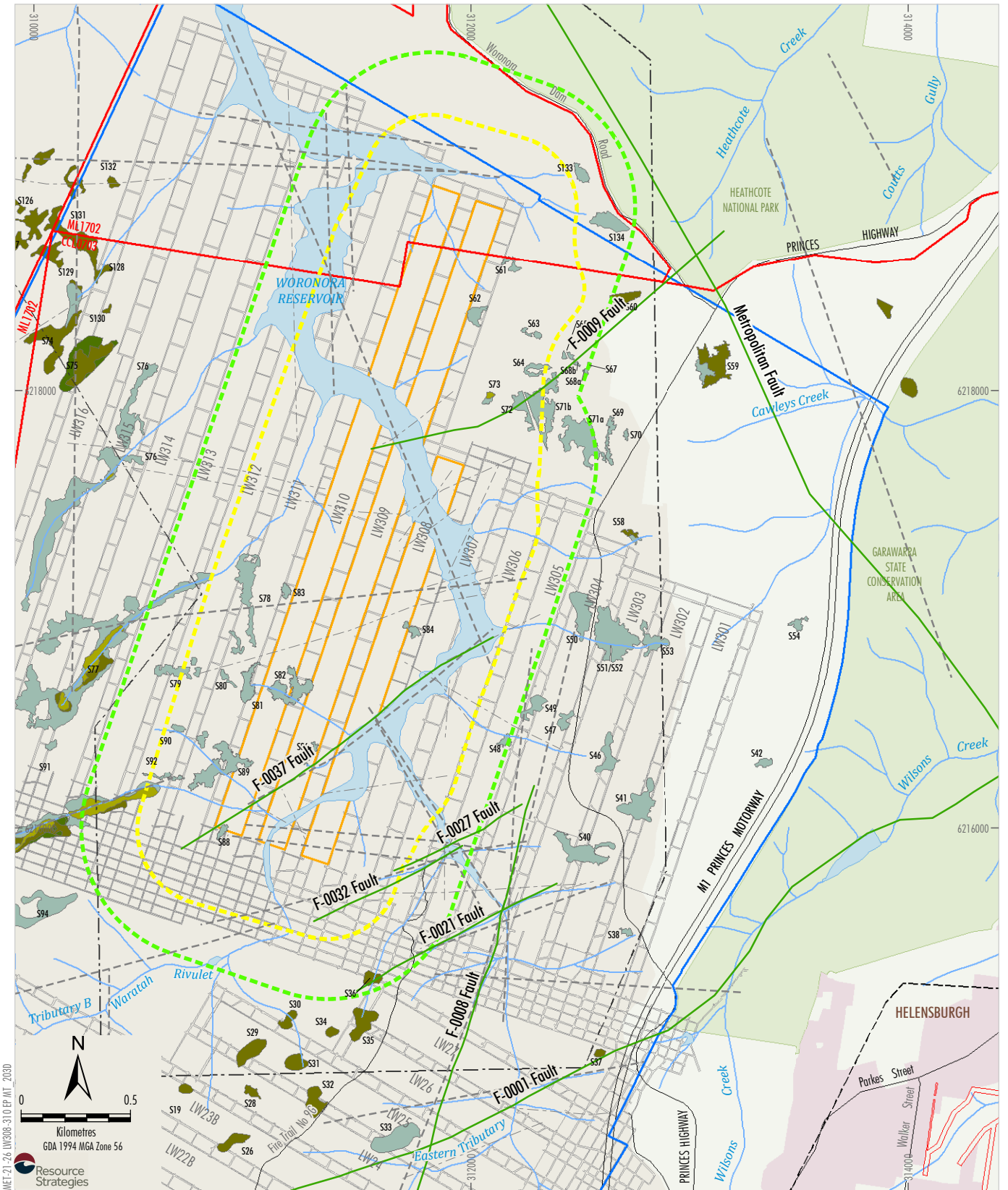
MET-21-26 LW308-310 EP.MT\_007C



Source: MSEC (2021)

**Peabody**  
METROPOLITAN COAL  
Longwalls 308-310 Geological Structures  
Identified at Seam Level

Figure 4



- LEGEND**
- Mining Lease Boundary
  - Woronora Special Area
  - 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)
  - Faults and Dykes (lateral extent > 1 km)
  - Lineament (prominent)
  - Lineament (minor)

Map Unit	Vegetation Community
	3a - Upland Swamp: Banksia Thicket
	3b - Upland Swamps: Tea Tree Thicket
	3c - Upland Swamp: Sedgeland-heath Complex
	3d - Upland Swamp: Fringing Eucalypt Woodland

*Note: 1. The NSW Native Vegetation Interim Type Standard 2002 requires patches of vegetation to be mapped if the dimensions of the representative polygon on a map sheet are 2 mm x 2 mm or greater (i.e. 0.25 hectares or greater at a scale of 1:25,000). Eco Logical Australia conducted field inspections of upland swamp vegetation previously mapped by Bangalay Botanical Surveys (2008) overlying or proximal to Longwalls 301-310 to confirm the upland swamp vegetation communities present and to confirm or update the swamp vegetation boundaries. It is noted that the revised boundaries of a number of upland swamps (Swamps 37, 38, 42, 48, 54, 58, 61, 63, 65/66, 67, 68a, 68b, 70, 73, 83, 86 and 88) are less than 0.25 hectares in area and consistent with NSW vegetation mapping guidelines are not required to be mapped. Notwithstanding, the revised swamp vegetation mapping boundaries (including those swamps less than 0.25 hectares in area) are shown on this figure to document the changes to previous vegetation mapping.*

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2021); MSEC (2021); after NPWS (2003), Bangalay Botanical Surveys (2008) and Eco Logical Australia (2015; 2016; 2018)

**Peabody**  
METROPOLITAN COAL  
Upland Swamps over Longwalls 308-310 and Surrounds

**Figure 5**

A strike slip fault, F0008 (Figure 4), 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 (Figure 5). 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 Longwall 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.

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

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for F0009 with further delineation to occur on roadway advancement (similar to controls previously used for structures passed through by mining).

A risk assessment workshop was held on 6 October 2021 to assess the potential for mining effects on geological features to impact on the quantity of water available to the Woronora Reservoir. The outcomes of the risk assessment are described in Section 2.1.2 and provided in Appendix H.

### 1.3.2 Mining Geometry

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

The Project Approval granted by the Minister for Planning in June 2009 included a layout for Longwalls 301-317 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 comprised 163 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.

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 DPE 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 DPE 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 NSW Department of Planning, Industry and Environment (DPIE) for a revision of the Longwalls 305 and 306 first workings 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.

Relevant to the Longwalls 308-310 Extraction Plan, the commencing positions (i.e. the northern end) of Longwall 309 and Longwall 310 are consistent with the Preferred Project Layout. 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 Preferred Project Layout 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.

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

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A summary of the longwall dimensions for Longwalls 308-310 is provided in Table 2. 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 2**  
**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

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

### 1.3.3 Mining Method

Longwalls 308-310 extraction will occur from north to south. 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.

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.

### 1.3.4 Mining Parameters

The Extraction Plan area and proposed mine plan is shown on Plan 1 of Attachment 1 in Appendix H and key dimensions are summarised in Table 3.

**Table 3**  
**Key Mining Parameters**

Parameter	Longwalls 308-310
ROM Coal Extracted (Mt)	Approx. 4.9
Gate Road Width (m)	5.2
Gate Road Height (m)	3.2
Maingate Chain Pillar Width (m)	70
Tailgate Chain Pillar Width (m)	70
Longwall Void Width (m) (ribline of goaf edge)	138

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**Table 3 (Continued)  
Key Mining Parameters**

Parameter	Longwalls 308-310
Longwall Void Length (m)	1,948 (LW308), 3,118 (LW309), 3,118 (LW310)
Seam Thickness (m)	2.6 – 2.9
Extraction Height (m)	Up to 3.2
Depth of Cover (m)	410 – 550

Mt = million tonnes.

### 1.3.5 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 4.

**Table 4  
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

The future Extraction Plans will consider the cumulative subsidence effects, subsidence impacts and/or environmental consequences. Note that the total cumulative predicted subsidence effects, subsidence impacts and/or environmental consequences at the completion of the Project are considered in the Project EA (HCPL, 2008) and the Preferred Project Report (HCPL, 2009).

### 1.3.6 Previous and Future Mining

Mining at Metropolitan Coal commenced in the 1880s after the Bulli Seam was identified during exploration in 1884. Prior to the commencement of longwall mining in 1995, bord and pillar underground mining methods were primarily employed.

Currently there are no plans for mining other coal seams (i.e. other than the Bulli Seam) at Metropolitan Coal.

Previous longwall mining areas at Metropolitan Coal are located to the east and south of Longwalls 308-310 and include Longwalls 1-18, Longwalls 20-27 and Longwalls 301-307. Extraction of Longwalls 1-18 commenced in 1995 and was completed in 2009. Extraction of Longwalls 20-27 commenced in 2010 and was completed in early 2017. Extraction of Longwalls 301-303 commenced in mid-2017 and was completed in May 2019. Extraction of Longwall 304 commenced in July 2019 and was completed in January 2020. Extraction of Longwall 305 commenced on 12 April 2020 and was completed 21 November 2020. Extraction of Longwall 306 commenced 15 June 2021 and is scheduled to be completed in April 2022. The location of historic and previous mining at Metropolitan Coal is shown on Plan 1 in Attachment 1 of the CRRP (Appendix H).

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The current layout of Longwalls 311-317 is shown on Figure 1 in this document, and on Plan 1 in Attachment 1 of the CRRP (Appendix H) 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.

#### 1.4 SUBSIDENCE PREDICTIONS

Revised predictions of subsidence effects for Longwalls 308-310 were developed by MSEC (2021) (Appendix I). The process for the development of these predictions is described in Section 2.3.1.

##### ***Predicted Conventional Subsidence Movements***

MSEC (2021) provides a detailed description of the development of mine subsidence and the method used to predict the mine subsidence movements resulting from the extraction of Longwalls 308-310. The report includes the maximum predicted conventional subsidence parameters for Longwalls 308-310 including:

- Incremental Subsidence Parameters, which are the predicted subsidence parameters due to the extraction of Longwalls 308-310.
- Total Subsidence Parameters, which include the accumulated subsidence parameters after the completion of a series of longwalls.

The maximum predicted incremental and total subsidence, tilt and curvatures for Longwalls 308-310 are summarised in Table 5. Figure 6 provides the predicted total subsidence contours after Longwalls 308-310 extraction.

**Table 5  
Maximum Predicted Subsidence, Tilt and Curvature for Longwalls 308-310**

Subsidence Parameter	Incremental Subsidence Predictions			Total Subsidence Predictions (after LW308-310)
	Longwall 308	Longwall 309	Longwall 310	
Maximum Subsidence (mm)	300	300	300	475
Maximum Tilt (mm/m)	2.0	2.5	2.5	2.5
Maximum Hogging Curvature (km <sup>-1</sup> )	0.04	0.03	0.04	0.05
Maximum Sagging Curvature (km <sup>-1</sup> )	0.10	0.07	0.08	0.08

Source: after MSEC (2021) (Appendix I).

mm/m = millimetres per metre.

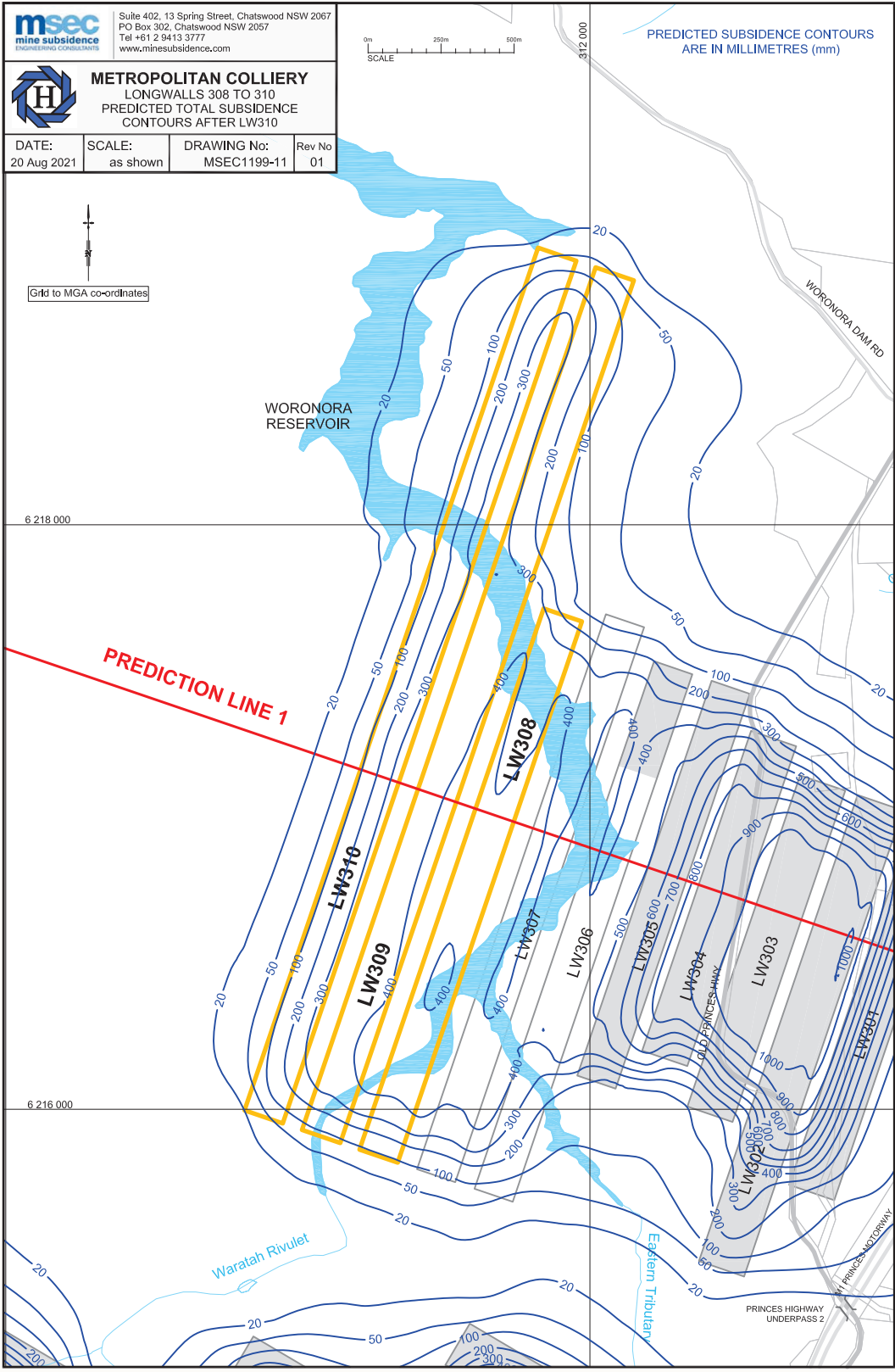
km<sup>-1</sup> = 1/kilometres.

The predictions of conventional subsidence parameters do not include the valley related upsidence and closure movements.

##### ***Non-Conventional Ground Movements***

MSEC (2021) (Appendix I) considers it likely that non-conventional ground movements will occur due to near surface geological conditions, steep topography and valley related movements, which are often accompanied by elevated tilts and curvatures. The potential subsidence impacts from non-conventional subsidence movements are described for natural and built features in Appendix I.





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Source: MSEC (2021)

Figure 6

In most cases, it is not possible to predict the exact locations or magnitudes of the non-conventional anomalous movements due to near surface geological conditions. For this reason, the strain predictions provided in Appendix I are based on a statistical analysis of measured strains in the Southern Coalfield, including both conventional and non-conventional anomalous strains.

### **Predicted Far-Field Movements**

Based on an empirical model for the Southern Coalfield, MSEC (2021) (Appendix I) concluded that the predicted far-field horizontal movements resulting from Longwalls 308-310 extraction are very small and could only be detected by precise surveys. While the impacts of far-field horizontal movements on natural and built features within the vicinity of Longwalls 308-310 are not expected to be significant, there are structures which are sensitive to small differential movements, including roads and road bridges to the east of Longwall 301 (Appendix I). The BFMP (Appendix E) has been developed to manage the potential impact of far-field movements on sensitive infrastructure.

## **1.5 SUBSIDENCE IMPACT PERFORMANCE MEASURES**

The Project Approval requires Metropolitan Coal not to exceed the subsidence impact performance measures outlined in Table 1 of Condition 1, Schedule 3. The subsidence impact performance measures are detailed in Table 6.

**Table 6  
Subsidence Impact Performance Measures**

<b>Water Resources</b>	
<i>Catchment yield to the Woronora Reservoir</i>	<i>Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir No connective cracking between the surface and the mine</i>
<i>Woronora Reservoir</i>	<i>Negligible leakage from the Woronora Reservoir Negligible reduction in the water quality of Woronora Reservoir</i>
<b>Watercourses</b>	
<i>Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)</i>	<i>Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases)</i>
<i>Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26</i>	<i>Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)</i>
<b>Biodiversity</b>	
<i>Threatened species, populations, or ecological communities</i>	<i>Negligible impact</i>
<i>Swamps 76, 77 and 92</i>	<i>Set through condition 4 below</i>
<b>Land</b>	
<i>Cliffs</i>	<i>Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall</i>
<b>Heritage</b>	
<i>Aboriginal heritage sites</i>	<i>Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts</i>
<i>Items of historical or heritage significance at the Garrawarra Centre</i>	<i>Negligible damage (that is fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing</i>
<b>Built Features</b>	
<i>Built features</i>	<i>Safe, serviceable and repairable, unless the owner agrees otherwise in writing</i>

## 1.6 SUBSIDENCE MANAGEMENT APPROACH

Potential environmental consequences during the mining of Longwalls 308-310 will be managed in accordance with the relevant requirements of the Project Approval and other approvals, through:

- **Mine Planning and Design** – The design of the mine, including avoidance and subsidence mitigation measures (Section 1.3.2).
- **Subsidence Monitoring** – Monitoring to confirm predictions of subsidence effects and potential subsidence impacts and environmental consequences (Section 3.7).
- **Management Measures and Remediation** – Implementation of management measures and/or remediation, as required, to address subsidence impacts and/or environmental consequences.
- **Adaptive Management** – The implementation of adaptive management where appropriate (Section 4.2).
- **Contingency Plans** – Implementation of Contingency Plans in the event an exceedance of a subsidence impact performance measure or an unexpected impact is detected (Section 4.1), including consideration of identified potential contingency measures (Sections 3.1 to 3.6).

## 2 DEVELOPMENT OF THE EXTRACTION PLAN

### 2.1 RISK ASSESSMENTS

In accordance with the DPE and DRE (2015) *Guidelines for the Preparation of Extraction Plans*, a number of risk assessments have been undertaken for the Metropolitan Coal Longwalls 308-310 Extraction Plan to ensure that appropriate consideration was given to risk assessment and risk management in each component management plan.

#### 2.1.1 Environmental Risk Assessment

An Environmental Risk Assessment (ERA) was conducted for four of the key component plans of this Extraction Plan *viz.* WMP, LMP, BMP and LMP.

The suitably qualified and experienced experts endorsed by the Secretary of the DPE for the preparation of the Metropolitan Coal Longwalls 308-310 Extraction Plan participated in the ERA<sup>2</sup>. The ERA process involved the key steps described below.

#### ***Review of Relevant Documentation and Risk Identification***

In preparation for the ERA workshop, the ERA participants reviewed a number of documents relevant to the risk assessment. This included (but was not limited to):

- The 2008 *Environmental Risk Analysis* (SP Solutions, 2008) conducted for the Project EA (Appendix O of the Project EA).

<sup>2</sup> Participants included Mr Peter DeBono (Mine Subsidence Engineering Consultants, Subsidence and Land), Dr Noel Merrick and Ms Ines Epari (SLR Consulting, Groundwater), Mr Anthony Marszalek and Dr Camilla West (Hydro Engineering & Consulting, Surface Water), Associate Professor Barry Noller (The University of Queensland, Surface Water Quality), Dr David Goldney (Cenwest Environmental Services, Fauna), Mr Jamie Reeves and Ms Renee Regal (Niche Environment and Heritage, Heritage), Mr Jon Degotardi (Metropolitan Coal), Mr Stephen Love (Metropolitan Coal), Mr Shane Kornek (Metropolitan Coal), Mr Jamie Warwick (Resource Strategies) and Mr Patric Illingworth (Resource Strategies). Ms Elizabeth Norris (Ecoplanning, Flora) contributed to the risk assessment external to the workshop.

- The Preferred Project Report (HCPL, 2009). During the NSW Government’s assessment phase of the Project EA, and in recognition of concerns raised by key stakeholders during the formal PAC assessment process, HCPL considered it appropriate to reduce the proposed extent of the original Project longwall mining area (i.e. Longwalls 20-44). This reduction in the extent of longwall mining resulted in a significant reduction to the extent of potential subsidence effects to the Waratah Rivulet and the Eastern Tributary and a reduction in the consequential potential environmental impacts.
- The Longwall 305-307 Environmental Risk Assessment Report (Operational Risk Mentoring, 2019) (which included consideration of the Longwalls 301-303 and Longwall 304 Environmental Risk Assessment Report).
- Figures showing the Longwalls 308-310 layout in relation to key surface features.
- Subsidence predictions for Longwalls 308-310 (including subsidence contours, Eastern Tributary, Waratah Rivulet, Woronora Reservoir, other streams, cliff sites, upland swamps and Aboriginal heritage sites).

The participants were asked to identify any additional (specific) issues/risks and/or changes to previously assessed levels of risk in preparation for the ERA workshop.

**ERA Workshop**

The ERA workshop for Longwalls 308-310 was conducted on 23 September 2021, with all participants attending via video conferencing. The ERA workshop was facilitated by an independent specialist, Dr Peter Standish of Risk Mentor and conducted in accordance with AS/NZS ISO 31000: 2009 *Risk Management – Principles and Guidelines*.

The general consensus of the workshop participants was the additional (specific) issues/risks identified for Longwalls 308-310 were broadly assessed and ranked as part of the 2008 Environmental Risk Analysis, Longwalls 301-303 ERA, Longwall 304 ERA and/or Longwalls 305-307 ERA. However, additional (specific) issues were identified by the workshop participants relevant to Longwalls 308-310. Each of the issues/risks were explained systematically by the relevant workshop participants and each carefully reviewed.

Loss scenarios for the key potential environmental issues were identified for upland swamps, aquatic biota, threatened amphibians, Waratah Rivulet and the Woronora Reservoir. The risk rankings are within the “low-medium” range and consequently the potential outcomes can be integrated into the existing management systems for effective review and monitoring.

**ERA Report Review**

All ERA participants were asked to review the draft Longwalls 308-310 ERA report that was prepared to summarise the outcomes of the risk assessment. Participants’ comments were incorporated into the final Risk Mentor (2021) report.

The WMP, LMP, BMP and HMP have been prepared to provide for effective management of the identified subsidence risks.

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

The IEPMC 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).

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In relation to the Metropolitan Coal Mine, the IEPMC Initial Report concluded (p. 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 risk assessment workshop was held on 6 October 2021 to assess the potential for Longwalls 308-310 mining effects on geological features to impact on the quantity of water available to the Woronora Reservoir. The workshop participants identified and assessed the potential for mining effects on lineaments, joints, faulting, basal 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.

The participants considered the risk control measures and procedures to be reasonable to manage the identified risks. The risk assessment is provided in Attachment 2 of the CRRP (Appendix H).

Further information on the risk assessment is provided in the Longwalls 308-310 CRRP (Appendix H).

### **2.1.3 Built Features Management Plan Risk Assessments**

Individual risk assessment meetings were held with each infrastructure owner (facilitated by an independent specialist) during the preparation of the Longwalls 301-303 Extraction Plan (Version A), to inform the development of the Longwalls 301-303 BFMP.

In summary, the investigation and analysis methods used during the risk assessments typically included:

- the identification of the infrastructure owner or manager's assets;
- a review of the revised subsidence predictions and potential impacts on the infrastructure owner's or manager's assets (including consideration of past experience in the Southern Coalfield);
- the development of a preliminary monitoring plan; and
- the identification of risk control measures and procedures.

Subsequent to the receipt of DPE approval for Longwalls 301 and 302 and in consultation with the infrastructure owners, Metropolitan Coal reviewed and where required, revised the risk assessments.

The risk control measures and procedures identified and implemented for Longwalls 301-303 were reviewed and continued for the extraction of Longwalls 304-307 and will be continued for the extraction of Longwalls 308-310, where applicable.

Risk assessment workshops were held with representatives from relevant infrastructure owners/managers. As the Extraction Plan Layout moves further away from built features (Transport for New South Wales [TfNSW], Wollongong City Council [WCC], Sydney Water), Metropolitan Coal has reviewed and where required, revised the risk assessments. The asset owners were provided with revised subsidence predictions specific to Longwalls 308-310 with the relevant BFMP on submission of the Extraction Plan.

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### 2.1.4 Public Safety Management Plan Risk Assessment

A risk assessment was held for the Longwalls 308-310 PSMP (Appendix F) to identify and address potential safety hazards to the public, including:

- potential subsidence impacts on built features;
- potential instability of cliff formations or steep slopes caused by subsidence;
- deformations or fracturing of any land caused by subsidence; and
- any other impacts of subsidence.

The risk assessment held on 19 October 2021. Risk assessment attendees included representatives from Metropolitan Coal (Technical Services Manager, Environment & Community Superintendent, Environment and Community Coordinator and Senior Mining Engineer / Facilitator), MSEC and Resource Strategies.

Several risk control and management measures were identified during the risk assessment which considered the extraction of coal beneath land and infrastructure.

Metropolitan Coal considers all risk control measures and procedures to be feasible to manage all identified risks.

## 2.2 REVIEW OF RELEVANT INFORMATION OBTAINED SINCE PROJECT APPROVAL

The six management plans of this Extraction Plan (i.e. the WMP [Appendix A], LMP [Appendix B], BMP [Appendix C], HMP [Appendix D], BFMP [Appendix E] and PSMP [Appendix F]) have been prepared in consideration of the information obtained since Project Approval (i.e. the results of monitoring of subsidence impacts and environmental consequences).

In particular, Appendices A to D provide a detailed summary of the information obtained since Project Approval by the Water, Land, Biodiversity and Heritage Management Plans, respectively.

A summary of the information obtained since Project Approval most relevant to the Longwalls 308-310 Extraction Plan has been provided below.

### ***Eastern Tributary and Waratah Rivulet***

The Preferred Project Report (HCPL, 2009) indicated that valley closure values of greater than 200 mm were predicted for a number of pools/rock bars on the Waratah Rivulet, Eastern Tributary and other streams. 'Negligible consequence' for a watercourse was considered by the Project Approval to mean, *'no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases'*, and was assumed to be achieved in circumstances where predicted valley closure was less than 200 mm. Subsidence impacts to a number of pools on the Eastern Tributary occurred during the mining of Longwalls 26 and 27 at predicted total valley closure values of less than 200 mm and resulted in the exceedance of the negligible environmental consequences performance measure for the Eastern Tributary.

The IEPMC Initial Report recommended that the concept of restricting predicted valley closure to a maximum of 200 mm to avoid significant environmental consequences be revised for watercourses (IEPMC, 2018). Metropolitan Coal agreed that the 200 mm valley closure concept required revision in relation to the Eastern Tributary, noting that the unexpected impacts are particular to the Eastern Tributary and not the Waratah Rivulet. Restricting predicted valley closure to 200 mm has been a successful design tool for mining in the vicinity of the Waratah Rivulet.

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The negligible environmental consequences performance measure for watercourses as described above applied specifically for the Waratah Rivulet along the portion of the '*Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)*'. This section of the Waratah Rivulet includes Pool P to Rock Bar W, located to the south of Longwalls 308-310.

The restriction of predicted valley closure to 200 mm has been a successful design tool on the Waratah Rivulet, with no impacts to pools and rock bars along the Waratah Rivulet at predicted total valley closure of less than 200 mm. Pool P to Rock Bar W have not exceeded the negligible environmental consequence performance measure for the Waratah Rivulet. Predicted total valley closure for Pool P to Rock Bar W was less than 200 mm for the extraction of Longwalls 20-27 and Longwalls 301-303 and did not increase for Longwalls 301-306.

Pool A to Pool O4 (a total of 16 pools) are located upstream of Pool P, and are therefore not subject to the Waratah Rivulet negligible environmental impact performance measure. It is noted that the majority of these pools were predicted to experience maximum predicted total closure of greater than 200 mm. However, of these pools, only two (Pools G1 and N) have experienced subsidence impacts that would have resulted in an exceedance of the negligible environmental impact performance measure. Impacts that have occurred at these pools have been the result of mining directly beneath the Waratah Rivulet or in close proximity (< 100 m) to the rock bars, at predicted total valley closure greater than 200 mm.

Although subsidence impacts were observed at a number of pools on the Eastern Tributary at predicted total valley closure values of less than 200 mm during the mining of Longwalls 26 and 27, restricting predicted total valley closure to 200 mm is no longer applied for the Eastern Tributary.

A geotechnical study of the Waratah Rivulet stream bed investigated the geological characteristics of the stream bed, with the aim of identifying any characteristics that would make the Waratah Rivulet more susceptible to subsidence movements (similar to the Eastern Tributary). The study focussed on Pool P to Rock Bar W on the Waratah Rivulet, and compared these sites to Pool ETAM on the Eastern Tributary, which has experienced subsidence movements due to historical mining.

The geotechnical study identified a thick unit (approximately 25 m) of thinly bedded sandstone along the Eastern Tributary at the location of Pool ETAM. The thinly bedded sandstone is considered to be of lower strength, and more weathered than adjoining thickly bedded sandstone units and therefore more prone to impact from valley closure movements. In addition, a higher frequency of seam level faults and surface lineaments have been identified in the vicinity of the Eastern Tributary. The thinly bedded units identified along the along Waratah Rivulet were limited to less than 5 m thickness and the frequency of seam level faults and surface lineaments was considerably less.

Based on the results of the assessment, the geological features identified along the Eastern Tributary are considered to be unique, compared to the Waratah Rivulet. The Eastern Tributary is therefore more likely to be susceptible to subsidence movements. Restricting valley closure to 200 mm therefore continues to be an appropriate design tool for the Waratah Rivulet. Further discussion on the subsidence predictions and 200 mm valley closure design tool for Longwalls 308-310 is provided in the WMP (Appendix A).

Metropolitan Coal developed a monitoring and adaptive management approach to the mining of Longwall 303 towards the Eastern Tributary. As Longwall 303 mined towards the Eastern Tributary, Metropolitan Coal used a Trigger Action Response Plan (TARP) designed to monitor valley closure movements on the Eastern Tributary. The Eastern Tributary Valley Closure TARP has been successfully implemented by Metropolitan Coal for Longwalls 303, 304 and 305. The same monitoring and adaptive management approach will be used for extraction of Longwalls 306 and 307. For Longwalls 308-310, the Waratah Rivulet will be monitored by the same Global Navigation Satellite System (GNSS) valley closure monitoring methods used for the Eastern Tributary with consideration of the 200 mm valley closure design tool (Appendix A).

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## **Woronora Reservoir**

Condition 2 of the Longwalls 301 and 302 approval required Metropolitan Coal to conduct further investigation into potential impacts on the Woronora Reservoir. Metropolitan Coal engaged independent experts to prepare a Woronora Reservoir Impact Strategy to provide a staged plan of action for further investigations and a report into the impacts of mining near the reservoir. Professor Bruce Hebblewhite (B. K. Hebblewhite Consulting), Dr Frans Kalf (Kalf and Associates Pty Ltd) and Emeritus Professor Thomas McMahon (University of Melbourne) were endorsed by the DPIE for the Woronora Reservoir Impact Strategy in May 2017.

The *Woronora Reservoir Strategy Report – Stage 1* (Hebblewhite *et al.*, 2017) was provided by the independent experts to the DP&E in September 2017. The Stage 1 report included recommendations for further groundwater and surface water investigations and monitoring and was approved by the Secretary for Planning in December 2017.

The *Woronora Reservoir Strategy Report – Stage 2* (Hebblewhite *et al.*, 2019) was provided by the independent experts to the DPIE in June 2019. The Stage 2 report includes additional recommendations in regard to groundwater and surface water investigations and monitoring, based on further data and analysis arising from the ongoing monitoring programs, including those recommended in the original Stage 1 report.

The Stage 1 report included recommendations for further groundwater and surface water investigations and monitoring. The key outcomes and recommendations of the Stage 1 report were considered in the Longwall 304 Extraction Plan.

The Stage 2 report represents the second stage of the Woronora Reservoir Impact Strategy, based on further data and analysis arising from the ongoing monitoring programs, including those recommended in the Stage 1 report

The surface water and groundwater monitoring locations that have been installed as a component of the Woronora Reservoir Impact Strategy are described in the WMP (Appendix A). The additional monitoring sites and environmental investigations for the Woronora Reservoir Impact Strategy included the installation of two streamflow monitoring stations in sub-catchments I and K to the west of Longwalls 301-303 and the installation of a pluviometer in the vicinity of the northern end of Longwall 307. The Stage 2 report recommended that further analysis of the data obtained from these monitoring sites (that covers at a minimum the initial 12-month period) be conducted. A summary of the outcomes of this assessment is provided below.

Data collected from the flumes on sub-catchments I and K commenced on 31 May 2018 and 3 June 2018, respectively (the flumes were installed on 17 May 2018 and 16 May 2018, respectively). Secondary extraction from Longwall 302 was occurring at the commencement of monitoring and continued through to 6 October 2018. Secondary extraction of Longwall 303 commenced on 13 November 2018 and was completed in May 2019. Longwall 304 commenced in July 2019 and was completed in January 2020. Mining of Longwall 305 commenced on 12 April 2020 and was completed on 21 November 2020. Mining of Longwall 306 commenced on 15 June 2021. An assessment of the dry weather recessions recorded at the flumes on sub-catchments I and K show consistent behaviour with time, although the recorded streamflow recession during low flow periods appears to be more rapid at the gauging station on Sub-Catchment K than on Sub-Catchment I during various periods throughout the duration of monitoring. There is no visual indication of a change in recessionary behaviour (i.e. rate of recession) for Sub-Catchment I and no indication from the recorded stage and streamflow data that mining of Longwall 301 to Longwall 305 has impacted streamflow at the Sub-Catchment I gauging station. Additionally, there is no visual indication of a change in recessionary behaviour (i.e. rate of recession) for Sub-Catchment K and no indication from the recorded data that mining of Longwall 306 has impacted streamflow at the Sub-Catchment K gauging station (to 30 June 2021).

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This is consistent with the results of monitoring of the quantity of water resources reaching the Woronora Reservoir for the Waratah Rivulet and Eastern Tributary.

A preliminary water balance of the Woronora Reservoir has been developed as a component of the Woronora Reservoir Impact Strategy. The primary purpose of the water balance analysis was to establish whether the inputs to and outputs from the Woronora Reservoir could be measured sufficiently accurately to estimate a loss through the bed of the reservoir because of longwall mining being undertaken in the catchment and/or from other activities that may affect the water balance. The issues identified in the water balance suggest that the magnitude of bias and uncertainty in the data used in the analysis is such that it is doubtful that the water balance values provide a satisfactory baseline for assessing the potential loss of reservoir water through the bed and it was recommended that a Stage 2 water balance study be not undertaken.

The Stage 2 report recommended groundwater model-derived cross sections be generated to display the pressure head profiles before and after mining specific panels with the zero pressure heads clearly displayed. Representative north-south and east-west cross sections have been prepared for Longwalls 308-310 using the re-calibrated model with stacked drains (Appendix 6 of the WMP).

In December 2019, the WRIS Panel prepared a letter report which provides a summary of the key conclusions from the Stage 1 and Stage 2 reports and considers the IEPMC *Report on Coal Mining Impacts in the Special Areas of the Greater Sydney Water Catchment* (dated 14 October 2019). It also considers feedback from the WRIS Panel's meeting with the DPIE, Water NSW and Metropolitan Coal on 11 November 2019. The key findings of this report were:

1. *Connective fracturing/depressurisation and depressurisation alone extends up to approximately 195 m above the current 163 m wide longwall extraction zone (Figure 1).*
2. *There is virtually no pressure head propagation (i.e. depressurisation), that is pressure head loss, extending upwards beyond about 80 m from the surface and very little above 150 m from the surface (Figure 1). The depressurisation zone below 150m is recovering due to lateral groundwater flow.*
3. *There is no evidence of surface to longwall panel connectivity at the Metropolitan Mine, with inflows averaging 0.01 ML/day between January 2009 and April 2019.*
4. *There is a clear benefit in using narrower panels and wider chain pillars near and beneath the Woronora Reservoir as it substantially reduces subsidence predictions.*
5. *The ratios of 'width of panel' and 'depth of cover' at the Metropolitan Mine proposed for mining under the Woronora Reservoir (0.32 to 0.35) are similar to those used for the previously successful mining conducted with very low inflow reported at the South Bulli Mine and Bellambi West Colliery below the Cataract Reservoir (0.34 to 0.41).*
6. *Mining in the upper reaches of sub-catchment I has not impacted on flows recorded at the flume further downstream, consistent with the results of monitoring of the quantity of water resources reaching the Woronora Reservoir for the Waratah Rivulet and Eastern Tributary.*
7. *Water balance modelling of inputs to and outputs from the Woronora Reservoir indicates that the combined average loss from groundwater outflow under the dam wall and loss through the bed of the Woronora Reservoir is 2.9 ML/day with a 95% uncertainty band between 0.4 ML/day to 5.4 ML/day, in which ungauged inflows to the reservoir and reservoir evaporation are the major contributors to the uncertainty. The 2.9 ML/day equates to 3.6% of the total outputs modelled from the Woronora Reservoir. Taking into account the facts that groundwater outflow under than dam wall could not be adequately modelled, that there are problems in stream gauging a large proportion of the current ungauged area, and there are difficulties in estimating reservoir evaporation, it is recommended that a Stage 2 water balance study be not undertaken.*
8. *Based on the review of available data, analytical predictions and monitoring bore evidence at LW302, together with the use of narrower panels and wider chain pillars beneath the reservoir, the proposed longwall mining is not expected to result in connective cracking between the longwalls and surface or significant inflows from Woronora Reservoir to the mine extraction zone.*

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9. *The existing monitoring regime should be continued, together with the additional monitoring recommended above. All monitoring results should be regularly reviewed against predicted values to provide ongoing confidence in the performance of the mining operation and its impacts.*

Metropolitan Coal understands that the WRIS Panel is no longer required to conduct investigations into potential impacts on the Woronora Reservoir and that these investigations will instead be conducted by a new panel of independent experts to be convened by the DPE.

## 2.3 REVIEW OF PREDICTIONS

The predicted subsidence effects, subsidence impacts and environmental consequences of the Project were assessed in the Project EA and Preferred Project Report. This section describes the process of reviewing and updating these predictions to consider the Extraction Plan Layout.

### 2.3.1 Predicted Subsidence Effects and Subsidence Impacts

A detailed subsidence assessment for Longwalls 308-310 has been prepared in support of this Extraction Plan by MSEC (2021), with the outcomes of this assessment incorporated into the management plans in Appendices A to F. The Subsidence Report by MSEC (2021) is provided in Appendix I.

#### ***Review of Subsidence Prediction Methodology***

The predictions of subsidence effects for Longwalls 308-310 were developed by MSEC (2021) using the Incremental Profile Method, calibrated using observed monitoring data above the previously extracted longwalls at Metropolitan Coal (Appendix I). The Incremental Profile Method is based on a large database of observed subsidence movements in the Southern Coalfield and has been found, in most cases, to give reasonable, if not conservative, predictions of maximum subsidence, tilt and curvature.

Based on monitoring data from the Southern Coalfield, there is an approximate 90 percent (%) confidence level that the maximum observed incremental subsidence will be less than the maximum predicted incremental subsidence using the standard model (Appendix I).

#### ***Comparison with Previous Predictions of Subsidence Effects***

MSEC (2021) (Appendix I) provides a comparison of the maximum predicted conventional total subsidence parameters for the Extraction Plan Layout and the Preferred Project Layout for Longwalls 308-310. The values are the maxima anywhere above the longwall layouts. The maximum predicted total subsidence, tilt and curvature for the Extraction Plan Layout are similar to or less than predicted based on the Preferred Project Layout (Appendix I).

A feature of the Preferred Project Layout is increased pillar widths beneath and in close proximity to the Woronora Reservoir. As a result, the maxima based on the Preferred Project Layout occurred in the north-east and west of the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour, however, the area in the north-east have been left unmined by the shortening of Longwalls 308-310 for the Extraction Plan Layout (Appendix I).

The Woronora Reservoir full supply level is located above Longwalls 308-310. The maximum predicted vertical subsidence, upsidence and closure for the Woronora Reservoir full supply level, based on the Extraction Plan Layout, are less than the maxima predicted based on the Preferred Project Layout (Appendix I).

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The Eastern Tributary flows in a northerly direction into the full supply level of the Woronora Reservoir approximately 780 m (at the full supply level) to the east of Longwall 308. (Figure 2). The Eastern Tributary is not predicted to experience measurable valley related movements and conventional subsidence movements during the extraction of Longwalls 308- 310 (Appendix I).

The Waratah Rivulet flows to the north-east and into the full supply level of the Woronora Reservoir, approximately 170 m (at the full supply level) to the south of Longwalls 308-310 (Figure 2). The maximum predicted vertical subsidence, upsidence and closure for the Waratah Rivulet, based on the Extraction Plan Layout, are less than the maxima predicted based on the Preferred Project Layout (Appendix I).

### ***Predicted Subsidence Impacts***

MSEC (2021) (Appendix I) has conducted a detailed assessment of potential subsidence impacts for each of the natural and built features identified in the vicinity of Longwalls 308-310. Potential subsidence impacts identified by MSEC (2021) are consistent with those identified in the Project EA and Preferred Project Report and include:

- surface cracking, heaving, buckling, humping and stepping;
- sub-surface fracturing;
- changes in gradients, ponding, scouring/erosion and changes in stream alignment; and
- instability of land features, including rock falls.

Potential impacts with respect to structures include cracking of road surfaces, opening of joints in pipelines, alteration of tension of electricity transmission lines and cracks in masonry.

The revised subsidence predictions for the Extraction Plan Layout do not change the subsidence impact assessments provided in the Project EA and Preferred Project Report (Appendix I).

### **2.3.2 Potential Environmental Consequences**

Detailed discussion of potential environmental consequences is provided in the management plans in Appendices A to F. The suitably qualified experts conducted a review of the potential environmental consequences due to Longwalls 308-310 extraction for the preparation of each management plan.

The IEPMC Initial Report indicates that in recent years it has been identified in the Western Coalfield that surface subsidence, groundwater and surface water responses to longwall mining can be significantly modified in the vicinity of lineaments. Further to advice from the IEPMC, the DPIE requested that specific regard be given to the potential impacts of mining near and under lineaments on surface water features, including swamps and waterfalls. This consideration of lineaments is included in the BMP (Appendix C) and WMP (Appendix A), respectively.

The potential impacts of mining effects on geological features on the quantity of water resources to the reservoir are assessed in the CRRP (Appendix H).

## **2.4 CONSULTATION**

Metropolitan Coal was granted Project Approval (08\_0149) for the Project in June 2009. Since then, extensive consultation with stakeholders has been undertaken in relation to the Extraction Plans and component management plans prepared for Longwalls 20-22, 23-27, 301-303, 304 and 305-307 in accordance with Condition 6, Schedule 3 of the Project Approval. This consultation has informed the development of the Longwalls 308-310 Extraction Plan and component management plans.

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Consultation undertaken with stakeholders to date in relation to the Longwalls 308-310 Extraction Plan is described below.

#### 2.4.1 NSW Government Agencies

Metropolitan Coal requested the endorsement of the Extraction Plan team as suitably qualified and experienced experts on 25 August 2021. The Extraction Plan team was endorsed by the DPE on 1 September 2021.

During the preparation of previous Metropolitan Coal extraction plans (i.e. the Longwalls 20-22, 23-27, 301-303, 304 and 305-307 Extraction Plans), component management plans were distributed to stakeholders for comment prior to submission to the DPE. To allow for the timely assessment of the Longwalls 308-310 Extraction Plan by the DPE, and to ensure continuation of mining at Metropolitan Coal, stakeholder consultation will be conducted in parallel with the DPE's assessment of the Longwalls 308-310 Extraction Plan.

#### 2.4.2 Landholders

A land ownership plan is provided on Figure 7. In summary, three lots are located within 600 m of Longwalls 308-310, and the ownership details are as follows:

- one lot is owned by WaterNSW;
- one lot is owned by The State of New South Wales (Crown Land); and
- one lot is owned by The State of New South Wales (National Parks and Wildlife Service Estate).

For land owned by the State of NSW (Crown Land), the Crown Lands Nowra District Office previously requested (for the Longwalls 301-303 Extraction Plan) that a copy of the Extraction Plan be provided on submission to the DPE. Metropolitan Coal will provide a copy of the Longwalls 308-310 Extraction Plan to the Crown Lands Nowra District Office on submission of the Extraction Plan.

As described in Section 2.4.1, stakeholder consultation will be conducted in parallel with the DPE's assessment of the Longwalls 308-310 Extraction Plan. Metropolitan Coal will provide a copy of the Longwalls 308-310 Extraction Plan to WaterNSW on submission of the Extraction Plan.

#### 2.4.3 Aboriginal Groups

As described in Section 2.4.1, stakeholder consultation will be conducted in parallel with the DPE's assessment of the Longwalls 308-310 Extraction Plan. A draft of the Longwalls 308-310 HMP will therefore be provided to Aboriginal stakeholders registered at Metropolitan Coal for their review and comment upon submission of the Longwalls 308-310 Extraction Plan to the DPE.

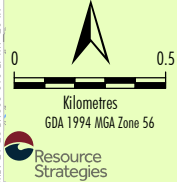
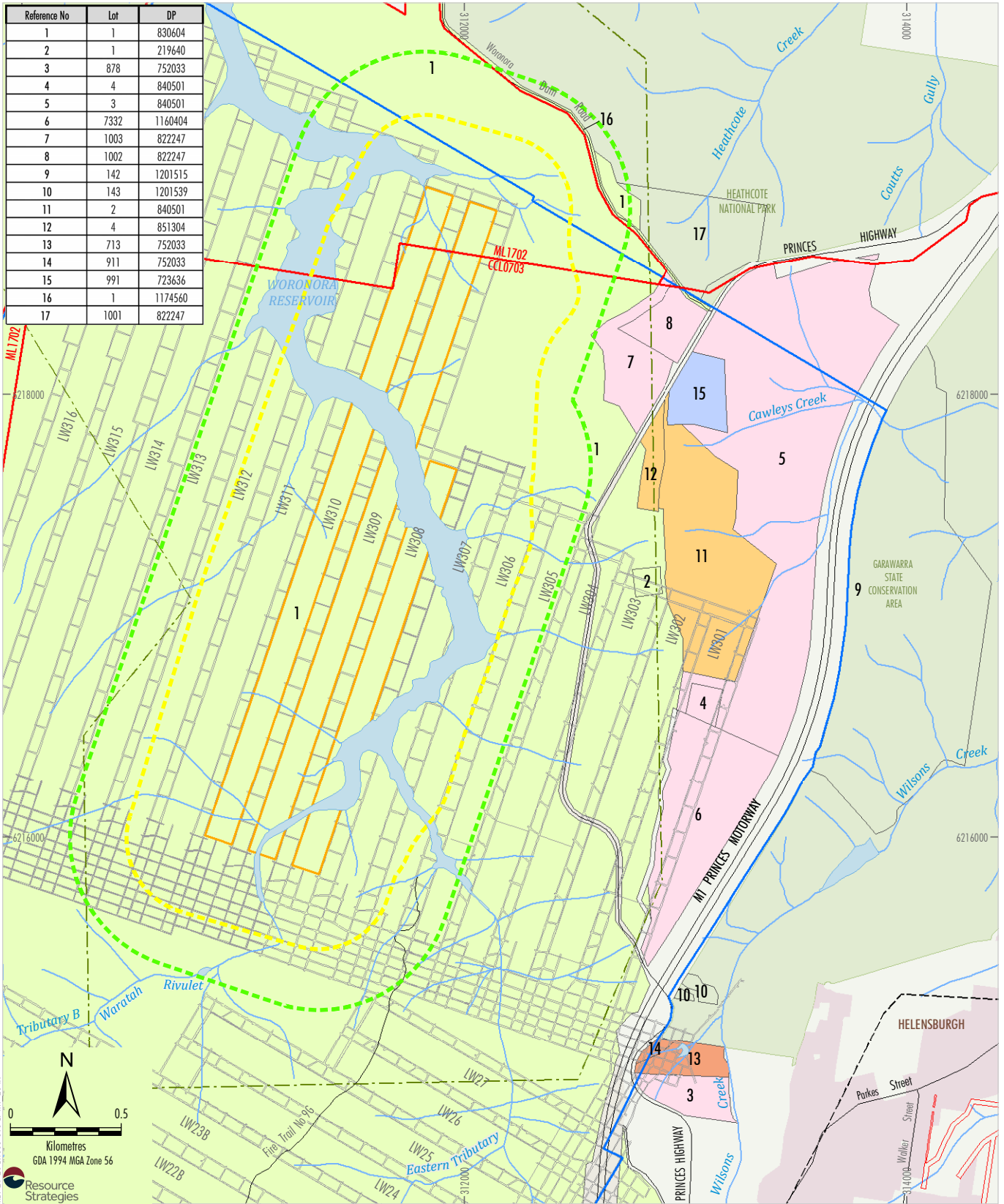
#### 2.4.4 Infrastructure Owners

Extensive consultation with each infrastructure owner/manager was conducted for the Longwalls 301-303, Longwall 304 and Longwalls 305-307 Extraction Plans. The relevant infrastructure owners/managers have been contacted by Metropolitan Coal to advise that the existing BFMPs were being updated to include Longwalls 308-310.

Each of the infrastructure owners/managers will be provided a copy of the relevant Longwalls 308-310 BFMP component plan upon submission of the Longwalls 308-310 Extraction Plan to the DPE.

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Reference No	Lot	DP
1	1	830604
2	1	219640
3	878	752033
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**
- Mining Lease Boundary
  - Woronora Special Area
  - 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)

- Landholder**
- WaterNSW
  - The State of New South Wales (Crown Land)
  - The State of New South Wales (National Parks and Wildlife Service Estate)
  - Health Administration Corporation
  - The Trustees of the Macedonian Orthodox Monastery
  - R & C Stewart

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

**Peabody**  
METROPOLITAN COAL  
Land Ownership within  
600 m of Longwalls 308-310

**Figure 7**

### 2.4.5 Public Consultation

The Metropolitan Coal Community Consultative Committee (CCC) was advised of the development of the Extraction Plan at a meeting on 21 September 2021. The CCC was informed that submission of the Extraction Plan was anticipated in Quarter 1, 2022.

## 3 SUBSIDENCE MANAGEMENT AND MONITORING

Surface and sub-surface features within the vicinity of Longwalls 308-310 are listed in Table 7. Features within the Longwalls 308-310 35° angle of draw and/or 20 mm predicted subsidence contour may potentially be impacted by the secondary extraction of Longwalls 308-310. There are also features that lie outside the Longwalls 308-310 35° angle of draw and/or 20 mm predicted subsidence contour that may experience either far-field movements, or valley related movements. The surface features which are sensitive to such movements have been identified and have been included in the subsidence assessments provided in MSEC (2021) (Appendix I).

The location of natural features and known Aboriginal heritage sites within 600 m of Longwalls 308-310 and surrounds are shown on Figures 8, 9 and 10. The locations of surface infrastructure/built features over and adjacent to Longwalls 308-310 are shown on Figures 11a and 11b. Descriptions of each of these features are contained within the relevant management plan referenced in Table 7.

Subsidence predictions and potential impacts to surface and sub-surface features are provided and described in MSEC (2021) (Appendix I).

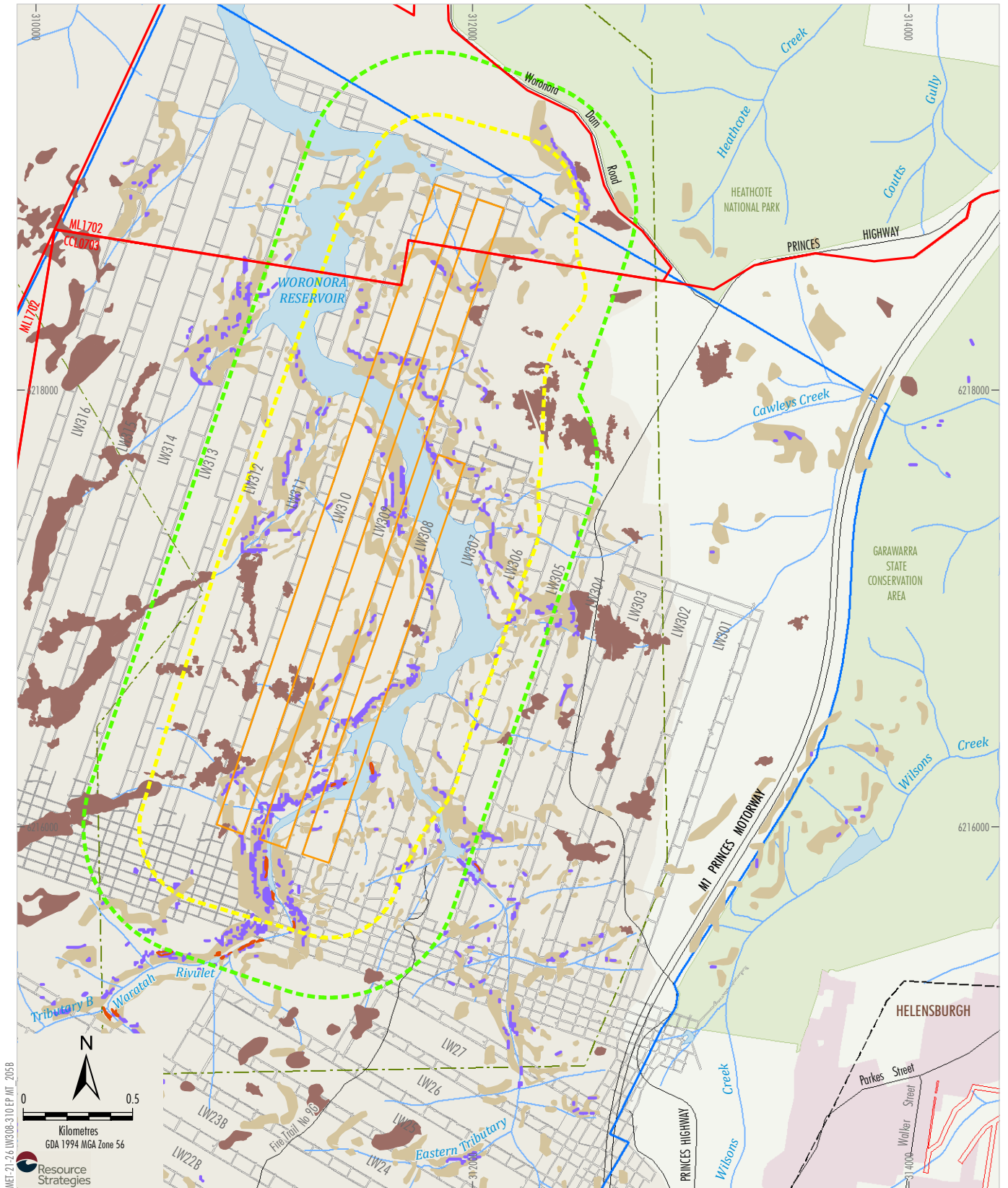
Management measures and monitoring for each feature are included in each of the management plans as indicated in Table 7 and summarised in Sections 3.1 to 3.6.

The SMP (Appendix G) has been prepared to validate the subsidence predictions and analyse the relationship between the subsidence effects and subsidence impacts of the Extraction Plan and any ensuing environmental consequences. A summary of the proposed monitoring for the Extraction Plan is provided in Section 3.7.

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**Table 7  
Surface and Sub-surface Features**

Feature	Section/Management Plan Reference
<b>Natural Features</b>	
Streams	Section 3.1 and WMP (Appendix A)
Cliffs and overhangs, Steep Slopes and Land in General (including rock ledges and outcrops)	Section 3.2 and LMP (Appendix B)
Upland Swamps	Section 3.3 and BMP (Appendix C)
Natural Vegetation	
<b>Public Utilities and Other Infrastructure</b>	
TfNSW – M1 Princes Motorway and Bridges	Section 3.5 and BFMP (Appendix E)
WCC – Old Princes Highway	
Sydney Water – Water Pipelines	
Woronora Reservoir	Section 3.1 and WMP (Appendix A)
Exploration Boreholes	Section 3.5 and Subsidence Report (Appendix I)
Survey Control Marks	
Fire Trails and Vehicular Tracks	Sections 3.2 and 3.5, LMP (Appendix B) and BFMP (Appendix E)
<b>Areas of Archaeological and/or Heritage Significance</b>	
Known Aboriginal Heritage Sites	Section 3.4 and HMP (Appendix D)



**LEGEND**

- |  |  |  |   |
|--|--|--|---|
|  | Mining Lease Boundary  |  | Woronora Notification Area                      |
|  | Woronora Special Area  |  | Existing Underground Access Drive (Main Drift)  |
|  | Project Underground Mining Area<br>Longwalls 20-27 and 301-317                   |  | Cliffs and Overhangs                            |
|  | Longwalls 308-310 Secondary Extraction   |  | Steep Slopes (Project Approval)                 |
|  | Longwalls 308-310 35° Angle of Draw and/or<br>Predicted 20 mm Subsidence Contour |  | Steep Slopes (Project Environmental Assessment) |
|  | 600 m from Longwalls 308-310<br>Secondary Extraction                             |  | Upland Swamp                                    |

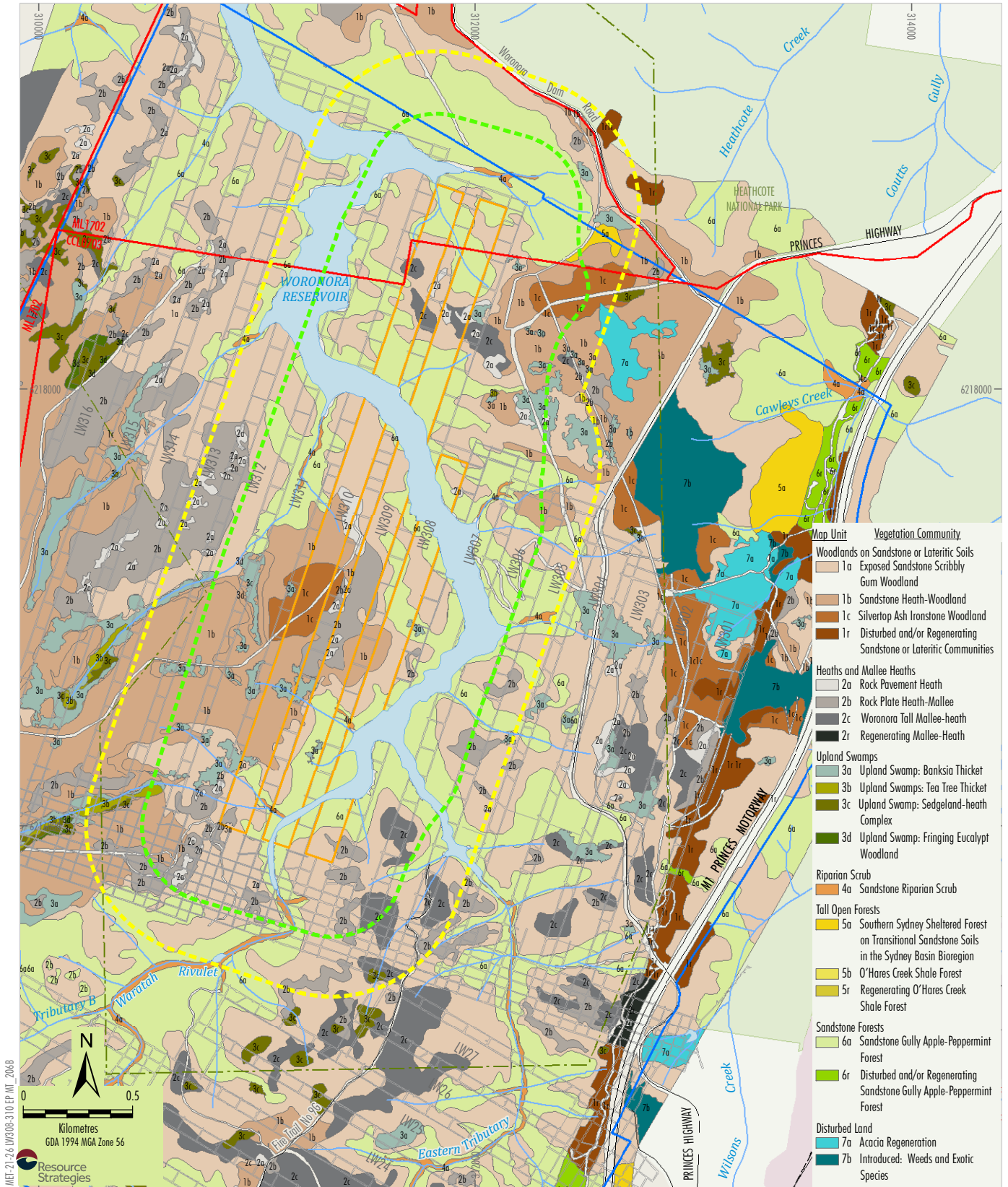
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2021); MSEC (2021)

**Peabody**

**METROPOLITAN COAL**  
Streams, Cliffs and Overhangs, Steep Slopes  
and Upland Swamps within 600 m of  
Longwalls 308-310 and Surrounds

**Figure 8**





- LEGEND**
- Mining Lease Boundary
  - Woronora Special Area
  - 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)

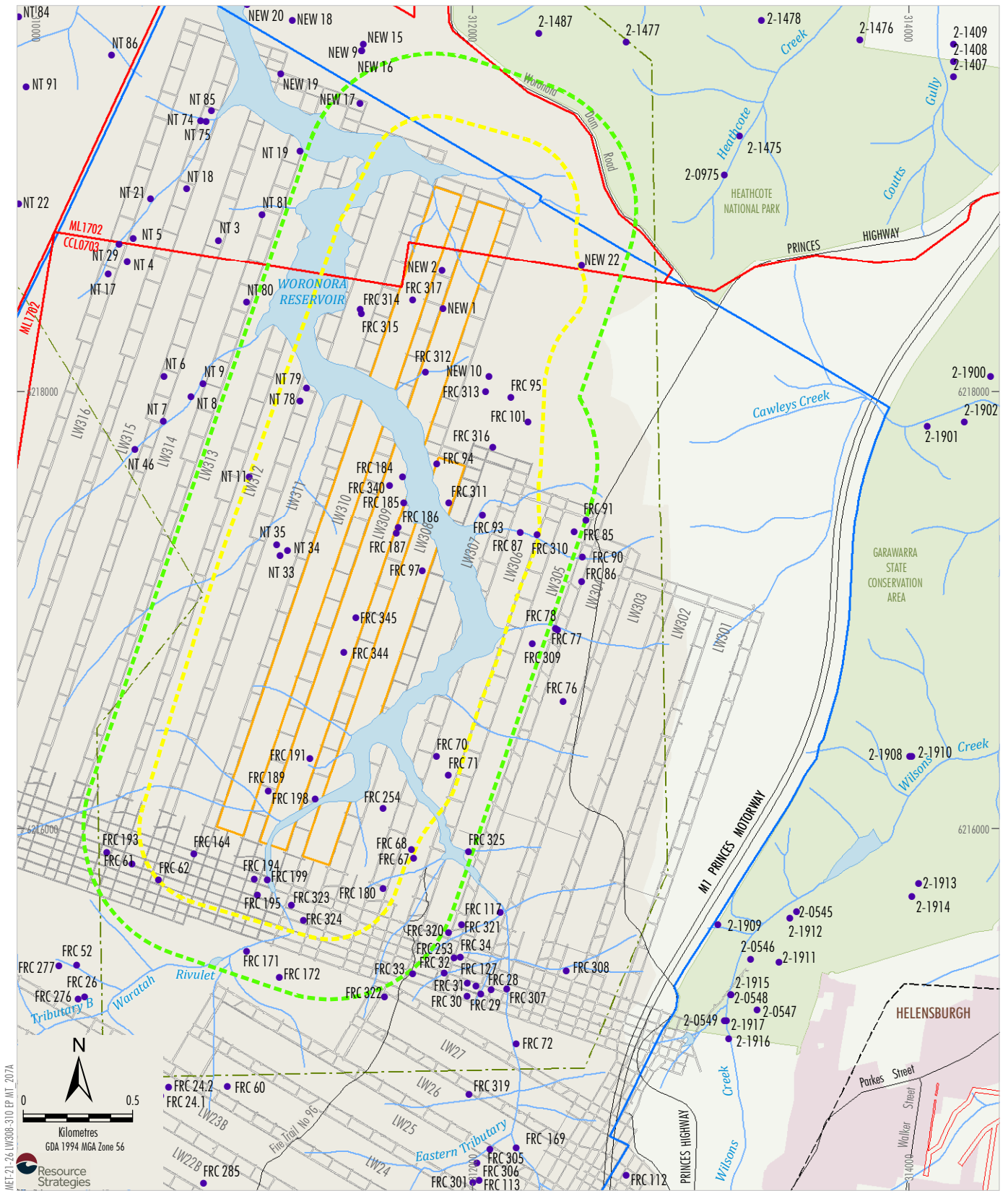
**Note:** The NSW Native Vegetation Interim Type Standard 2009 requires patches of vegetation to be mapped if the dimensions of the representative polygon on a map sheet are 2 mm x 2 mm or greater (i.e. 0.25 hectares or greater at a scale of 1:25,000). Eco Logical Australia conducted field inspections of upland swamp vegetation previously mapped by Bangalay Botanical Surveys (2008) overlying or proximal to Longwalls 301-310 to confirm the upland swamp vegetation communities present and to confirm or update the swamp vegetation boundaries. It is noted that the revised boundaries of a number of upland swamps (Swamps 37, 38, 42, 48, 54, 58, 61, 63, 65/66, 67, 68a, 68b, 70, 73, 83, 86 and 88) are less than 0.25 hectares in area and consistent with NSW vegetation mapping guidelines are not required to be mapped. Notwithstanding, the revised swamp vegetation mapping boundaries (including those swamps less than 0.25 hectares in area) are shown on this figure to document the changes to previous vegetation mapping.

**Source:** Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2021); MSEC (2021); after NPWS (2003), Bangalay Botanical Surveys (2008) and Eco Logical Australia (2015; 2016; 2018); Ecoplanning (2021)



**METROPOLITAN COAL**  
**Longwalls 308-310 Vegetation Mapping**

**Figure 9**



MET-21-26 LW308-310 EP ANT 207A  
Resource Strategies

**LEGEND**

- Mining Lease Boundary
- Woronora Special Area
- 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 Drive)
- Aboriginal Heritage Site

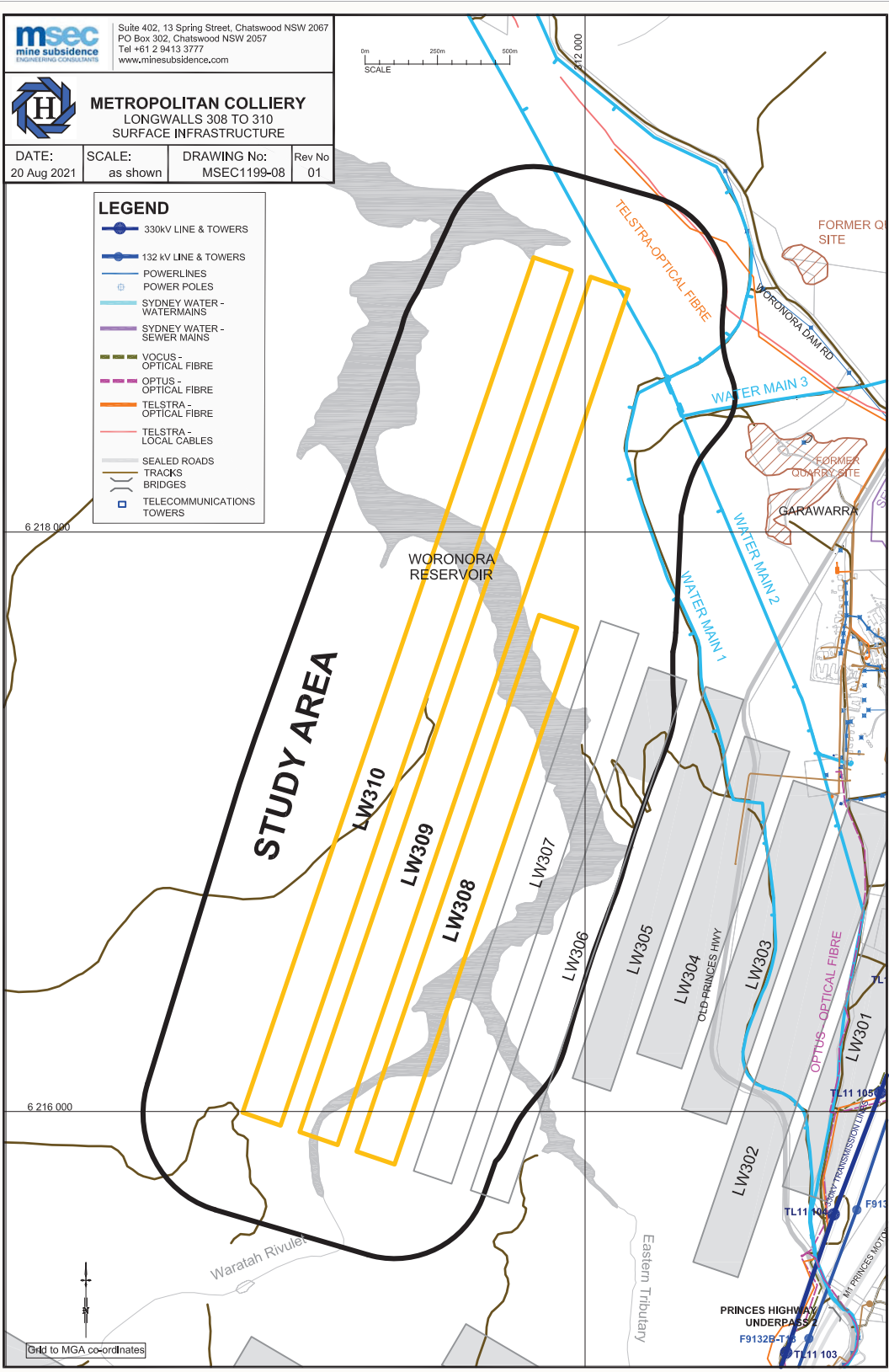
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2021); MSEC (2021); Illawarra Prehistory Group (2007; 2008); AHIMS (2007); Kayandel Archaeological Services (2006; 2007; 2008); Niche Environmental and Heritage (2013)

**Peabody**

**METROPOLITAN COAL**  
Longwalls 308-310  
Known Aboriginal Heritage Sites

**Figure 10**

- LEGEND**
- 330kV LINE & TOWERS
  - 132 kV LINE & TOWERS
  - POWERLINES
  - POWER POLES
  - SYDNEY WATER - WATERMANS
  - SYDNEY WATER - SEWER MAINS
  - VOCUS - OPTICAL FIBRE
  - OPTUS - OPTICAL FIBRE
  - TELSTRA - OPTICAL FIBRE
  - TELSTRA - LOCAL CABLES
  - SEALED ROADS
  - TRACKS
  - BRIDGES
  - TELECOMMUNICATIONS TOWERS



MET-21-26 LW308-310 EP.MT\_003B



Grid to MGA co-ordinates

Source: MSEC (2021)

**msec**  
mine subsidence  
ENGINEERING CONSULTANTS

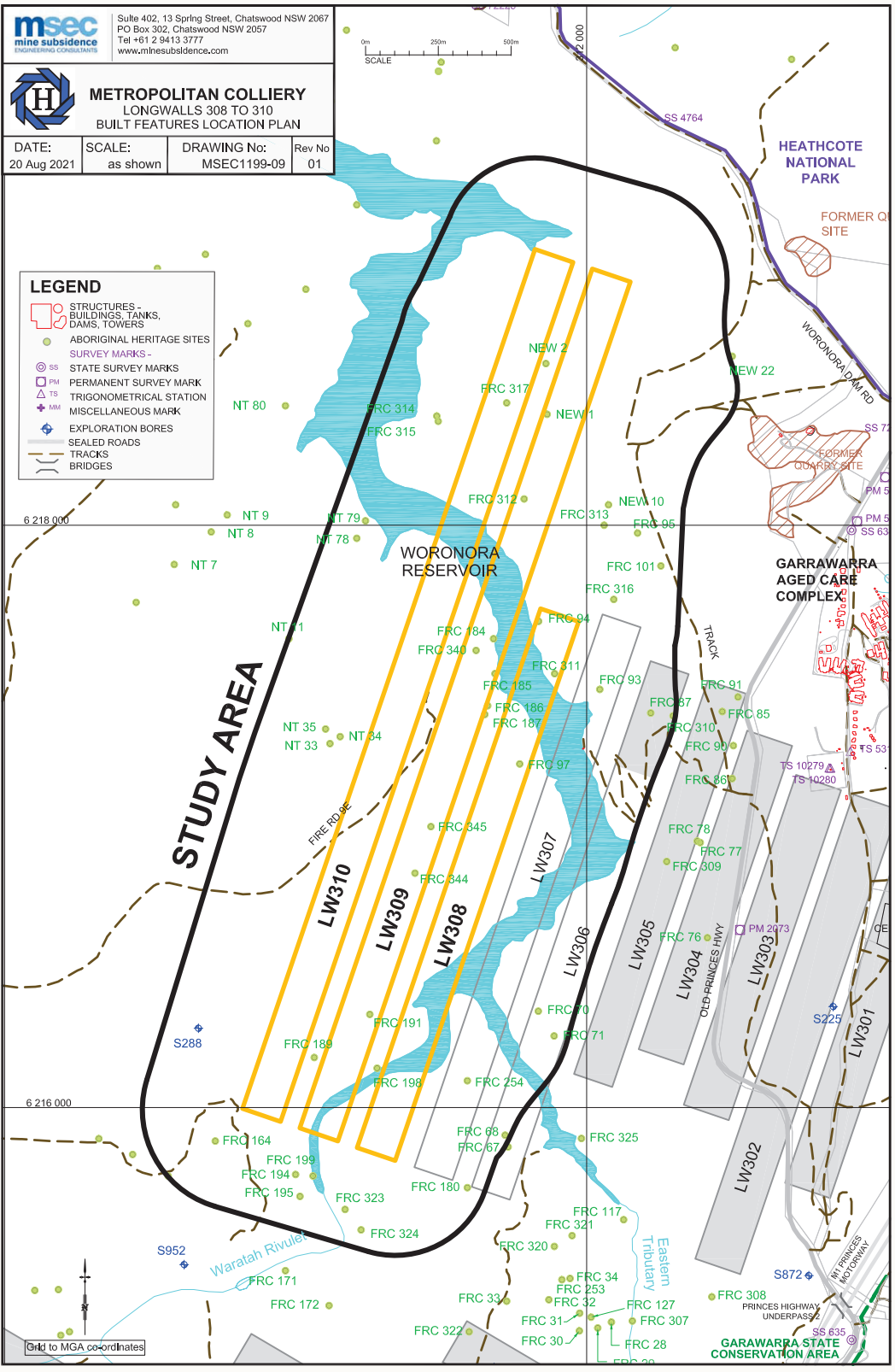
Sulle 402, 13 Spring Street, Chatswood NSW 2067  
PO Box 302, Chatswood NSW 2057  
Tel +61 2 9413 3777  
www.minesubsidence.com

**METROPOLITAN COLLIERY**  
LONGWALLS 308 TO 310  
BUILT FEATURES LOCATION PLAN

DATE: 20 Aug 2021    SCALE: as shown    DRAWING No: MSEC1199-09    Rev No: 01

**LEGEND**

- STRUCTURES - BUILDINGS, TANKS, DAMS, TOWERS
- ABORIGINAL HERITAGE SITES
- SURVEY MARKS -
  - SS STATE SURVEY MARKS
  - PM PERMANENT SURVEY MARK
  - TS TRIGONOMETRICAL STATION
  - MM MISCELLANEOUS MARK
- EXPLORATION BORES
- SEALED ROADS
- TRACKS
- BRIDGES



MET-21-26 LW308-310 EP.MT\_004B



Source: MSEC (2021)

### 3.1 WATER MANAGEMENT

#### 3.1.1 Overview

The WMP is provided in Appendix A. The purpose and scope of the WMP are summarised below:

**Purpose:** To manage the potential environmental consequences of the Extraction Plan on watercourses (including the Woronora Reservoir), aquifers and catchment yield.

**Scope:** Surface water and groundwater resources during the mining of Longwalls 308-310.

#### 3.1.2 Key Water Issues, Monitoring and Management Measures

First and second order streams are located within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour (Figure 8). These streams consist of shallow drainage lines from the topographical high points, forming tributaries where valley heights increase and drain into the Woronora Reservoir. The streams are located above Longwalls 308-310, and could experience the full range of predicted subsidence movements, with maximum predicted closure up to 700 mm (MSEC, 2021) (Appendix I).

The Woronora Reservoir full supply level is located above Longwalls 308-310 and within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour (Figure 8). As described in Section 1.4 and the WMP (Appendix A), the potential impacts on the Woronora Reservoir based on the Extraction Plan Layout are predicted to be consistent with those based on the Preferred Project Layout.

The Woronora Reservoir Impact Strategy, developed by the Independent Experts, provides a staged plan of action for further investigation into the impacts of mining near the reservoir. Metropolitan Coal have implemented a number of additional groundwater and surface water monitoring sites in response to the Stage 1 and Stage 2 reports. The Woronora Reservoir Impact Strategy is described in Section 2.2 and the WMP (Appendix A).

The Eastern Tributary flows in a northerly direction into the full supply level of the Woronora Reservoir approximately 780 m (at the full supply level) to the east of Longwall 308. The Eastern Tributary is not predicted to experience measurable valley related movements and conventional subsidence movements during the extraction of Longwalls 308 to 310 (Appendix I).

Metropolitan Coal established a comprehensive monitoring and adaptive management program to identify subsidence related movements at the Eastern Tributary to minimise the risk of further exceedance of the Eastern Tributary performance measure. The Eastern Tributary Valley Closure TARP has been successfully implemented by Metropolitan Coal for Longwalls 303, 304 and 305. Consistent with the TARP, the decision to cease mining of Longwalls 303, 304 and 305 was made at a very low magnitude of valley closure. The same monitoring and adaptive management program will be used for the extraction of Longwalls 306 and 307 (as described in the Longwall 305-307 Extraction Plan).

For Longwalls 308-310, the Waratah Rivulet will be monitored by the same Global Navigation Satellite System (GNSS) valley closure monitoring methods used for the Eastern Tributary with consideration of the 200 mm valley closure design tool (Appendix A).

As described in Section 2.2, restricting predicted valley closure to 200 mm has been a successful design tool to date for mining in the vicinity of the Waratah Rivulet and Metropolitan Coal has developed a TARP for Waratah Rivulet closure based on this principal as well as monitoring data from the previous extraction underneath and adjacent to the Waratah Rivulet.

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The intent of the Waratah Rivulet Valley Closure TARP is to identify the initial development of valley closure prior to an impact occurring. The adaptive management approach is based on Metropolitan Coal conducting GNSS monitoring of the Waratah Rivulet to detect mining-induced effects, allowing the cessation of mining prior to mining resulting in any unacceptable or adverse impacts on the Waratah Rivulet. The monitoring provides the earliest possible indicator for development of valley closure. The development of valley closure is recognised as the dominant mechanism that results in impact to a rockbar.

The geotechnical study of the Waratah Rivulet stream bed investigated the geological characteristics of the stream bed, with the aim of identifying any characteristics that would make the Waratah Rivulet more susceptible to subsidence movements (similar to the Eastern Tributary). The study focussed on Pool P to Rock Bar W on the Waratah Rivulet, and compared these sites to Pool ETAM on the Eastern Tributary, which has experienced subsidence movements due to historical mining. Based on the results of the assessment, the geological features identified along the Eastern Tributary are considered to be unique, compared to the Waratah Rivulet. The Eastern Tributary is therefore more likely to be susceptible to subsidence movements. Restricting valley closure to 200 mm therefore continues to be an appropriate design tool for the Waratah Rivulet. Further discussion on the subsidence predictions and 200 mm valley closure design tool for Longwalls 308-310 is provided in the WMP (Appendix A).

Notwithstanding, the potential impacts of mining near and under lineaments on surface water features, including the waterfall at Rock Bar ETAU on the Eastern Tributary has been assessed. Hydraulic connectivity via lineaments to the waterfall at rock bar ETAU on the Eastern Tributary is considered to be highly unlikely as a result of the extraction of Longwalls 308-310 (Appendix A).

A risk assessment workshop was held on 6 October 2021. The workshop participants identified and assessed the potential for mining effects on lineaments, joints, faulting, basal 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. The participants considered the risk control measures and procedures to be reasonable to manage the identified risks. Further information on the risk assessment is provided in the CRRP (Appendix H).

The key issues relating to subsidence impacts on surface water and groundwater resources are described in the WMP and the relevant monitoring and management measures are summarised in Table 8 and Section 3.7.

### 3.1.3 Assessment of Performance Indicators and Measures

Performance indicators developed for the subsidence impact performance measures relating to water resources and watercourses are presented in the WMP and are summarised in Table 9.

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**Table 8**  
**Management Issues for Water Resources and Watercourses during Longwalls 308-310 Extraction**

Issue	Approved Impact	Monitoring	Management
Catchment yield to the Woronora Reservoir	<ul style="list-style-type: none"> <li>Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir.</li> <li>No connective cracking between the surface and the mine.</li> </ul>	Monitoring in accordance with the WMP, including: <ul style="list-style-type: none"> <li>Surface water quality.</li> <li>Surface water flow.</li> </ul>	<ul style="list-style-type: none"> <li>Mine planning and design:               <ul style="list-style-type: none"> <li>Conservative mining geometry.</li> <li>Shortening of Longwalls 303, 304 and 305.</li> </ul> </li> </ul>
Woronora Reservoir	<ul style="list-style-type: none"> <li>Negligible leakage from the Woronora Reservoir.</li> <li>Negligible reduction in water quality of Woronora Reservoir.</li> </ul>	<ul style="list-style-type: none"> <li>Groundwater pressure/level.</li> <li>Inspections of underground workings for water accumulation.</li> <li>Mine water make.</li> </ul>	<ul style="list-style-type: none"> <li>Adaptive management – Waratah Rivulet Valley Closure TARP.</li> <li>Risk assessments.</li> </ul>
Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)	<ul style="list-style-type: none"> <li>Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases).</li> </ul>	<ul style="list-style-type: none"> <li>Woronora Reservoir water quality.</li> <li>Visual inspections of stream cracking, gas releases, iron staining and drainage behaviour.</li> <li>Gas releases.</li> </ul>	<ul style="list-style-type: none"> <li>Additional monitoring (e.g. increase in monitoring frequency or additional sampling).</li> <li>Stream remediation.</li> <li>Revegetation measures.</li> <li>Offsets.</li> </ul>
Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26	<ul style="list-style-type: none"> <li>Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases).</li> </ul>	<ul style="list-style-type: none"> <li>Pool water levels.</li> <li>Groundwater quality.</li> </ul> Subsidence monitoring at Waratah Rivulet gauging station. Subsidence monitoring for the Waratah Rivulet Valley Closure TARP. Subsidence monitoring in accordance with the SMP.	

**Table 9**  
**Summary of Water Resources and Watercourses Performance Measures and Indicators**

<b>Performance Measure</b>	<b>Performance Indicator(s)</b>
Negligible reduction to the quantity of water resources reaching the Woronora Reservoir.	<ul style="list-style-type: none"> <li>Changes in the quantity of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining, that are not also occurring in the control catchment(s).</li> </ul>
Negligible reduction to the quality of water resources reaching the Woronora Reservoir.	<ul style="list-style-type: none"> <li>Changes in the quality of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations that are not also occurring at control site WOWQ2.</li> </ul>
No connective cracking between the surface and the mine.	<ul style="list-style-type: none"> <li>Visual inspection does not identify abnormal water flow from the goaf, geological structure, or the strata generally.</li> <li>The 20-day average mine water make does not exceed 1 ML/day.</li> <li>Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PM02 does not occur.</li> <li>Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore PHGW2A does not occur.</li> </ul>
No connective cracking between the surface and the mine. Negligible leakage from the Woronora Reservoir.	<ul style="list-style-type: none"> <li>The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PHGW2A is reduced by no more than 40% from that measured to 30 June 2017.</li> </ul>
Negligible leakage from the Woronora Reservoir.	<ul style="list-style-type: none"> <li>The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 40% from that measured to 30 June 2017.</li> <li>The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PM02 is reduced by no more than 40% from that measured to 30 June 2017.</li> <li>The hydraulic gradient from transect bore T5 to bore T3-R is reduced by no more than 10% from that measured on 30 June 2017.</li> </ul>
Negligible reduction in the water quality of Woronora Reservoir.	<ul style="list-style-type: none"> <li>Changes in the quality of water in the Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations.</li> </ul>
Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P).	<ul style="list-style-type: none"> <li>No change to the natural drainage behaviour of Pools P, Q, R, S, T, U, V and W.</li> <li>Analysis of water level data for Pools P, T, U, V and W indicates the water level is at or above the pool's previous minimum.</li> <li>Analysis of water level data for Pools Q, R and S indicates the water levels are above that required to maintain water over the downstream rock bar.</li> <li>Visual inspection of the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir does not show significant changes in the extent or nature of iron staining that isn't also occurring in the Woronora River (control site).</li> <li>Gas releases in Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir have not increased beyond those observed up to the commencement of Longwall 301 extraction.</li> </ul>
Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases) of the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26.	<ul style="list-style-type: none"> <li>No change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU.</li> <li>Analysis of water level data for Pools ETAS/ETAT and ETAU indicates the water levels are above that required to maintain water over the downstream rock bars.</li> <li>Gas releases in Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 have not increased beyond those observed up to the commencement of Longwall 301 extraction.</li> </ul>



Monitoring against these performance indicators during the mining of Longwalls 308-310 is summarised in Table 8 and Section 3.7 and described in detail in Appendix A. The procedure that will be followed to assess the extraction of Longwalls 308-310 against the performance indicators and performance measures is outlined in Figure 12 and described in detail in the WMP (Appendix A).

Monitoring conducted in accordance with the Metropolitan Coal Longwalls 23-27 WMP identified that the following watercourse impact performance measure for the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26 had been exceeded in relation to *minimal iron staining* and *no diversion of flows/no change in the natural drainage behaviour of pools*. (emphasis added):

*Negligible environmental consequences over at least 70% of the stream length (that is **no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining** and minimal gas releases)*

Metropolitan Coal provided the DPE with a proposed course of action in relation to the exceedance of the Eastern Tributary subsidence impact performance measure, focused on the implementation of stream remediation measures. In accordance with Condition 1, Schedule 6 of the Project Approval, Metropolitan Coal is required to restore surface flow and pool holding capacity on the Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26. Metropolitan Coal is committed to the remediation of pools on the Eastern Tributary.

### 3.1.4 Contingency Plan

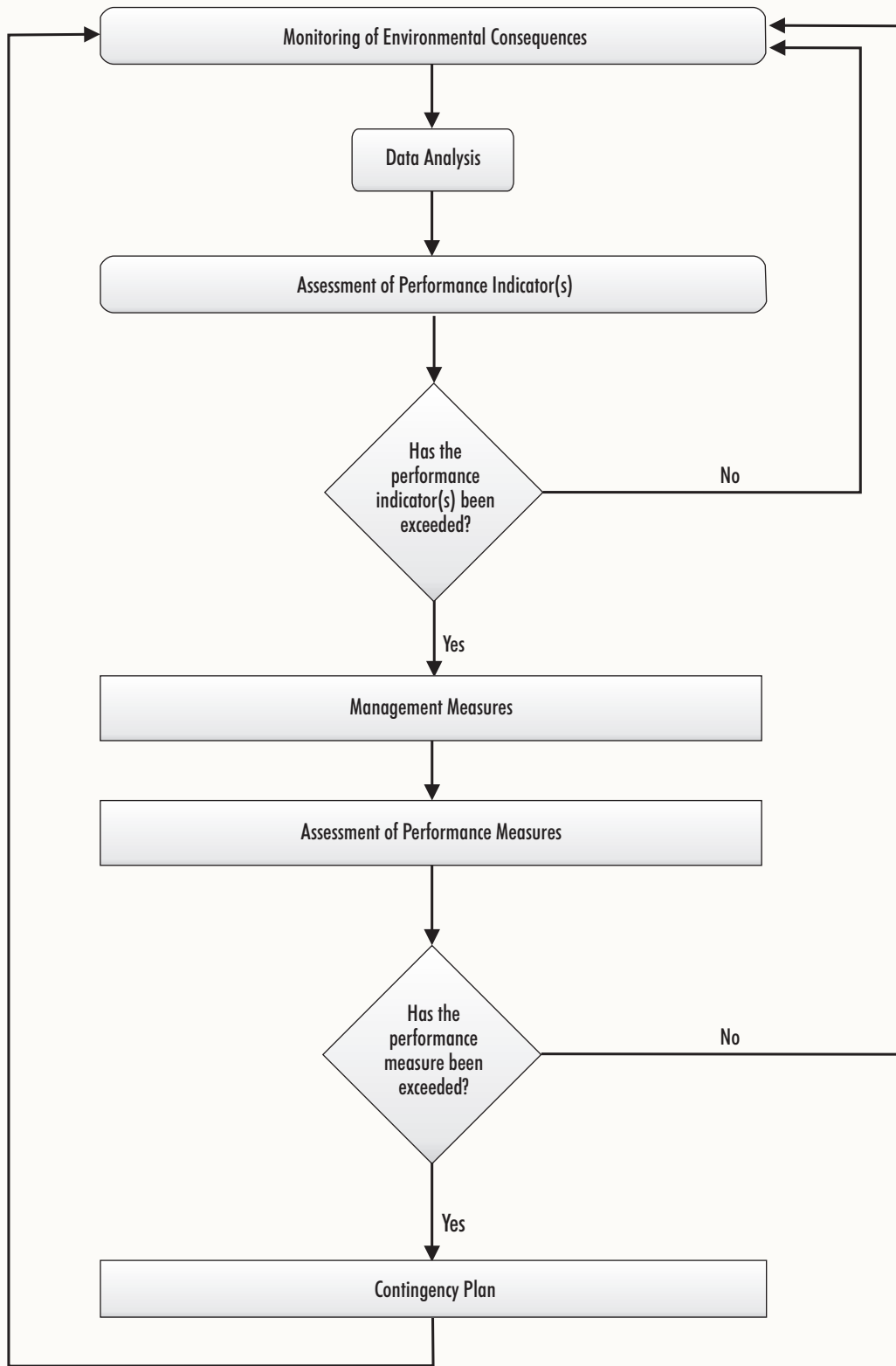
In the event that a water resource or watercourse subsidence impact performance measure is exceeded, Metropolitan Coal will implement a Contingency Plan as described in the WMP and summarised in Section 4.1. Potential contingency measures for an exceedance of the water resource or watercourse performance measures include:

- The conduct of additional monitoring (e.g. increase in monitoring frequency or additional sampling) to inform the proposed contingency measures.
- The implementation of stream remediation measures to restore surface water flow/pool holding capacity.
- The implementation of revegetation measures to remediate impacts of gas releases on riparian vegetation.
- The purchase of water from Sydney Water in accordance with a license agreement established to the satisfaction of WaterNSW and the DPE.
- The provision of a suitable offset(s) to compensate for the reduction in the quantity of water resources reaching the Woronora Reservoir. Examples of potential offsets include improvement works in the Woronora Reservoir water supply catchment.
- The implementation of adaptive management measures. Examples of adaptive management measures include stepping-around a longwall, the use of stand-offs (environmental pillar) from a particular location, or increasing the setback of the longwalls already subject to stand-off.

As indicated in Section 3.1.3 above, Metropolitan Coal will conduct stream remediation on the Eastern Tributary in response to the exceedance of the Eastern Tributary watercourse subsidence impact performance measure during the mining of Longwalls 23-27.

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## 3.2 LAND MANAGEMENT

### 3.2.1 Overview

The LMP is provided in Appendix B. The purpose and scope of the LMP are summarised below:

**Purpose:** To manage the potential environmental consequences of the Extraction Plan on cliffs and overhangs, steep slopes and land in general.

**Scope:** Cliffs and overhangs, steep slopes and land in general during the mining of Longwalls 308-310.

### 3.2.2 Key Land Issues, Monitoring and Management Measures

Cliffs are defined as a continuous rock face, including overhangs, having a minimum height of 10 m and a slope of greater than 66°. Overhangs associated with cliffs and/or considered sensitive to potential mine subsidence movements (due to their location relative to the Waratah Rivulet) were also identified within the Project underground mining area (Figure 8).

Six cliff and overhang sites are located within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour (sites COH9, COH10, COH11, COH12, COH13, and COH16) while an additional five cliff and overhang sites (sites COH5, COH6, COH6A, COH7 and CH08) are outside the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour and within 600 m of Longwalls 308-310. None of the cliffs are located directly above Longwalls 308-310.

Detailed baseline recording for these sites has been conducted and is included in Appendix B.

Visual inspections for subsidence impacts on cliff site COH17 were conducted following the completion of Longwalls 303 and 304. The visual inspections did not record any subsidence impacts. For Longwalls 308-310, visual inspections for subsidence impacts will be conducted at sites COH9, COH10, COH11, COH12, COH13, and COH16:

- prior to the commencement of Longwall 308 extraction;
- monthly at cliff site(s) located within 450 m of longwall extraction; and
- within three months of the completion of Longwall 308, Longwall 309 and Longwall 310.

The cliffs located outside of the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour and within 600 m of Longwalls 308-310 are not expected to experience any measurable vertical subsidence resulting from the extraction of Longwalls 308-310 (Appendix B).

Consistent with the Project Approval, steep slopes are defined as an area of land having a natural gradient of between 33° and 66° (Figure 8). Steep slopes have been identified to highlight areas where existing ground slopes may be marginally stable. However, no significant slope failures have been observed in the Southern Coalfield as a result of longwall mining.

Land in general refers to the general landscape other than cliffs and steep slopes. There are rock ledges, also called rock outcrops and minor cliffs, which occur within 600 m of Longwalls 308-310 (Appendix B). Land in general includes other land features such as fire trails and vehicular tracks, however excludes surface features such as streams and upland swamps which are addressed in the WMP and BMP, respectively.

The key issues relating to subsidence impacts on land are described in the LMP and the relevant monitoring and management measures are summarised in Table 10 and Section 3.7.

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### 3.2.3 Assessment of Performance Indicators and Measures

The Project Approval requires Metropolitan Coal not to exceed the subsidence impact performance measure relating to land, outlined in Table 1 of Condition 1, Schedule 3:

*Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall.*

Metropolitan Coal will assess the Project against the following performance indicator:

*Cliff sites COH9, COH10, COH11, COH12, COH13, and/or COH16 experience cliff instabilities that do not require management measures to be implemented.*

Metropolitan Coal will assess steep slopes and land in general against the following performance indicator:

*Steep slopes and land in general experience sandstone fracturing/cracking and rock falls that do not require management measures to be implemented.*

Monitoring against the performance indicators and performance measure during the mining of Longwalls 308-310 is summarised in Table 10 and Section 3.7 and described in detail in Appendix B. The procedure that will be followed to assess the extraction of Longwalls 308-310 against the performance indicators and performance measure is outlined in Figure 12 and described in detail in the LMP (Appendix B).

### 3.2.4 Contingency Plan

In the event the subsidence impacts observed exceed the land subsidence impact performance measure, Metropolitan Coal will implement a Contingency Plan as described in the LMP and summarised in Section 4.1.

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**Table 10**  
**Management Issues for Land during Longwalls 308-310 Extraction**

Issue	Approved Impact	Monitoring	Management
Cliffs and overhangs	<ul style="list-style-type: none"> <li>Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall.</li> </ul>	Monitoring in accordance with the LMP, including visual observations of: <ul style="list-style-type: none"> <li>Cliff instabilities or cracking.</li> <li>Sandstone fracturing.</li> <li>Rock falls.</li> </ul>	<ul style="list-style-type: none"> <li>Stabilisation techniques including:               <ul style="list-style-type: none"> <li>Installation of artificial rock support.</li> <li>Installation of standing supports.</li> </ul> </li> </ul>
Steep slopes and land in general	<ul style="list-style-type: none"> <li>Sandstone fracturing (including surface tension cracking) and subsequent rock falls consistent with that observed during the extraction of previous longwalls at Metropolitan Coal.</li> </ul>	Subsidence monitoring in accordance with the SMP.	<ul style="list-style-type: none"> <li>Improvement of appearance including:               <ul style="list-style-type: none"> <li>Application of product to enhance the weathered appearance of a cliff face.</li> <li>Planting of endemic native vegetation.</li> </ul> </li> <li>Implementation of erosion and sediment controls.</li> <li>Permanent filling of surface tension cracks.</li> <li>Measures to address safety hazards.</li> </ul>

### 3.3 BIODIVERSITY MANAGEMENT

#### 3.3.1 Overview

The BMP is provided in Appendix C. The purpose and scope of the BMP are summarised below:

- Purpose:** To manage the potential environmental consequences of the Extraction Plan on aquatic and terrestrial flora and fauna, with a specific focus on swamps.
- Scope:** Aquatic and terrestrial flora and fauna (including swamps) during the mining of Longwalls 308-310.

#### 3.3.2 Key Biodiversity Issues, Monitoring and Management Measures

Nineteen upland swamps are located within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour (Swamps 61, 62, 63, 64, 71b, 72, 73, 78, 79, 80, 81, 82, 83, 84, 86, 88, 89, 90 and 92) and an additional twelve swamps (Swamps 36, 48, 60, 65, 66, 67, 68a, 68b, 71a, 77, 133 and 134) are located within 600 m of Longwalls 308-310 (Figures 5 and 8).

Riparian vegetation and habitats for aquatic biota occur along streams which flow to the Woronora Reservoir (including the Waratah Rivulet and Eastern Tributary), and some of their tributaries (Figure 9). No threatened aquatic biota listed under the *Fisheries Management Act 1994*, NSW *Biodiversity Conservation Act 2016* (BC Act) or Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) has been recorded within the Project underground mining area or in the Woronora Reservoir.

Vegetation communities mapped on slopes and ridgetops within 600 m of Longwalls 308-310 secondary extraction include woodlands on sandstone or lateritic soils, heaths and mallee heaths, sandstone forests and disturbed land (Figure 9).

The cliffs and overhangs, steep slopes, and land in general described in Section 3.2 also provide habitat for aquatic and terrestrial flora and fauna.

A number of threatened terrestrial flora and fauna species listed under the BC Act or EPBC Act are known to occur, or have the potential to occur within the Project underground mining area or surrounds. No endangered flora or fauna populations that were listed under the BC Act at the time of Project Approval occur within the Project underground mining area or surrounds.

Endangered Ecological Communities (EECs) listed under the BC Act at the time of Project Approval and identified as occurring in the Project underground mining area or surrounds includes the Southern Sydney Sheltered Forest on Transitional Sandstone Soils in the Sydney Basin Bioregion EEC and the O'Hares Creek Shale Forest EEC.

The key issues relating to subsidence impacts on biodiversity are described in the BMP and the relevant monitoring and management measures are summarised in Table 11 and Section 3.7.

Other subsidence impact performance measures and indicators of relevance to biodiversity include the water resource and watercourse performance measures detailed in the WMP and the land subsidence impact performance measure detailed in the LMP.

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**Table 11**  
**Management Issues for Biodiversity during Longwalls 308-310 Extraction**

Issue	Approved Impact	Monitoring	Management
Threatened species, populations, or ecological communities	Negligible impact	<p><b>Upland Swamps</b></p> <ul style="list-style-type: none"> <li>• Vegetation monitoring.               <ul style="list-style-type: none"> <li>- Visual inspections.</li> <li>- Transect/quadrat monitoring.</li> <li>- Indicator species.</li> </ul> </li> <li>• Groundwater monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• Swamp remediation techniques.</li> <li>• Additional monitoring (e.g. increase in monitoring frequency or additional sampling).</li> </ul>
		<p><b>Riparian Vegetation</b></p> <ul style="list-style-type: none"> <li>• Vegetation monitoring.               <ul style="list-style-type: none"> <li>- Visual inspections.</li> <li>- Quadrat monitoring.</li> <li>- Indicator species.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Stream remediation.</li> <li>• Weed control measures.</li> <li>• Planting of endemic species.</li> <li>• Stream bank erosion control measures in accordance with the WMP.</li> <li>• Management measures for impacts associated with cliffs and overhang sites include:               <ul style="list-style-type: none"> <li>– the implementation of erosion and sediment control measures; and</li> <li>– stabilisation techniques; in accordance with the LMP.</li> </ul> </li> <li>• Additional monitoring (e.g. increase in monitoring frequency or additional sampling).</li> </ul>
		<p><b>Slopes and Ridgetops</b></p> <ul style="list-style-type: none"> <li>• Visual inspections of cliffs and overhangs, steep slopes and land in general.</li> </ul>	<ul style="list-style-type: none"> <li>• Management measures for impacts associated with cliffs and overhang sites include:               <ul style="list-style-type: none"> <li>– the implementation of erosion and sediment control measures; and</li> <li>– stabilisation techniques; in accordance with the LMP.</li> </ul> </li> <li>• Filling of surface tension cracks in accordance with the LMP.</li> </ul>
		<p><b>Aquatic Biota and their Habitats</b></p> <ul style="list-style-type: none"> <li>• Watercourses (i.e. aquatic habitats) in accordance with WMP.</li> <li>• Aquatic biota stream monitoring.</li> </ul> <p>Aquatic biota pool monitoring.</p>	<ul style="list-style-type: none"> <li>• Mine planning and design:               <ul style="list-style-type: none"> <li>- Conservative mining geometry.</li> <li>- Shortening of Longwalls 303, 304 and 305.</li> </ul> </li> <li>• Adaptive management – Waratah Rivulet Valley Closure TARP.</li> <li>• Stream remediation.</li> <li>• Additional monitoring (e.g. increase in monitoring frequency or additional sampling).</li> </ul>

**Table 11 (Continued)**  
**Management Issues for Biodiversity during Longwalls 308-310 Extraction**

Issue	Approved Impact	Monitoring	Management
Threatened species, populations, or ecological communities (Cont.)	Negligible impact (Cont.)	<p><b>Terrestrial Fauna and their Habitats</b></p> <ul style="list-style-type: none"> <li>• Terrestrial fauna habitats, as discussed for upland swamps, riparian vegetation, slopes and ridgetops and aquatic habitats above.</li> <li>• Amphibian monitoring.</li> </ul>	<ul style="list-style-type: none"> <li>• Mine planning and design:               <ul style="list-style-type: none"> <li>- Conservative mining geometry.</li> <li>- Shortening of Longwalls 303, 304 and 305.</li> </ul> </li> <li>• Adaptive management – Waratah Rivulet Valley Closure TARP.</li> <li>• Swamp remediation techniques.</li> <li>• Stream remediation.</li> <li>• Weed control measures.</li> <li>• Planting of endemic species.</li> <li>• Stream bank erosion control measures in accordance with the WMP.</li> <li>• Management measures for impacts associated with cliffs and overhang sites include:               <ul style="list-style-type: none"> <li>– the implementation of erosion and sediment control measures; and</li> <li>– stabilisation techniques; in accordance with the LMP.</li> </ul> </li> <li>• Filling of surface tension cracks in accordance with the LMP.</li> <li>• Additional monitoring (e.g. increase in monitoring frequency or additional sampling).</li> </ul>

### 3.3.3 Assessment of Performance Indicators and Measure

Performance indicators developed for the subsidence impact performance measure relating to biodiversity are presented in the BMP and are summarised in Table 12.

**Table 12**  
**Biodiversity Performance Measure and Performance Indicators**

Performance Measure	Performance Indicators
Negligible impact to threatened species, populations, or ecological communities.	<p><b>Upland Swamps</b></p> <ul style="list-style-type: none"> <li>• The vegetation in upland swamps is not expected to experience changes significantly different to vegetation in control swamps.</li> <li>• Surface cracking within upland swamps resulting from mine subsidence is not expected to result in measurable changes to swamp groundwater levels when compared to control swamps or seasonal variations in water levels experienced by upland swamps prior to mining.</li> </ul> <p><b>Riparian Vegetation</b></p> <ul style="list-style-type: none"> <li>• Impacts to riparian vegetation are expected to be localised and limited in extent, similar to the impacts previously experienced at Metropolitan Coal.</li> </ul> <p><b>Aquatic Biota</b></p> <ul style="list-style-type: none"> <li>• The aquatic macroinvertebrate and macrophyte assemblages in streams are not expected to experience long-term impacts as a result of mine subsidence.</li> </ul> <p><b>Terrestrial Fauna</b></p> <ul style="list-style-type: none"> <li>• The amphibian assemblage is not expected to experience changes significantly different to the amphibian assemblage at control sites.</li> </ul>



Monitoring against these performance indicators during the mining of Longwalls 308-310 is summarised in Table 11 and Section 3.7 and described in detail in the BMP (Appendix C). The procedure that will be followed to assess the extraction of Longwalls 308-310 against the performance indicators and performance measures is outlined in Figure 12 and described in detail in the BMP.

### 3.3.4 Contingency Plan

In the event the subsidence impact performance measure for threatened species, populations or ecological communities is considered to have been exceeded, Metropolitan Coal will implement a Contingency Plan as described in the BMP and summarised in Section 4.1.

## 3.4 HERITAGE MANAGEMENT

### 3.4.1 Overview

The HMP is provided in Appendix D. The purpose and scope of the HMP are summarised below:

**Purpose:** To manage the potential environmental consequences of the Extraction Plan on Aboriginal heritage sites or values.

**Scope:** Aboriginal heritage sites or values that could experience subsidence effects during the mining of Longwalls 308-310.

### 3.4.2 Key Aboriginal Heritage Issues, Monitoring and Management Measures

43 known sandstone overhang sites are located within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwalls 308-310 (Figure 10). Of the 43 sites with overhangs, 18 have art only and nine have art and/or artefacts and/or a deposit or Potential Archaeological Deposit. Four open sites are located within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour, namely sites FRC 95, FRC 101, FRC 164 and NEW 1.

11 Aboriginal heritage sites of high scientific (archaeological) significance and/or particular cultural significance are located within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour (Figure 10). Sites FRC 62, FRC 185 and NEW 2 are of high scientific (archaeological) significance and particular cultural significance, Sites FRC 68, FRC 191 and FRC 195 are of high scientific (archaeological) significance, and sites FRC 198, FRC 316, FRC 340, NT 35 and NEW 1 are of particular cultural significance.

A geotechnical risk assessment report was prepared for the sites of high scientific (archaeological) significance and/or particular cultural significance within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour, provided as Appendix 4 of the HMP (Appendix D).

Metropolitan Coal acknowledges that all Aboriginal heritage sites are of cultural significance to the Aboriginal people who have a traditional connection to Country.

The key issues relating to subsidence impacts on Aboriginal heritage sites and values are described in the HMP and the relevant monitoring and management measures are summarised in Table 13 and Section 3.7.

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**Table 13**  
**Management Issues for Aboriginal Heritage during Longwalls 308-310 Extraction**

Issue	Approved Impact	Monitoring	Management
Aboriginal heritage sites	Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.	<ul style="list-style-type: none"> <li>Aboriginal heritage sites.</li> </ul>	<ul style="list-style-type: none"> <li>Installation of an artificial dripline (e.g. silicone dripline) to direct increased moisture/water seepage away from art panels.</li> <li>Installation of artificial rock support (e.g. rock bolts, cable bolts, cement sprays [e.g. shotcrete], injections of a binding agent [PUR or similar]).</li> <li>Installation of standing supports (e.g. timber props, timber cogs, sandbags and metal [hydraulic] props).</li> <li>Scaling/dislodgement/removal of remaining loose rock.</li> <li>Salvage of artefacts for safekeeping and storage and/or display at a suitable location in consultation with the Aboriginal community.</li> <li>Use of cosmetic treatments (e.g. in the form of coloured grout or similar) to restore aesthetic values.</li> <li>Installation of a stress relief slot or stress focus notch.</li> </ul>

### 3.4.3 Assessment of Performance Indicators and Measure

The Project Approval requires Metropolitan Coal not to exceed the subsidence impact performance measure relating to Aboriginal heritage sites, as specified in Table 1 of Condition 1, Schedule 3:

*Less than 10% of Aboriginal Heritage sites within the mining area are affected by subsidence impacts.*

The performance indicator developed for the subsidence impact performance measure relating to Aboriginal heritage sites is presented in the HMP and is summarised in Table 14.

Monitoring against the performance indicator during the mining of Longwalls 308-310 is summarised in Table 13 and Section 3.7 and described in detail in the HMP (Appendix D). The procedure that will be followed to assess the extraction of Longwalls 308-310 against the performance indicator and performance measure is outlined in Figure 12 and described in detail in the HMP (Appendix D).

**Table 14**  
**Heritage Performance Measure and Performance Indicator**

Performance Measure	Performance Indicator
Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.	<p>Metropolitan Coal will assess the Project against the following performance indicator to allow early recognition of mining impacts:</p> <p><i>Less than 7% of Aboriginal heritage sites within the mining area are affected by subsidence impacts.</i></p> <p>Sites are considered to be “affected by subsidence impacts” if they exhibit one or more the following consequences that cannot be attributed to natural weathering or deterioration:</p> <ul style="list-style-type: none"> <li>overhang collapse;</li> <li>cracking of sandstone that coincides with Aboriginal art or grinding grooves; and</li> <li>rock fall that damages Aboriginal art.</li> </ul>

### 3.4.4 Contingency Plan

In the event the Aboriginal heritage sites subsidence impact performance measure has been exceeded, Metropolitan Coal will implement a Contingency Plan as described in the HMP and summarised in Section 4.1.

## 3.5 BUILT FEATURES MANAGEMENT

### 3.5.1 Overview

The BFMP is provided in Appendix E and includes component plans for the individual infrastructure owners. The purpose and scope of the BFMP are summarised below:

**Purpose:** To manage the potential environmental consequences of the Extraction Plan on built features.

**Scope:** Built features that could experience subsidence effects during the mining of Longwalls 308-310.

### 3.5.2 Key Built Features Issues, Monitoring and Management Measures

Built features within the vicinity of Longwalls 308-310 consist of (Figures 11a and 11b):

- underground water mains (Sydney Water);
- public roads (M1 Princes Motorway [TfNSW] and Old Princes Highway [Wollongong City Council, WCC]) and associated infrastructure (e.g. culverts, cuttings, roadside furniture);
- bridges (TfNSW); and
- access roads/tracks (including fire trails and vehicular tracks).

The access roads/tracks (including fire trails and vehicular tracks) will be managed in accordance with the LMP and the BFMP component plans.

Appendix I of the Extraction Plan (Subsidence Report) also assesses potential subsidence effects, impacts and environmental consequences of other built features not subject to the component plans including survey marks, exploration boreholes and the Woronora Dam.

The key issues relating to management of built features in regard to subsidence impacts are described in the relevant component plans of the BFMP (Appendix E). The relevant monitoring and management measures for these built features are summarised in Table 15 and Section 3.7.

### 3.5.3 Assessment of Performance Indicators and Measures

The subsidence impact performance measure specified in Table 1 of Condition 1, Schedule 3 of the Project Approval in relation to built features is:

*Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing.*

Performance indicators developed for the subsidence impact performance measure relating to built features are presented in the component plans of the BFMP and are summarised in Table 15. Monitoring against the performance indicators is described in detail in the component plans of the BFMP and summarised in Table 15 and Section 3.7.

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The procedure followed to assess the extraction of Longwalls 308-310 against the performance indicators and performance measures is outlined in Figure 12 and described in detail in the component plans of the BFMP (Appendix E).

### **3.5.4 Contingency Plan**

In the event that a subsidence impact performance measure relating to built features is considered to have been exceeded, Metropolitan Coal will implement a Contingency Plan as described in detail in the component plans of the BFMP and summarised in Section 4.1.

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**Table 15**  
**Built Features Performance Indicators, Monitoring and Management Measures**

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
TfNSW M1 Princes Motorway, Bridge 2 and Cawley Road Overbridge	<ul style="list-style-type: none"> <li>• Measured absolute horizontal movements.</li> <li>• Cracking of bridge elements.</li> <li>• Pavement cracking and deformation.</li> <li>• Visual consequence of slope movement.</li> <li>• Defects in culverts.</li> </ul>	<ul style="list-style-type: none"> <li>• Subsidence, tilt, tensile strain and compressive strain.</li> <li>• Horizontal movement.</li> </ul> <p><i>Bridge 2</i></p> <ul style="list-style-type: none"> <li>• Real-time survey monitoring.</li> <li>• Monitoring of movements including: Absolute three dimensional (3D) movement of the survey reference pillar, relative 3D movements of all bridge monitoring points.</li> <li>• Visual inspection for impacts on: abutments, pier frames, elastomeric bearings, soffits of girders, deck expansion joints, steel traffic barrier joints and other areas of substructure and adjoining areas including concrete paths, stairs, and slope protection.</li> </ul> <p><i>Cawley Road Overbridge</i></p> <ul style="list-style-type: none"> <li>• Real-time survey monitoring.</li> <li>• Monitoring of movements including: absolute 3D movement of the survey reference pillar and relative 3D movements of all bridge monitoring points.</li> <li>• Visual inspection for impacts on: abutments, pier blade wall, Tetron bearings, deck expansion joints, steel traffic barrier joints and safety screen joints.</li> </ul>	<p>A number of general management measures in relation to TfNSW assets are applicable. These include:</p> <ul style="list-style-type: none"> <li>• review of scope and frequency of monitoring;</li> <li>• site inspections;</li> <li>• review by relevant specialists;</li> <li>• initiate traffic management procedures;</li> <li>• review of potential factors contributing to the exceedance of the performance trigger including review of subsidence measurements and predictions; and</li> <li>• review of effectiveness of management measures.</li> </ul> <p>Potential management measures that can be implemented for Bridge 2 and Cawley Road Overbridge include repair of cracked elements where the crack width is within the acceptable limit. This can be carried out after ground movements due to mining have ceased as their presence during mining does not affect to safe operation of the bridge.</p>

**Table 15 (Continued)**  
**Built Features Performance Indicators, Monitoring and Management Measures**

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
TfNSW M1 Princes Motorway, Bridge 2 and Cawley Road Overbridge (Cont.)	As above.	<p><i>Other Relevant Infrastructure</i></p> <ul style="list-style-type: none"> <li>Visual inspection for impacts on: asphaltic concrete surface, kerbs, gutters and pits, signs or other road infrastructure, cuttings along the M1 Princes Motorway and closed circuit television (CCTV) inspection for impacts on internal surfaces of culverts.</li> </ul>	<p>A number of potential management measures in relation to the M1 Princes Motorway pavement are considered to be applicable. These include:</p> <ul style="list-style-type: none"> <li>mill and replace pavement layers;</li> <li>slotting; and</li> <li>crack sealing.</li> </ul> <p>A number of potential management measures in relation to cuttings are considered to be applicable. These include:</p> <ul style="list-style-type: none"> <li>rock bolting;</li> <li>scaling;</li> <li>shotcreting;</li> <li>installation of rockfall mesh;</li> <li>installation of barriers; and</li> <li>trimming of the cut face.</li> </ul> <p>A number of potential management measures in relation to culverts are considered to be applicable. These include:</p> <ul style="list-style-type: none"> <li>point repairs;</li> <li>lining;</li> <li>grouting; and</li> <li>culvert replacement.</li> </ul>

**Table 15 (Continued)**  
**Built Features Performance Indicators, Monitoring and Management Measures**

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
WCC Old Princes Highway	<ul style="list-style-type: none"> <li>• No pavement cracking exceeding 10 mm, or other defects of the road pavement resulting in deterioration of ride quality.</li> <li>• No ponding of water on the road surface as a result of changes in grade from subsidence associated with Longwalls 308-310.</li> <li>• No joint displacement or cracking or other defects of the drainage structure (e.g. pipes/culverts) in excess of 5 mm.</li> <li>• Serviceability of guard rails, marker posts and signage is maintained.</li> </ul>	<ul style="list-style-type: none"> <li>• Subsidence, tilt, tensile strain and compressive strain.</li> <li>• Impacts to the surface including cracks, buckling and stepping.</li> <li>• Impacts to the visible surfaces of pipes/culverts including cracking, buckling, shearing and collapse.</li> <li>• Visible impacts to furniture.</li> </ul>	<p>A number of potential management measures in relation to the Old Princes Highway pavement, drainage structures and other furniture are considered to be applicable. These include:</p> <ul style="list-style-type: none"> <li>• mill and/or replace pavement layers;</li> <li>• crack sealing/repair;</li> <li>• point repairs;</li> <li>• replace sections of pipe/culvert;</li> <li>• grouting/sealing of cracks; and</li> <li>• repair/replacement of furniture.</li> </ul> <p>In the event that repairs are required, traffic control measures such as contra-flow of traffic or partial carriageway closures may be used to divert traffic off one carriageway, lane or shoulder. Repairs would be carried out as soon as practicable in consultation with the WCC.</p> <p>Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures.</p>
Sydney Water water pipelines	<ul style="list-style-type: none"> <li>• No more than repairable (minor) leakages of the water pipelines occur due to mining.</li> <li>• No more than repairable (minor) defects (cracks, etc.) in the structural integrity of the pipes and associated connections occur due to mining.</li> </ul>	<ul style="list-style-type: none"> <li>• Subsidence, tilt, tensile strain and compressive strain.</li> <li>• Surface ground cracks.</li> <li>• Cracks or leaks in the pipelines.</li> <li>• Leakage in pipeline.</li> <li>• Acoustic monitoring.</li> </ul>	<p>A number of potential management measures in relation to pipelines are considered to be applicable. These include:</p> <ul style="list-style-type: none"> <li>• repair of broken pipes or fittings by Sydney Water maintenance staff; and</li> <li>• if major adjustment is required to re-align pipe, the pipe can be temporarily end capped to maintain supply to customers either side of break and/or alternative water supply provided to service properties while repair of water main is in progress.</li> </ul> <p>Follow-up inspections will be conducted to assess the effectiveness of the management measures implemented and the requirement for any additional management measures.</p>

## 3.6 PUBLIC SAFETY MANAGEMENT

### 3.6.1 Overview

The PSMP is provided in Appendix F. The purpose and scope of the PSMP are summarised below:

- Purpose:** To manage the potential consequences of the Extraction Plan on public safety within the mining area.
- Scope:** Land within the mining area where potential risks to the public could be encountered.

### 3.6.2 Key Public Safety Issues, Monitoring and Management Measures

The primary hazards associated with the extraction of Longwalls 308-310 include:

- potential subsidence impacts on built features;
- potential instability of cliff formations or steep slopes caused by subsidence;
- deformations or fracturing of any land caused by subsidence; and
- any other impacts of subsidence.

A large proportion of the land within 600 m of Longwalls 308-310 is owned and/or managed by WaterNSW or The State of NSW (Crown Land), and therefore accessibility to the general public is restricted (Figure 7). The general public are not allowed in the Woronora Special Area for any recreational or other purpose. Access restrictions are also applicable to some of the identified built features in the vicinity of Longwalls 308-310.

Longwalls 308-310 are located within the Woronora Notification Area (Figure 2). At its closest point to Longwalls 308-310, the Woronora Dam wall is located approximately 5.2 km from the commencing end of Longwall 310 and the distance from the labyrinth spillway, which is to the south of the dam wall, is approximately 4.8 km (Figure 1). The dam wall and spillway are located at large distances from Longwalls 308-310. It is not expected that measurable conventional subsidence movements would occur at the dam wall and spillway (MSEC, 2021) (Appendix I). In addition, it is unlikely that non-conventional subsidence movements would be observed at the distances of the dam wall and spillway from Longwalls 308-310 (Appendix I).

Metropolitan Coal is required to obtain all necessary approvals from the Minister administering the *Mining Act 1992* in accordance with the requirements of the *Dams Safety Act 2015* and the Dams Safety Committee.

The key issues relating to potential risks to public safety during the extraction of Longwalls 308-310 are described in the PSMP (Appendix F). The relevant monitoring and management measures are summarised in Table 16 and Section 3.7.

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**Table 16**  
**Management Issues for Public Safety during Longwalls 308-310 Extraction**

<b>Issue</b>	<b>Approved Impact</b>	<b>Monitoring</b>	<b>Management</b>
Public Safety	<ul style="list-style-type: none"> <li>Public safety to be ensured within the mining area.</li> <li>Built features – Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring in accordance with the LMP.</li> <li>Monitoring in accordance with the BFMP.</li> </ul>	<ul style="list-style-type: none"> <li>Restricted access.</li> <li>Woronora Special Areas Consent.</li> <li>Woronora Special Area Catchment Induction.</li> <li>Management of roads/tracks (including fire trails and vehicular tracks) in accordance with the LMP and BFMP.</li> <li>Management of built features in accordance with the BFMP.</li> <li>DSC approval requirements.</li> <li>Consultation with landowners and infrastructure owners.</li> <li>Other management measures in relation to public safety may include: <ul style="list-style-type: none"> <li>traffic control including diversion of traffic;</li> <li>temporary speed restrictions;</li> <li>warning signs/lights;</li> <li>restriction of public access;</li> <li>erection of barriers;</li> <li>implementation of security services; and</li> <li>use of emergency services for public control.</li> </ul> </li> </ul>

### 3.6.3 Assessment of Performance Indicators and Measures

The Project Approval requires Metropolitan Coal not to exceed the subsidence impact performance measure relating to built features, as specified in Table 1 of Condition 1, Schedule 3:

*Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing.*

Metropolitan Coal will also assess the Project against the following public safety performance indicator:

*Public safety will be ensured in the event that any hazard to the general public arising from subsidence effects becomes evident.*

Specific performance indicators have also been developed with each asset owner as described in Section 3.5 and the BFMP (Appendix E).

Monitoring against the performance indicator and performance measure during the mining of Longwalls 308-310 is summarised in Table 16 and Section 3.7 and described in detail in Appendix F. The procedure that will be followed to assess the extraction of Longwalls 308-310 against the performance indicator and performance measure is outlined in Figure 12 and described in detail in the PSMP (Appendix F).

### 3.6.4 Contingency Plan

In the event the built features subsidence impact performance measure of 'safe' is considered to have been exceeded or is likely to be exceeded, Metropolitan Coal will implement a Contingency Plan as described in the PSMP and summarised in Section 4.1.

### 3.7 SUBSIDENCE MONITORING

The various monitoring programs that are detailed in each of the management plans (Appendices A to F) are summarised in Table 17. The location of environmental monitoring sites included in Metropolitan Coal's various environmental monitoring programs detailed in Table 17, are shown on Figure 8, and Figures 13 to 21.

Plan 7 in Attachment 1 of Appendix G shows the subsidence monitoring locations during the mining of Longwalls 308-310.

**Table 17**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
WMP	Stream Features	<ul style="list-style-type: none"> <li>The Eastern Tributary from full supply level of the Woronora Reservoir to the maingate of Longwall 26.</li> <li>The Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir.</li> </ul>	<ul style="list-style-type: none"> <li>Location, approximate dimensions (length, width and depth), and orientation of surface cracks (specifically whether cracks are developed perpendicular to the stream flow or are controlled by rock joints or other factors, etc.).</li> <li>Nature of iron staining (e.g. whether isolated or across the entire streambed).</li> <li>Extent of iron staining (e.g. the length of stream affected).</li> <li>Description of gas release (e.g. isolated bubbles or continuous stream, and type of gas [methane or carbon dioxide]).</li> <li>Nature of scouring, for example the depth of scouring, type of soil exposed, any obvious vegetation impact, potential for severe erosion, etc.</li> <li>Water discoloration or opacity if present.</li> <li>Rock bar characteristics such as extent of cracking, seepage, underflow.</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection and photographic survey of Eastern Tributary at annual intervals.</li> <li>Visual inspection and photographic survey of Waratah Rivulet monthly when longwall extraction is within 450 m of the stream and within 3 months of the completion of each longwall.</li> <li>Weekly monitoring at pools observed with gas releases until no gas releases have been observed at the pool for three consecutive weeks.</li> </ul>
	Surface Water Flow	<ul style="list-style-type: none"> <li>Eastern Tributary (GS 300078).</li> <li>Waratah Rivulet (GS 2132102).</li> <li>Woronora Reservoir Sub-catchment I (GS 300092).</li> <li>Woronora Reservoir Sub-catchment K (GS 300093).</li> <li>Woronora Reservoir Sub-catchment P (GS 300142).</li> <li>Woronora Reservoir Sub-catchment R (GS 300143).</li> <li>Woronora River (GS 2132101).</li> <li>Honeysuckle Creek (GS 300077).</li> <li>O'Hares Creek (GS 213200).</li> </ul>	<ul style="list-style-type: none"> <li>Stream flow data.</li> </ul>	<ul style="list-style-type: none"> <li>Continuous (downloaded monthly).</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
WMP (Cont.)	Pool Water Levels and Drainage Behaviour	<ul style="list-style-type: none"> <li>Eastern Tributary Pools ETG, ETJ, ETM, ETO, ETU, ETW, ETAF, ETAG, ETAH, ETAI/ETAJ/ETAK, ETAL, ETAM, ETAN, ETAO, ETAP, ETAQ, ETAR, ETAS/ETAT<sup>3</sup> and ETAU.</li> <li>Waratah Rivulet Pools A, F, J, K, L, M, N, O, P, Q, R, S, T, U, V and W.</li> <li>Pools SR1, SR2 and SP1 on tributaries of the Woronora Reservoir.</li> <li>Woronora River Control Pools WRP1, WRP2, WRP3 and WRP4.</li> </ul>	<ul style="list-style-type: none"> <li>Pool water levels.</li> </ul>	<ul style="list-style-type: none"> <li>Continuous water level sensor and logger (downloaded monthly at all sites).</li> </ul>
		<ul style="list-style-type: none"> <li>Waratah Rivulet Pools B, C, E, G, G1, H and I.</li> </ul>	<ul style="list-style-type: none"> <li>Pool water levels.</li> </ul>	<ul style="list-style-type: none"> <li>Manually monitored daily, until such time that continuous sensors are installed.</li> </ul>
		<ul style="list-style-type: none"> <li>Pools ETAS, ETAT and ETAU on the Eastern Tributary.</li> </ul>	<ul style="list-style-type: none"> <li>Evidence of new cracking within the stream bed or rock bar.</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspections conducted at the completion of each longwall.</li> </ul>
		<ul style="list-style-type: none"> <li>Pools on the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir.</li> </ul>	<ul style="list-style-type: none"> <li>Whether the pools continue to flow over, through and/or below the rock bars (where relevant).</li> <li>Whether surface flow is evident along the length of the pools prior to flowing over/through/below the rock bars or boulder fields.</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspections conducted monthly when longwall extraction is within 450 m of the stream and at the completion of each longwall.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
WMP (Cont.)	Stream Water Quality	<ul style="list-style-type: none"> <li>Eastern Tributary sites ETWQ F, ETWQ J, ETWQ N, ETWQ U, ETWQ W, ETWQ AF, ETWQ AH, ETWQ AQ and ETWQ AU.</li> <li>Waratah Rivulet sites WRWQ 2, WRWQ 6, WRWQ 8, WRWQ 9, WRWQ M, WRWQ N, WRWQ P, WRWQ R, WRWQ T, WRWQ U, WRWQ V, and WRWQ W.</li> <li>Woronora Reservoir tributaries at sites SR1, SR2 and SP1.</li> <li>Tributary B site RTWQ 1.</li> <li>Tributary D site UTWQ 1.</li> <li>Far Eastern Tributary site FEWQ 1.</li> <li>Honeysuckle Creek site HCWQ 1.</li> <li>Bee Creek site BCWQ1.</li> <li>Woronora River sites WOWQ1 and WOWQ 2.</li> </ul>	<ul style="list-style-type: none"> <li>Water quality parameters as described in the WMP (samples collected for metal analysis to be field filtered).</li> </ul>	<ul style="list-style-type: none"> <li>Monthly.</li> </ul>
		<ul style="list-style-type: none"> <li>Eastern Tributary sites ETWQ F, ETWQ J, ETWQ N, ETWQ AF and ETWQ AQ.</li> <li>Waratah Rivulet sites WRWQ 2, WRWQ 6, WRWQ 8, WRWQ 9, WRWQ M, WRWQ N and WRWQ P.</li> <li>Woronora River control site WOWQ 2.</li> </ul>	<ul style="list-style-type: none"> <li>Unfiltered water quality samples analysed for total iron, total aluminium and total manganese.</li> </ul>	<ul style="list-style-type: none"> <li>Monthly.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
WMP (Cont.)	Stream Water Quality (Cont.)	<ul style="list-style-type: none"> <li>Site ETAU, and at a minimum of three downstream sites (site ETFSL 0, site ETFSL 100, ETFSL 200, site ETFSL 300, site ETFSL 400, site ETFSL 500, site CONFLU1, site WDFS1 and/or site WDFS1+100).</li> <li>Site WARARM5.</li> </ul>	<ul style="list-style-type: none"> <li>Water quality parameters as described in the WMP (samples collected for metal analysis to be field filtered).</li> <li>Unfiltered water quality samples analysed for total iron and total manganese.</li> </ul>	<ul style="list-style-type: none"> <li>Site ETAU, and at a minimum of three downstream sites - weekly (until the site ETWQ AU monitoring results are at Level 1 or Level 2 of the WMP TARP for the quality of water resources reaching the Woronora Reservoir for four consecutive assessment periods.</li> <li>Site ETAU, and at a minimum of three downstream sites - fortnightly (once the site ETWQ AU monitoring results have returned to Level 1 or Level 2 TARP levels for four consecutive assessment periods, unless the TARP level returns to Level 3).</li> <li>Site WARARM5 - at the same frequency described above when the sites downstream of site CONFLU1 can be accessed for sampling (i.e. when the Woronora Reservoir water levels are suitably low).</li> </ul>
	Woronora, Nepean and Cataract Reservoir Water Quality	<ul style="list-style-type: none"> <li>Woronora Reservoir (site DW01).</li> <li>Nepean Reservoir.</li> <li>Cataract Reservoir.</li> </ul>	<ul style="list-style-type: none"> <li>Total iron, total manganese and total aluminium.</li> </ul>	<ul style="list-style-type: none"> <li>As made available by WaterNSW.</li> </ul>
	Shallow Groundwater Levels Near Streams	<ul style="list-style-type: none"> <li>Site ETO1, ETO2, ETO3 and ETO4 (adjacent to Pool ETO).</li> <li>Waratah Rivulet sites WRGW1, WRGW2 and WRGW7.</li> </ul>	<ul style="list-style-type: none"> <li>Groundwater levels.</li> </ul>	<ul style="list-style-type: none"> <li>Data downloaded monthly at all sites.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
WMP (Cont.)	Groundwater Levels/Pressures	<ul style="list-style-type: none"> <li>• Transect sites T1, T2, T3-R, T5 and T6.</li> <li>• Groundwater standpipes TBS02-90 and TBS02-190.</li> <li>• Site 9HGW0 (Longwall 10 Goaf Hole).</li> <li>• Site 9EGW1B.</li> <li>• Site 9FGW1A.</li> <li>• Site 9GGW2B.</li> <li>• Site 9HGW1B.</li> <li>• Site PM02.</li> <li>• Site 9GGW1-80.</li> <li>• Site PM01 (9DGW1B).</li> <li>• Site 9EGW2A and Site 9EGW2-4 (redrill)</li> <li>• Site PM03.</li> <li>• Site PHGW1B.</li> <li>• Site PHGW2A.</li> <li>• Site F6GW3A.</li> <li>• Site F6GW4A.</li> <li>• Site TBS02-250R.</li> </ul>	<ul style="list-style-type: none"> <li>• Groundwater levels.</li> </ul>	<ul style="list-style-type: none"> <li>• Data downloaded/reading monthly.</li> <li>• Analysis at the frequency described in the WMP.</li> </ul>
	Groundwater Quality	<ul style="list-style-type: none"> <li>• Waratah Rivulet sites WRGW1, WRGW2 and WRGW7.</li> </ul>	<ul style="list-style-type: none"> <li>• Water quality parameters as described in the WMP.</li> </ul>	<ul style="list-style-type: none"> <li>• Monthly.</li> </ul>
	Mine Water Make	<ul style="list-style-type: none"> <li>• Underground.</li> </ul>	<ul style="list-style-type: none"> <li>• Groundwater inflow to the mine (20-day average).</li> </ul>	<ul style="list-style-type: none"> <li>• Mine water balance inputs (as described in the WMP).</li> <li>• Weekly statutory inspections.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
LMP	Cliffs and overhangs	<ul style="list-style-type: none"> <li>Cliff sites COH09, COH10, COH11, COH12, COH13, COH16.</li> </ul>	<ul style="list-style-type: none"> <li>Cliff instabilities – length of cliff/overhang that experiences mining-induced rock fall (i.e. the exposure of a fresh face of rock and debris scattered around the base of the cliff or overhang), compared against the land subsidence impact performance indicator and subsidence impact performance measure.</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspection prior to Longwall 308 extraction.</li> <li>Monthly when longwall extraction is within 450 m of each site.</li> <li>Following the completion of each longwall.</li> </ul>
	Steep slopes and land in general	<ul style="list-style-type: none"> <li>Steep slopes and other land within 600 m of Longwalls 20-27 and Longwalls 301-310 secondary extraction.</li> </ul>	<ul style="list-style-type: none"> <li>Sandstone fracturing and rock falls (nature and extent of surface tension cracks and rock ledge collapse, compared against the land subsidence impact performance indicator).</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspections as part of routine works conducted in the catchment.</li> </ul>
BMP	Upland Swamps – Vegetation	<ul style="list-style-type: none"> <li>Swamps 16, 17, 18, 19, 20, 24, 25, 28, 30, 31, 32, 33, 34, 35, 36 and 94 (overlying or adjacent to Longwalls 20-27).</li> <li>Swamps 40, 41, 46, 47, 48, 49, 50, 51/52, 53 and 58 (overlying or adjacent to Longwalls 301-304).</li> <li>Swamps 69, 70, 71a, 71b, 72 and 73 (overlying or adjacent to Longwalls 305-307)</li> <li>Swamps 61, 62, 63, 64, 78, 79, 80, 81, 82, 83, 88, 89, 90 and 92 within the Longwalls 308-3210 35° angle of draw and/or predicted 20 mm subsidence contour.</li> <li>Control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Woronora River 1, Woronora River south arm and Dahlia Swamp.</li> </ul>	<ul style="list-style-type: none"> <li>Cracking of exposed bedrock areas and/or swamp substrate.</li> <li>Areas of increased erosion, particularly along any existing drainage line.</li> <li>Any changes in water colour, particularly evidence of iron precipitation.</li> <li>Changes in vegetation condition, including areas of stressed vegetation (i.e. plants that demonstrate symptoms of stress) and dead/dying plants that appear unusual.</li> <li>Whether the amount of seepage (at the terminal step/over exposed surfaces of the swamp) at the time of inspection appears unusual (relative to recent rainfall).</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspections bi-annually in spring and autumn for swamps overlying or adjacent to Longwalls 301-310.</li> <li>Every second year, in autumn and spring for swamps overlying or adjacent to Longwalls 20-27.</li> </ul>



**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP (Cont.)	Upland Swamps – Vegetation (Cont.)	<ul style="list-style-type: none"> <li>Swamps 28, 30, 33, 35 and 94 (Longwalls 23-27).</li> <li>Swamps 40, 41, 46, 48, 50 51/52 and 53 (Longwalls 301-304).</li> <li>Swamp 71a (Longwalls 305-307).</li> <li>Swamps 62, 64, 78, 79, 80, 81, 82, 83, 89, 90 and 92 within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwalls 308-310.</li> <li>Control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Woronora River 1, Woronora River south arm and Dahlia Swamp.</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation structure.</li> <li>Dominant species.</li> <li>Estimated cover and height for each stratum.</li> <li>Full floristics.</li> <li>Estimated cover abundance for each species using seven point Braun-Blanquet scale.</li> <li>Condition/health rating for each species in the quadrat.</li> </ul>	<ul style="list-style-type: none"> <li>Transect and quadrat monitoring bi-annually in spring and autumn for swamps overlying or adjacent to Longwalls 301-310.</li> <li>Every second year, in autumn and spring for swamps overlying or adjacent to Longwalls 20-27.</li> </ul>
		<ul style="list-style-type: none"> <li>Twenty tagged individuals (<i>Epacris obtusifolia</i>) in each of Swamps 18 and 24 (Longwalls 20-22) and Control Swamps 101, 111a and 125.</li> <li>Twenty tagged individuals (<i>Epacris obtusifolia</i>) in each of Swamps 35 and 94 (Longwalls 23-27) and Control Swamps 137a, 137b and 138.</li> <li>Twenty tagged individuals (<i>Epacris obtusifolia</i>) in each of Swamps 40 and 53 (Longwalls 301-304) and Control Swamps 101, 136 and 137a.</li> <li>Twenty tagged individuals (<i>Pultenaea aristata</i>) in each of Swamps 19, 30, 33, 35 and 94 (Longwalls 23-27) and Control Swamps 135, 136, 137a and 138.</li> <li>Twenty tagged individuals (<i>Banksia robur</i>, <i>Callistemon citrinus</i> and <i>Leptospermum juniperinum</i>) in each of Swamps 20 (Longwalls 20-22) and Control Swamps Woronora River 1, Woronora River south arm and Dahlia Swamp.</li> <li>Twenty tagged individuals (<i>Callistemon citrinus</i>) in each of Swamps 28 (Longwalls 23-27) and Control Swamps Woronora River 1, Woronora River south arm and Dahlia Swamp.</li> </ul>	<ul style="list-style-type: none"> <li>Population monitoring data including condition/health rating for each plant and reproductive rating</li> </ul>	<ul style="list-style-type: none"> <li>Indicator species monitoring bi-annually in spring and autumn for swamps overlying or adjacent to Longwalls 301-310.</li> <li>Every second year, in autumn and spring for swamps overlying or adjacent to Longwalls 20-27.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP (Cont.)	Upland Swamps - Groundwater	<p>Includes paired piezometers (i.e. one swamp substrate piezometer to a depth of approximately 1 m and one sandstone piezometer to a depth of approximately 10 m).</p> <ul style="list-style-type: none"> <li>Swamps 20 and 25 (Longwalls 20-22).</li> <li>Swamps 28, 30, 33 and 35 (Longwalls 23-27).</li> <li>Swamps 40, 41, 46, 51, 52 and 53 (Longwalls 301-303).</li> <li>Swamp 50 (Longwall 304).</li> <li>Swamps 71a and 72 (Longwalls 305-307).</li> <li>Swamps 62 and 64 (Longwalls 308-310)</li> <li>Control Swamps 101, 137a, 137b, Bee Creek Swamp and Woronora River 1.</li> </ul>	<ul style="list-style-type: none"> <li>Groundwater levels.</li> </ul>	<ul style="list-style-type: none"> <li>Datalogger (continuous).</li> </ul>
	Riparian Vegetation	<ul style="list-style-type: none"> <li>Sites MRIP01 to MRIP12.</li> </ul>	<ul style="list-style-type: none"> <li>Areas of new water ponding.</li> <li>Any cracking or rock displacement.</li> <li>Changes in vegetation condition, including areas of stressed vegetation that appear unusual.</li> </ul>	<ul style="list-style-type: none"> <li>Visual inspections bi-annually in spring and autumn.</li> </ul>
		<ul style="list-style-type: none"> <li>Sites MRIP01 to MRIP08, MRIP11 and MRIP12.</li> </ul>	<ul style="list-style-type: none"> <li>Vegetation structure.</li> <li>Dominant species.</li> <li>Estimated cover and height for each stratum.</li> <li>Full floristics.</li> <li>Estimated cover abundance for each species using seven point Braun-Blanquet scale.</li> <li>Condition/health rating for each species in the quadrat.</li> </ul>	<ul style="list-style-type: none"> <li>Permanent quadrat (20 m x 2 m) monitoring bi-annually in spring and autumn.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP (Cont.)	Riparian Vegetation (cont.)	<ul style="list-style-type: none"> <li>Existing tagged individuals (<i>Prostanthera linearis</i>, <i>Schoenus melanostachys</i> and <i>Lomatia myricoides</i>) at sites MRIP01, MRIP03, MRIP05, MRIP06, MRIP07, MRIP08, MRIP09, MRIP10, MRIP11, MRIP12.</li> <li>Existing tagged individuals (<i>Lomatia myricoides</i>) at site MRIP02.</li> <li>Existing tagged individuals (<i>Schoenus melanostachys</i> and <i>Lomatia myricoides</i>) at site MRIP04.</li> </ul>	<ul style="list-style-type: none"> <li>Population monitoring data including condition/health rating for each plant and reproductive rating.</li> </ul>	<ul style="list-style-type: none"> <li>Indicator species monitoring bi-annually in spring and autumn.</li> </ul>
	Aquatic Biota and their Habitats	<ul style="list-style-type: none"> <li>Surface water resources and watercourses in accordance with the WMP.</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring of aquatic habitats in accordance with the WMP.</li> </ul>	<ul style="list-style-type: none"> <li>In accordance with the WMP.</li> </ul>
		<ul style="list-style-type: none"> <li>Stream monitoring at following Locations (if sufficient aquatic habitat is available for sampling); <ul style="list-style-type: none"> <li>WT3, WT4, WT5, ET1, ET2, ET3 and ET4.</li> <li>Control Locations: WR1 and OC.</li> </ul> </li> <li>Larger pools ETAG on the Eastern Tributary and control Pool WP on the Woronora River and Pool OC on O'Hares Creek.</li> <li>Smaller pools ETAG, ETAI and ETAK on the Eastern Tributary and control Pools WP-A, WP-B and WP-C on the Woronora River and Pools OC-A, OC-B and OC-C on O'Hares Creek.</li> </ul>	<ul style="list-style-type: none"> <li>Impacts on aquatic ecology: <ul style="list-style-type: none"> <li>Habitat Characteristics.</li> <li>Water Quality.</li> <li>Aquatic Macroinvertebrates.</li> <li>Aquatic Macrophytes.</li> </ul> </li> <li>The response of aquatic ecosystems to the implementation of stream remediation works: <ul style="list-style-type: none"> <li>Habitat Characteristics.</li> <li>Water Quality.</li> <li>Aquatic Macroinvertebrates.</li> <li>Aquatic Macrophytes.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Biannually in spring (15 September to 15 December) and autumn (15 March to 15 June).</li> <li>Monitoring of Pools ETAG and ETAG will recommence subsequent to the conduct of stream remediation activities at Pool ETAG and will be conducted bi-annually in spring (15 September to 15 December) and autumn (15 March to 15 June).</li> <li>Monitoring of Pools ETAI and ETAK will recommence subsequent to the conduct of stream remediation activities at Pool ETAK and will be conducted bi-annually in spring (15 September to 15 December) and autumn (15 March to 15 June).</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

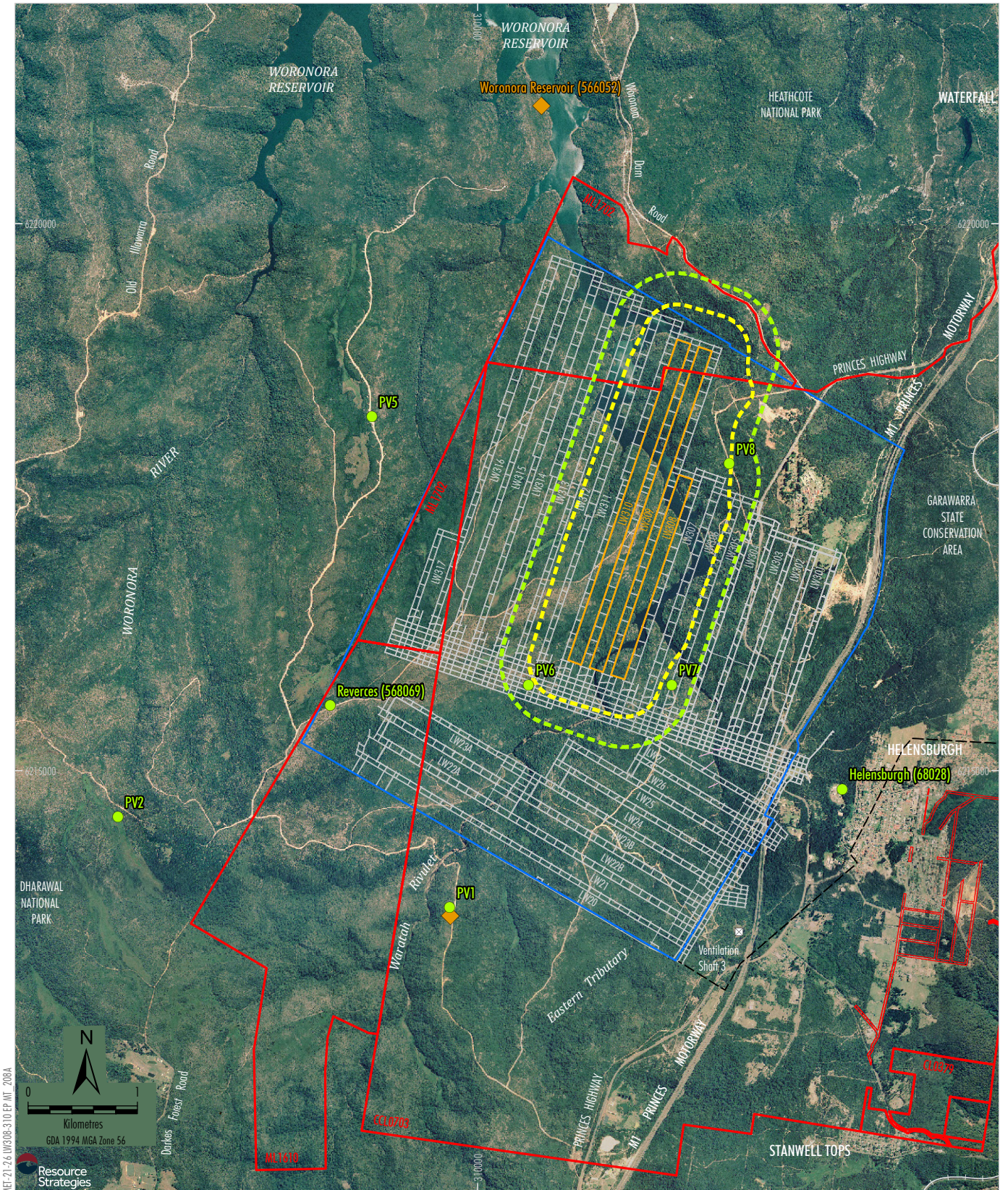
Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP (Cont.)	Amphibian Monitoring	<ul style="list-style-type: none"> <li>Sites 23-28 (Longwalls 301-303).</li> <li>Sites 29 and 30 (Longwalls 305-307).</li> <li>Sites 32 and 39 (Longwalls 308-310).</li> <li>Control Sites 7, 8, 9, 10, 11, 12, 18, 19, 20, 21 and 22.</li> </ul>	Species assigned to relative abundance categories for tadpole and adult stages.	<ul style="list-style-type: none"> <li>Survey annually in spring/summer (i.e. October to February) during suitable weather conditions.</li> </ul>
HMP	Aboriginal Heritage	<ul style="list-style-type: none"> <li>All sites within the Longwall 308 35° angle of draw and/or predicted 20 mm subsidence contour, namely Sites FRC 67, FRC 68, FRC 70, FRC 71, FRC 87, FRC 93, FRC 94, FRC 97, FRC 101, FRC 180, FRC 184, FRC 185, FRC 186, FRC 187, FRC 189, FRC 191, FRC 194, FRC 195, FRC 198, FRC 199, FRC 254, FRC 310, FRC 311, FRC 313, FRC 316, FRC 323, FRC 324, FRC 340, FRC 344, FRC 345.</li> </ul>	<ul style="list-style-type: none"> <li>Inspections of rock surfaces for cracking and/or exfoliation and/or blockfall.</li> <li>Inspection of art motifs for damage or deterioration.</li> <li>Identification of any natural weathering processes that may result in deterioration (e.g. fire, vegetation growth and water seepage).</li> <li>Comparison of the physical characteristics of the site at the time of monitoring against the previous monitoring and the baseline record.</li> </ul>	<ul style="list-style-type: none"> <li>Within three months following the completion of Longwall 308.</li> </ul>
		<ul style="list-style-type: none"> <li>All sites within the Longwalls 308 35° angle of draw and/or predicted 20 mm subsidence contour above, in addition to all sites within the Longwall 309 35° angle of draw and/or predicted 20 mm subsidence contour, namely Sites FRC 164, FRC 312, FRC 314, FRC 315, FRC 317, FRC 95, NEW 1, NEW 2, NEW 10, NEW 22, NT 33, NT 34, NT 35.</li> </ul>		<ul style="list-style-type: none"> <li>Within three months following the completion of Longwall 309.</li> </ul>
		<ul style="list-style-type: none"> <li>All sites within the Longwalls 308-309 35° angle of draw and/or predicted 20 mm subsidence contour above, in addition to all remaining sites within the Longwalls 308-310 35° angle of draw and/or predicted 20 mm subsidence contour, namely Sites FRC 62, NT 11, NT 78, NT 79.</li> </ul>		<ul style="list-style-type: none"> <li>Within three months following the completion of Longwall 310.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-TfNSW	M1 Princes Motorway - Pavement	Visual inspection for impacts on: <ul style="list-style-type: none"> <li>Asphaltic concrete surface.</li> <li>Kerbs, gutters and pits.</li> <li>Signs or other road infrastructure.</li> </ul>	To identify changes post Longwall 307 if identified as required by the TfNSW Technical Committee: <ul style="list-style-type: none"> <li>Asphaltic concrete surface including cracks, buckling and stepping.</li> <li>Kerbs and gutters including cracking, buckling and joint movement.</li> </ul>	<ul style="list-style-type: none"> <li>If determined in consultation with the TfNSW Technical Committee</li> <li>Network Safety Inspection twice weekly during longwall extraction.</li> </ul>
	M1 Princes Motorway - Cuttings	Visual inspection for impacts on: <ul style="list-style-type: none"> <li>Cuttings along the M1 Princes Motorway as described in the BFMP-TfNSW.</li> </ul>	To identify: <ul style="list-style-type: none"> <li>Changes in cutting condition, including opening of cracks, spalling.</li> <li>Changes in groundwater seepage or surface water flows.</li> <li>Rockfalls.</li> <li>Changes in TfNSW risk ranking.</li> </ul>	<ul style="list-style-type: none"> <li>If determined in consultation with the TfNSW Technical Committee</li> <li>Network Safety Inspection twice weekly during longwall extraction.</li> </ul>
	M1 Princes Motorway - Culverts	<ul style="list-style-type: none"> <li>Closed circuit television (CCTV) inspection for impacts on internal surfaces.</li> </ul>	<ul style="list-style-type: none"> <li>To identify changes to the visible surfaces of the culverts including cracking, buckling, shearing, and collapse.</li> </ul>	<ul style="list-style-type: none"> <li>Following the completion of Longwall 310</li> <li>Greater frequency if determined in consultation with the TfNSW Technical Committee</li> </ul>
	Bridge 2 (Old Princes Highway Underpass)	Visual inspection for impacts on: <ul style="list-style-type: none"> <li>Abutments.</li> <li>Pier frames.</li> <li>Elastomeric bearings.</li> <li>Soffits of girders.</li> <li>Deck expansion joints.</li> <li>Steel traffic barrier joints.</li> <li>Other areas of substructure and adjoining areas including concrete paths, stairs, and slope protection.</li> </ul>	To identify changes post Longwall 307 if identified as required by the TfNSW Technical Committee: <ul style="list-style-type: none"> <li>Surface cracks.</li> <li>Closing or opening of joints.</li> <li>Distortion or damage to elastomeric bearings.</li> </ul>	<ul style="list-style-type: none"> <li>If GNSS #3 records absolute movement greater than 50 mm, or</li> <li>If determined in consultation with the TfNSW Technical Committee.</li> </ul>

**Table 17 (Continued)**  
**Longwalls 308-310 Environmental Monitoring Program Summary**

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-TfNSW (Cont.)	Cawley Road Overbridge	Visual inspection for impacts on: <ul style="list-style-type: none"> <li>• Abutments.</li> <li>• Pier blade wall.</li> <li>• Tetron bearings.</li> <li>• Deck expansion joints.</li> <li>• Steel traffic barrier and safety screen joints.</li> </ul>	To identify changes post Longwall 307 if identified as required by the TfNSW Technical Committee: <ul style="list-style-type: none"> <li>• Surface cracks.</li> <li>• Closing or opening of joints.</li> <li>• Distortion or damage to Tetron bearings.</li> </ul>	<ul style="list-style-type: none"> <li>• If GNSS #9 records absolute movement greater than 30mm, or</li> <li>• If determined in consultation with the TfNSW Technical Committee.</li> </ul>
BFMP-WCC	Old Princes Highway - Pavement	From the Old Princes Highway Underpass (Bridge 2) to the entrance to the Garrawarra Centre Complex.	<ul style="list-style-type: none"> <li>• Impacts to the surface including cracks, buckling and stepping.</li> </ul>	<ul style="list-style-type: none"> <li>• Following completion of Longwall 308.</li> </ul>
	Old Princes Highway – Drainage Structures (Pipe/Culverts) and Other Furniture	Drainage structures from the Old Princes Highway Underpass (Bridge 2) to the entrance to the Garrawarra Centre Complex..	<ul style="list-style-type: none"> <li>• Impacts to the visible surfaces of pipes/culverts including cracking, buckling, shearing, and collapse.</li> <li>• Visible impacts to furniture.</li> </ul>	<ul style="list-style-type: none"> <li>• Within 3 months following the completion of extraction of Longwall 308.</li> </ul>
BFMP-Sydney Water	Water pipelines	<ul style="list-style-type: none"> <li>• Water Main 1</li> <li>• Water Main 2</li> <li>• Water Main 3</li> </ul>	<ul style="list-style-type: none"> <li>• Surface ground cracks.</li> <li>• Cracks or leaks in the pipelines.</li> </ul>	<ul style="list-style-type: none"> <li>• Routinely as per Sydney Water inspections.</li> <li>• Weekly for Watermain 1, 2 and 3 within the bounds of the study area on commencement of mining Longwalls 309 and 310 for first 400 m of extraction and then until subsidence no longer detectable.</li> <li>• Following the completion of each Longwall.</li> </ul>



MEF-21-26 LW308-310 EP MT 2024

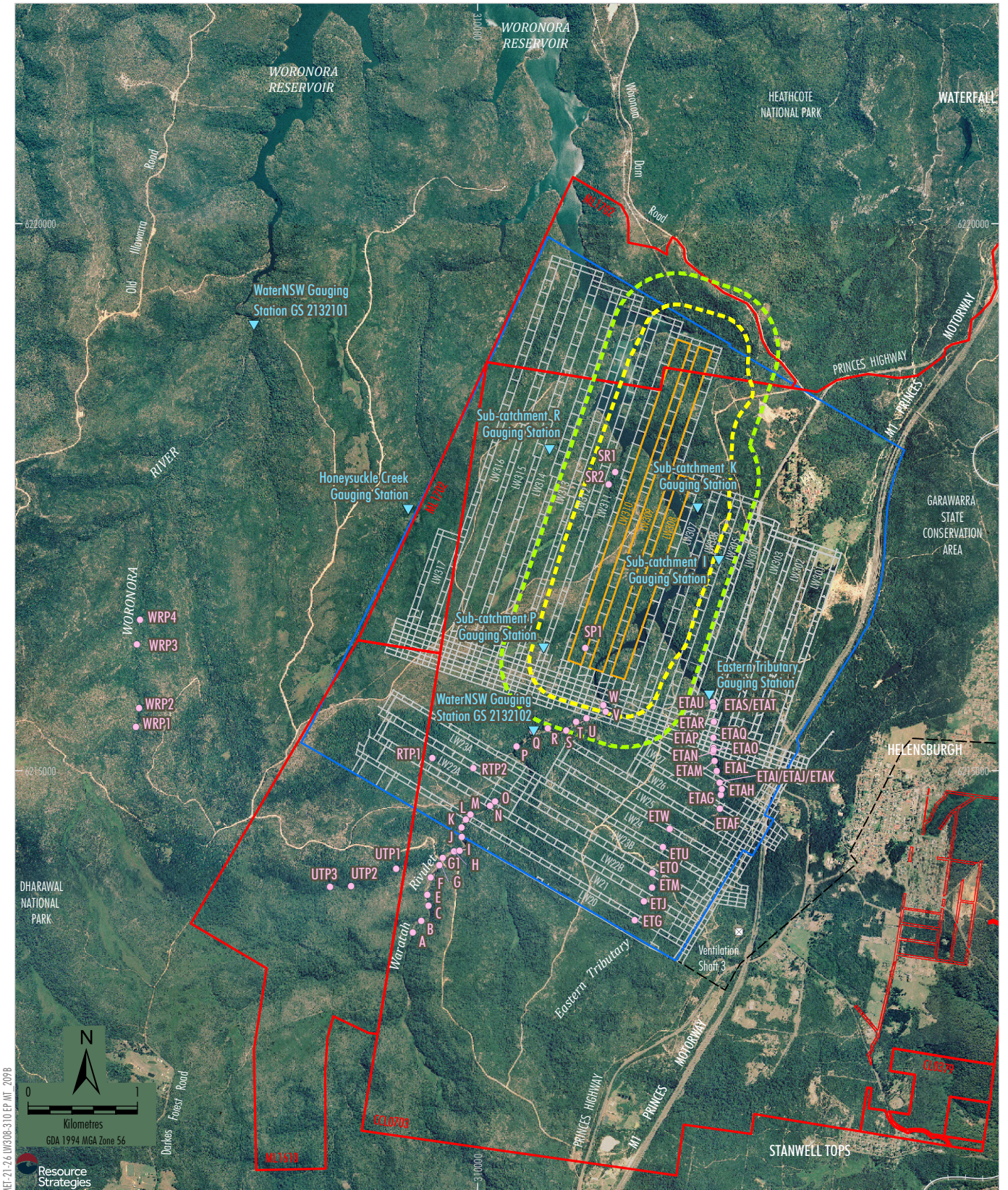
- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Longwalls 308-310 Secondary Extraction
  - Longwalls 308-310 35° Angle of Draw and/or  
Predicted 20 mm Subsidence Contour
  - 600 m from Longwalls 308-310  
Secondary Extraction
  - Existing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

- Notes:**
1. The Bureau of Meteorology pluviometer at Darkes Forest (68024) is not shown. It is located approximately 3.75 km south of the Metropolitan Coal pluviometer (PV2).
  2. The Bureau of Meteorology pluviometer at Lucas Heights (66078) is not shown. It is located approximately 12.5 km north of the Metropolitan Coal pluviometer (PV8).

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

**Peabody**  
METROPOLITAN COAL  
Meteorological Sites

**Figure 13**



MET-21-26 LW308-310 EP INT 2098

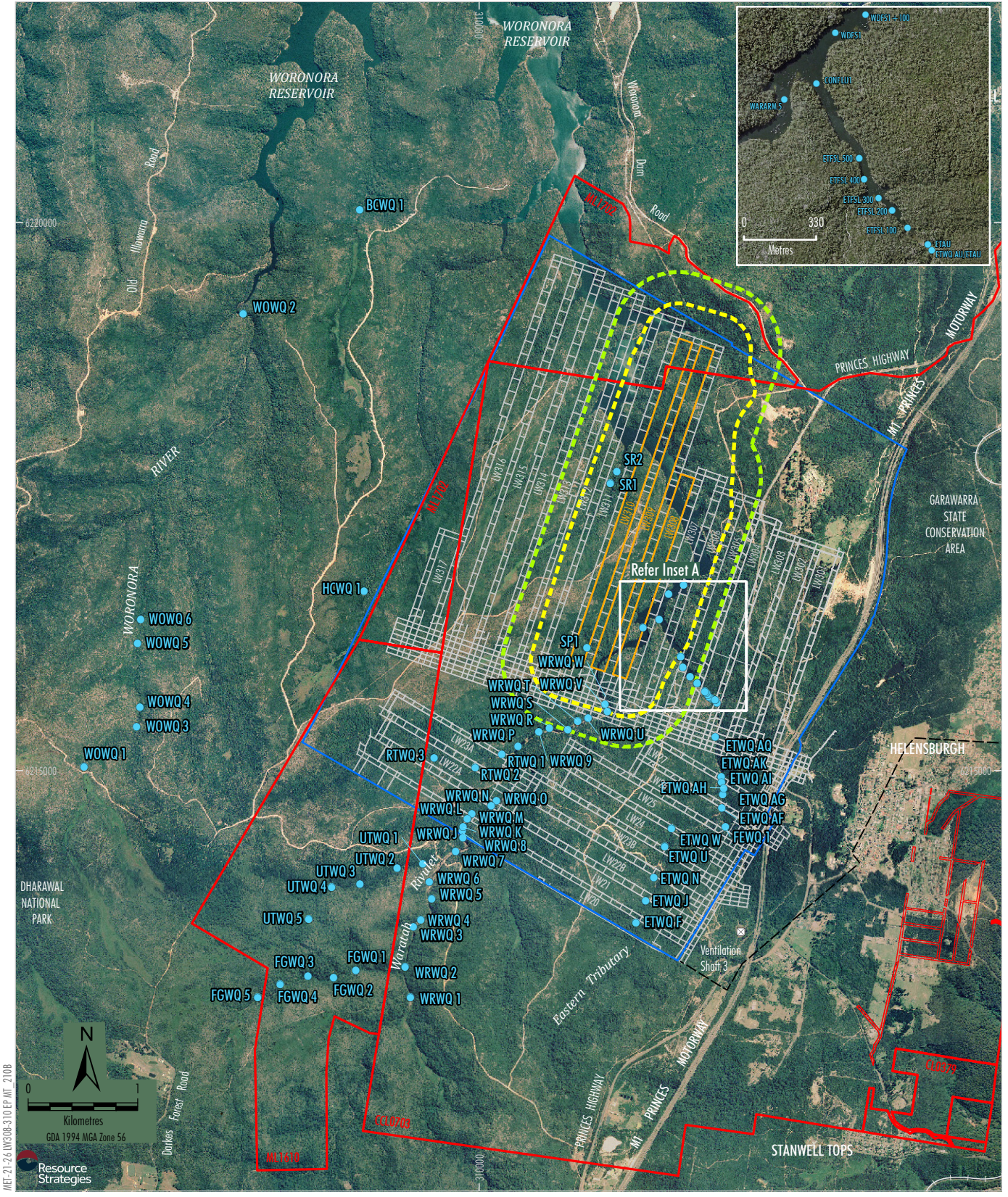
- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Longwalls 308-310 Secondary Extraction
  - Longwalls 308-310 35° Angle of Draw and/or  
Predicted 20 mm Subsidence Contour
  - 600 m from Longwalls 308-310  
Secondary Extraction
  - Existing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

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

**Peabody**  
METROPOLITAN COAL  
Surface Water Quantity Sites

**Figure 14**



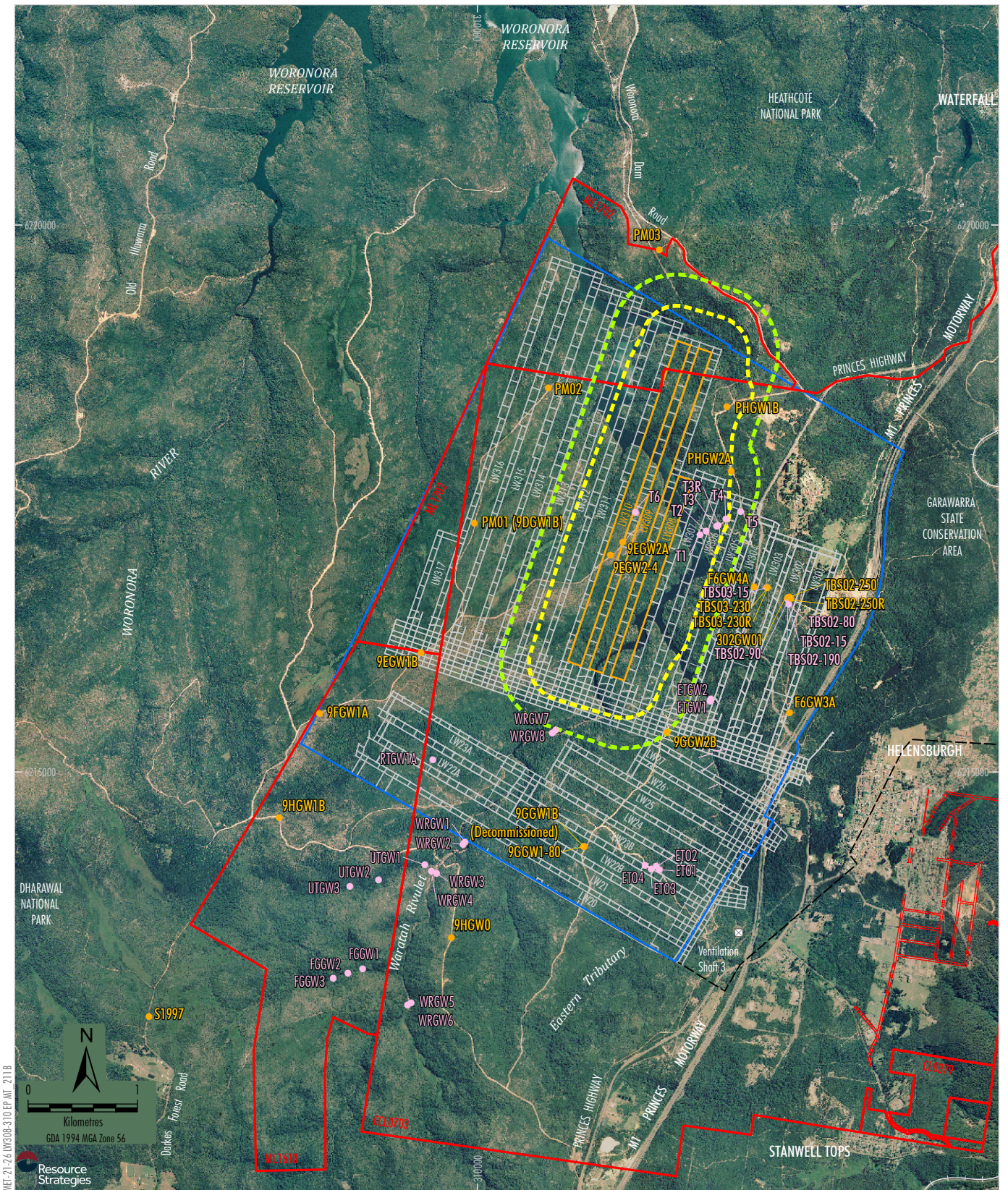


- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Longwalls 308-310 Secondary Extraction
  - Longwalls 308-310 35° Angle of Draw and/or  
Predicted 20 mm Subsidence Contour
  - 600 m from Longwalls 308-310  
Secondary Extraction
  - Existing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

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

**Peabody**  
METROPOLITAN COAL  
Surface Water Quality Sites

**Figure 15**

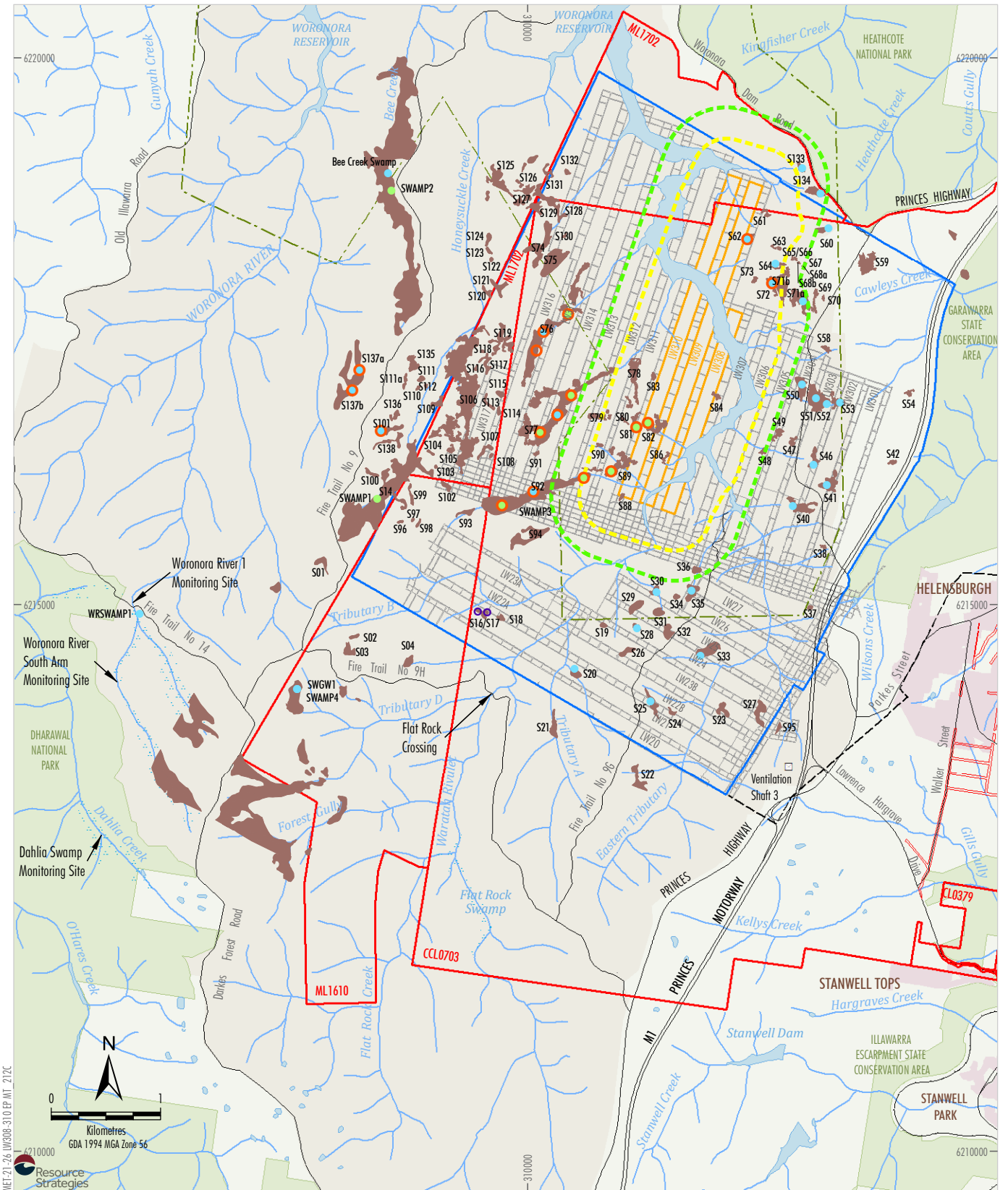


- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Longwalls 308-310 Secondary Extraction
  - Longwalls 308-310 35° Angle of Draw and/or  
Predicted 20 mm Subsidence Contour
  - 600 m from Longwalls 308-310  
Secondary Extraction
  - Existing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

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

**Peabody**  
METROPOLITAN COAL  
Groundwater Level  
and/or Pressure Bore Locations

**Figure 16**



AKET 21-26 LW308-310 RP.MT. 21ZC  
 4210000  
 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
  - Existing Underground Access Drive (Main Drift)
  - Woronora Notification Area

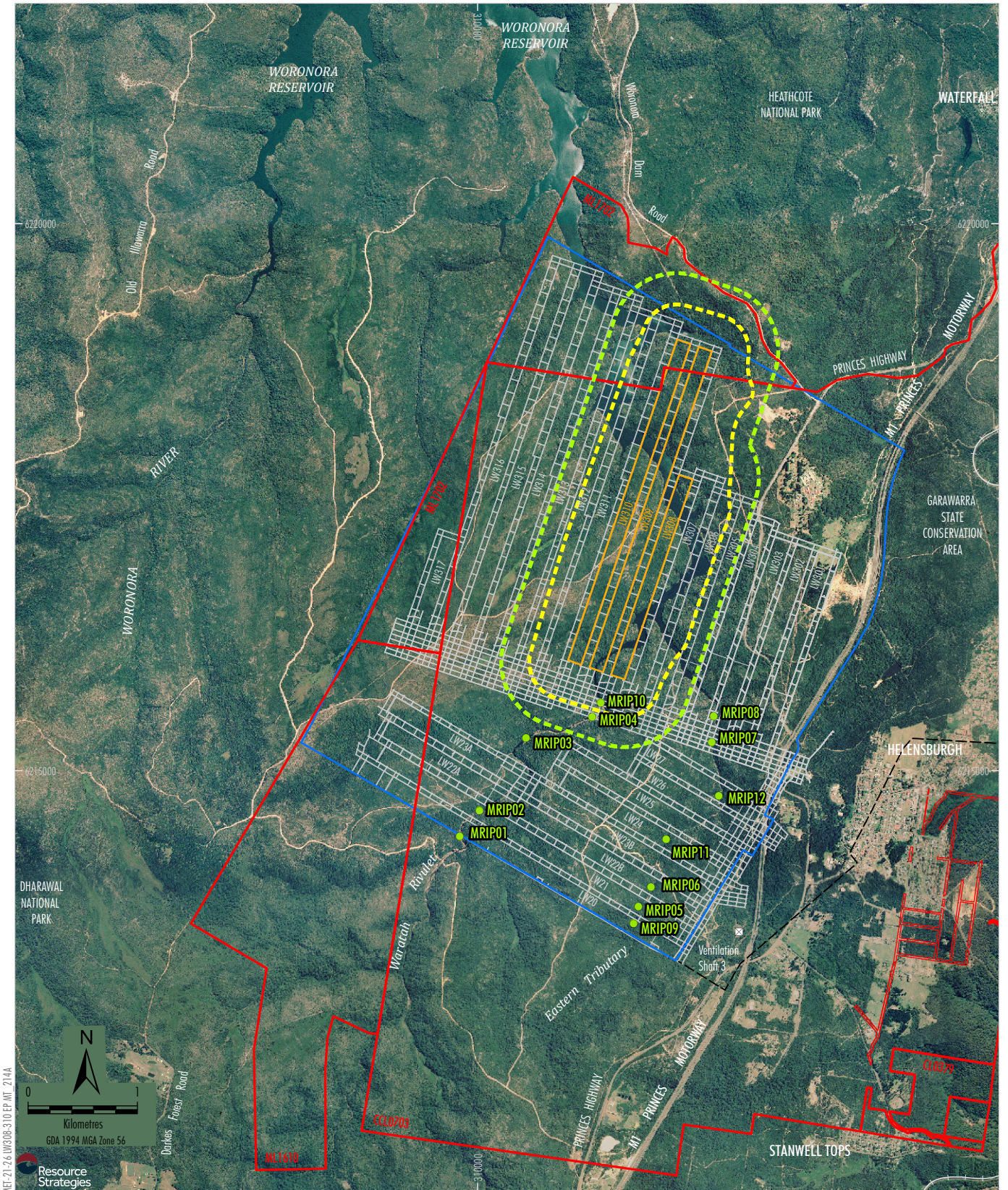
- Upland Swamp
- Swamp Substrate and Shallow Groundwater Piezometer
- Swamp Substrate Groundwater Piezometer
- Swamp Shallow Groundwater Piezometer
- Swamp Soil Moisture Probe

Source: Land and Property Information (2015); Department of Industry (2015);  
 Metropolitan Coal (2021); MSEC (2021); after NPWS (2003), Bangalay  
 Botanical Surveys (2008); Eco Logical Australia (2015; 2016; 2018)

**Peabody**  
 METROPOLITAN COAL  
 Upland Swamps Groundwater  
 Piezometer Locations

**Figure 17**





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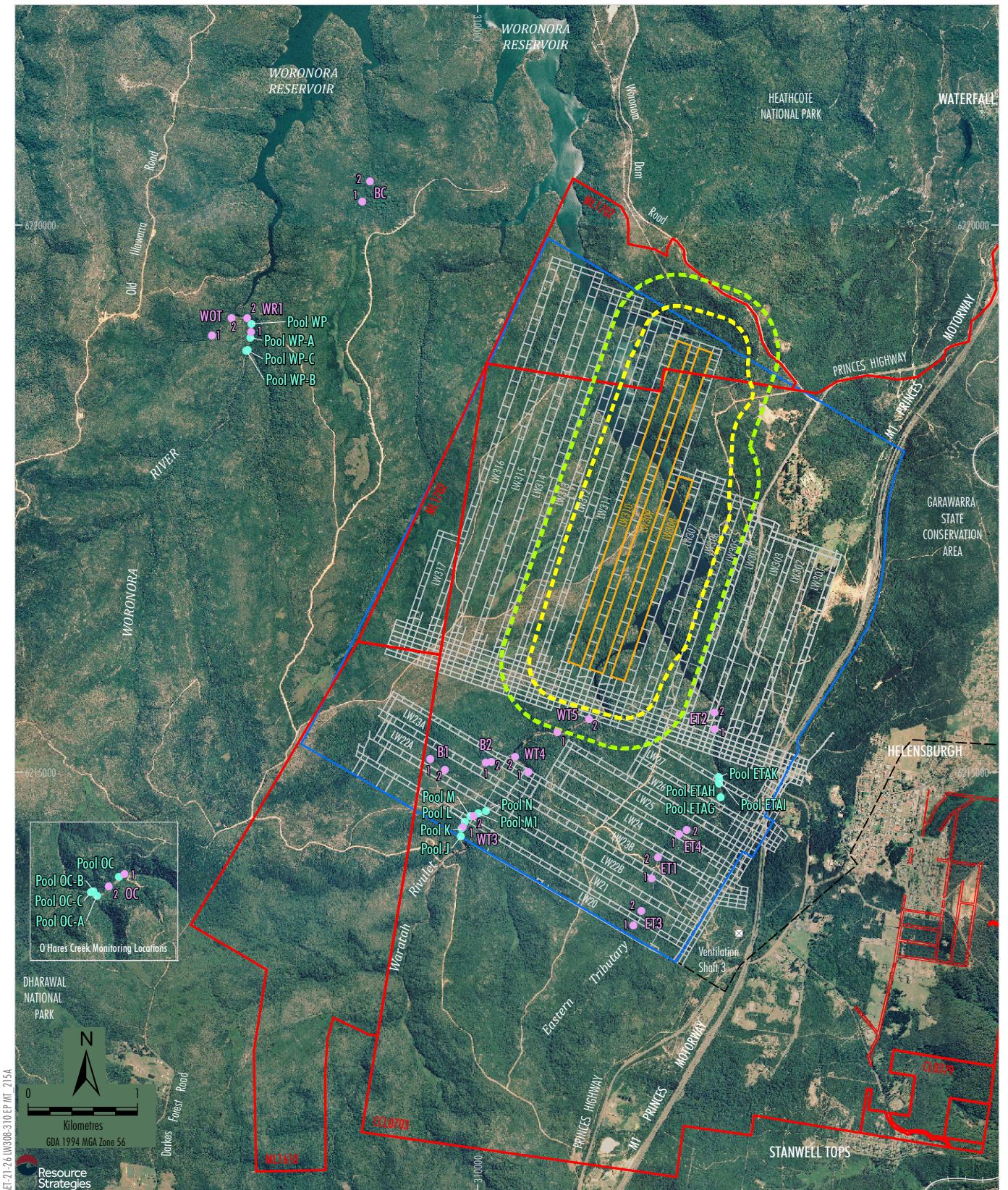
- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Longwalls 308-310 Secondary Extraction
  - Longwalls 308-310 35° Angle of Draw and/or  
Predicted 20 mm Subsidence Contour
  - 600 m from Longwalls 308-310  
Secondary Extraction
  - Existing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

- Monitoring Site**
- Riparian Vegetation Monitoring Site

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

**Peabody**  
METROPOLITAN COAL  
Riparian Vegetation Monitoring Locations

**Figure 19**



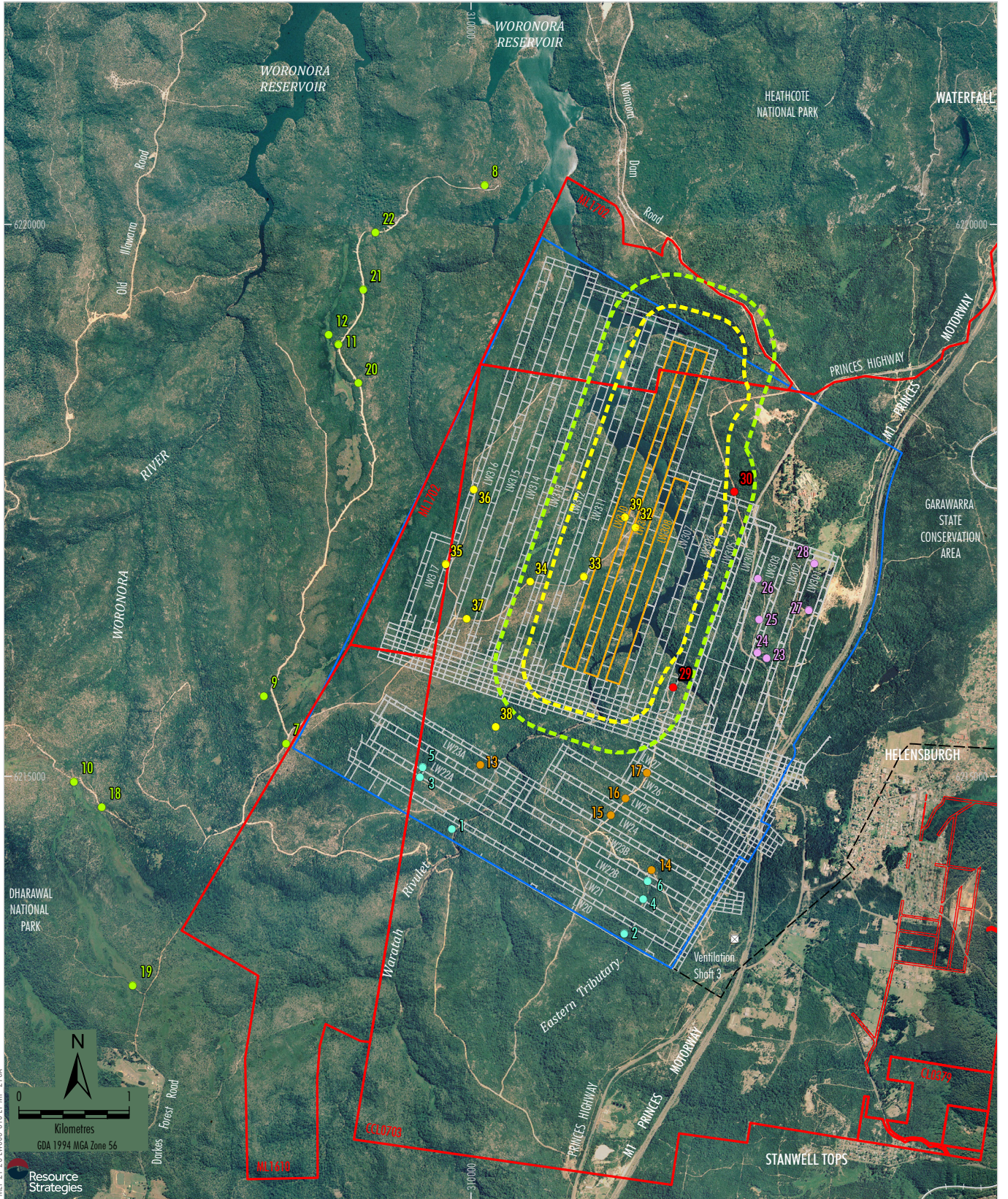
- LEGEND**
- Mining Lease Boundary
  - Railway
  - Project Underground Mining Area  
Longwalls 20-27 and 301-317
  - Longwalls 308-310 Secondary Extraction
  - Longwalls 308-310 35° Angle of Draw and/or  
Predicted 20 mm Subsidence Contour
  - 600 m from Longwalls 308-310  
Secondary Extraction
  - Existing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

- Monitoring**
- Pool Aquatic Ecology Sampling Site
  - Stream Aquatic Ecology Sampling Site

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

**Peabody**  
METROPOLITAN COAL  
Aquatic Ecology Sampling Locations

**Figure 20**



Resource Strategies

Scale: 0 to 1 Kilometres  
GDA 1994 MGA Zone 56

North Arrow

- LEGEND**
- Mining Lease Boundary
  - 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
  - Existing Underground Access Drive (Main Drift)

- Monitoring Sites**
- Longwalls 20-22 Amphibian Monitoring
  - Longwalls 23-27 Amphibian Monitoring
  - Longwalls 301-303 Amphibian Monitoring
  - Longwalls 305-307 Amphibian Monitoring
  - Longwalls 308-317 Amphibian Monitoring
  - Control Site

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

**Peabody**  
METROPOLITAN COAL  
Amphibian Monitoring Locations

**Figure 21**

## 4 IMPLEMENTATION

### 4.1 CONTINGENCY RESPONSE

In the event a subsidence impact performance measure described in Sections 3.1 to 3.6 has been exceeded as a result of Longwalls 308-310 extraction, Metropolitan Coal will implement the relevant Contingency Plan detailed in the WMP (Appendix A), LMP (Appendix B), BMP (Appendix C), HMP (Appendix D), BFMP (Appendix E) or the PSMP (Appendix F). In general, the Contingency Plans include the following:

- The likely exceedance will be reported to the Technical Services Manager and/or the Environment & Community Superintendent within 24 hours.
- The Technical Services Manager or the Environment & Community Superintendent will report the likely exceedance to the General Manager as soon as practicable after becoming aware of the exceedance.
- Metropolitan Coal will report the exceedance to the DPE, relevant agencies and relevant stakeholders as soon as practicable after Metropolitan Coal becomes aware of the exceedance.
- Metropolitan Coal will conduct an investigation to evaluate the potential contributing factors.
- Metropolitan Coal will identify an appropriate course of action with respect to the identified impact(s), in consultation with specialists, relevant agencies and relevant stakeholders as necessary. For example:
  - proposed management and/or mitigation measures (Section 3);
  - a program to review the effectiveness of the management and/or mitigation measures; and
  - consideration of offsets or adaptive management.

Contingency measures will be developed in consideration of the specific circumstances of the exceedance and the assessment of environmental consequences.

- Metropolitan Coal will submit the proposed course of action to the DPE for approval.
- Metropolitan Coal will implement the approved course of action to the satisfaction of the DPE.

In accordance with Condition 6, Schedule 6 of the Project Approval, Metropolitan Coal will provide a suitable offset to compensate for the impact to the satisfaction of the Secretary of the DPE if either the contingency measures implemented by Metropolitan Coal have failed to remediate the impact or the Secretary of the DPE determines that it is not reasonable or feasible to remediate the impact.

Relevant management and contingency measures are summarised in Section 3 and outlined in the component management plans (Appendices A to F).

Responsibilities during contingency response are outlined in Section 4.6, which is designed to clearly outline actions, levels of responsibility within Metropolitan Coal and reporting requirements where monitoring results indicate that impacts are exceeding (or likely to exceed) predicted or approved limits. Table 19 is designed to support the TARPs provided in the component management plans (Appendices A to F).

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## 4.2 ADAPTIVE MANAGEMENT

Metropolitan Coal will implement an adaptive management approach for the Project. Adaptive management will involve:

- Planning – developing management strategies to meet performance measures; identifying performance indicators to assess performance; and establishing monitoring programs to monitor against the performance measures.
- Implementation – implementing management strategies and monitoring impacts against performance indicators.
- Review – reviewing and evaluating the effectiveness of management strategies by analysis of monitoring data against predicted impacts, performance indicators and performance measures in accordance with the schematic presented in Figure 12.
- Contingency Response – implementing contingency plans where an exceedance of a subsidence impact performance measure or an unexpected impact is detected (Section 4.1).
- Adjustment – adjusting management strategies to improve performance.

## 4.3 REPORTING FRAMEWORK

Metropolitan Coal has developed a reporting framework for the Extraction Plan based on the nature of the predicted subsidence impacts and consequences and streamlining of reporting requirements.

Table 18 provides a summary of the proposed reporting framework, including which stakeholders will receive copies of each report and the distribution method. The subsections below provide further detail on the contents of each reporting mechanism.

### 4.3.1 Incident Report

An incident is defined as a set of circumstances that causes or threatens to cause or threatens to cause material harm to the environment, and/or breaches or exceeds the limits or performance measures/criteria in the Project Approval.

The reporting of incidents will be conducted in accordance with Condition 6, Schedule 7 of the Project Approval. Metropolitan Coal will notify the Secretary of the DPE and any other relevant agencies (Table 18) of any incident associated with the Project as soon as practicable after Metropolitan Coal becomes aware of the incident. Within seven days of the date of the incident, Metropolitan Coal will provide the Secretary of the DPE and relevant agencies with a detailed report on the incident.

An Incident Report will include the following:

- details on the nature of the incident (including survey results, photographs and date of the incident);
- results of investigation(s) to identify/evaluate the contributing factors to the incident;
- proposed course of action and development of contingency measures; and
- relevant Metropolitan Coal contact details to obtain further information on the incident.

**Table 18**  
**Summary of Reporting Framework**

Report	Frequency	Distribution	Distribution Method <sup>1</sup>	Responsibility for Data Collation and Preparation	Responsibility for Submission
Incident Report	As required	DPE (Secretary of the DPE, c/- Executive Director) RR (Manager and Principal Inspector, Environment) Other regulators as specified in management plans	Email	Technical Services Manager or Environment & Community Superintendent	Technical Services Manager, Environment & Community Superintendent or General Manager
Six Monthly Report	Six monthly	DPE (Director, Resource Assessments)	Email and Website	Technical Services Manager or Environment & Community Superintendent	Technical Services Manager or Environment & Community Superintendent
Annual Review	Annually	DPE (Director, Resource Assessments) RR (Manager and Principal Inspector, Environment) Other regulators as specified in management plans Metropolitan Coal website	Email and Website	Technical Services Manager or Environment & Community Superintendent	Technical Services Manager or Environment & Community Superintendent
Complaints Register	Updated following receipt of complaints	Metropolitan Coal website	Website	Environment & Community Superintendent	Environment & Community Superintendent

<sup>1</sup> See Attachment 3 for distribution details.

#### 4.3.2 Six Monthly Reporting

A six monthly report (**Six Monthly Report**) will be prepared to report on subsidence impacts and environmental consequences associated with the Longwalls 308-310 Extraction Plan. The Six Monthly Report will include:

- a comprehensive summary of all subsidence impacts, including a revised characterisation according to the relevant TARP(s);
- any proposed actions resulting from triggers being met in the TARP(s), or other actions;
- assessment of compliance with all relevant subsidence impact performance measures and indicators; and
- a comprehensive summary of all quantitative and qualitative environmental monitoring results, including landscape monitoring, water quality data, water flow and pool level data, piezometer readings, etc.

#### 4.3.3 Annual Review

An Annual Review will be prepared and submitted in accordance with Condition 3, Schedule 7 of the Project Approval. The Annual Review will review the performance of the Project to the satisfaction of the Secretary of the DPE and will:

- describe the works that were carried out in the past calendar year, and the works that are proposed to be carried out over the current calendar year;
- include a comprehensive review of the monitoring results and complaints records of the Project over the past calendar year, which includes a comparison of these results against:
  - the relevant statutory requirements, limits or performance measures/criteria;
  - the monitoring results of previous years; and
  - the relevant predictions in the Project EA, Preferred Project Report and Extraction Plan.
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the Project;
- identify any discrepancies between the predicted and actual impacts of the Project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the Project.

#### 4.3.4 Complaints

The Environment & Community Superintendent is responsible for maintaining a system for recording complaints.

Metropolitan Coal will maintain public signage advertising the telephone number on which environmental complaints can be made. The Environment & Community Superintendent is responsible for ensuring that the currency and effectiveness of the service is maintained. Notifications of complaints received are to be provided as quickly as practicable to the Environment & Community Superintendent.

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Complaints and enquiries do not have to be received via the telephone line and may be received in any other form. Any complaint or enquiry relating to environmental management or performance is to be relayed to the Environment & Community Superintendent as soon as practicable. All employees are responsible for ensuring the prompt relaying of complaints. All complaints will be recorded in a complaints register.

For each complaint, the following information will be recorded in the complaints register:

- date and time of complaint;
- method by which the complaint was made;
- personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect;
- nature of the complaint;
- the action(s) taken by Metropolitan Coal in relation to the complaint, including any follow-up contact with the complainant; and
- if no action was taken by Metropolitan Coal, the reason why no action was taken.

The Environment & Community Superintendent is responsible for ensuring that all complaints are appropriately investigated, actioned and that information is fed back to the complainant, unless requested to the contrary.

In accordance with Condition 10, Schedule 7 of the Project Approval, the complaints register will be made publicly available on the website and updated on a monthly basis. A summary of complaints received and actions taken will be presented to the CCC as part of the operational performance review.

**4.4 REVIEW AND REVISION OF STRATEGIES, PLANS AND PROGRAMS**

In accordance with Condition 4, Schedule 7 of the Project Approval, the strategies, plans and programs required under The Project Approval will be reviewed within three months of the submission of:

- (a) an audit under Condition 8, Schedule 7;
- (b) an incident report under Condition 6, Schedule 7;
- (c) an annual review under Condition 3, Schedule 7; and

if necessary, revised to the satisfaction of the Secretary of the DPE, to ensure the strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve environmental performance.

The strategies, plans and programs will also be reviewed within three months of approval of any Project modification and if necessary, revised to the satisfaction of the DPE. The revision status of the strategies, plans and programs is indicated on the title page of each copy.

**4.5 DISTRIBUTION**

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

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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 the Extraction Plan, 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 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 Extraction Plan 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.

#### 4.6 KEY RESPONSIBILITIES

Key responsibilities under this Extraction Plan are summarised in Table 19. The component management plans provide additional responsibilities under the plans.

**Table 19**  
**Key Extraction Plan Responsibilities**

<b>Responsibility</b>	<b>Task</b>
General Manager	<ul style="list-style-type: none"> <li>• Ensure resources are available to Metropolitan Coal personnel to facilitate the completion of responsibilities under this Extraction Plan.</li> <li>• Ensure the safety of Metropolitan Coal employees and the public in relation to Metropolitan Coal operations.</li> <li>• Approve and instruct implementation of remediation/corrective action/compensation, if necessary.</li> </ul>
Mining Engineering Manager	<ul style="list-style-type: none"> <li>• Ensure the safety of Metropolitan Coal employees and the public in relation to Metropolitan Coal operations.</li> <li>• Ensure adequate resources are available for implementation of remediation/corrective actions.</li> </ul>
Technical Services Manager	<ul style="list-style-type: none"> <li>• Liaise with relevant stakeholders regarding environmental management.</li> <li>• Ensure monitoring and reporting required in accordance with this Extraction Plan are carried out within specified timeframes, are adequately checked and processed and are prepared to the required standard.</li> <li>• Ensure that any Incident Reports are lodged in a timely manner with all available information.</li> <li>• Ensure that reviews of the strategies, plans and programs are conducted as described in Section 4.4.</li> <li>• Liaise with relevant stakeholders regarding subsidence impact management and related public safety hazards.</li> </ul>
Environment & Community Superintendent	<ul style="list-style-type: none"> <li>• Liaise with relevant stakeholders regarding environmental management.</li> <li>• Ensure monitoring and reporting required in accordance with this Extraction Plan are carried out within specified timeframes, are adequately checked and processed and are prepared to the required standard.</li> <li>• Ensure that any Incident Reports are lodged in a timely manner with all available information.</li> <li>• Ensure that reviews of the strategies, plans and programs are conducted as described in Section 4.4.</li> </ul>
Registered Mine Surveyor	<ul style="list-style-type: none"> <li>• Undertake all subsidence monitoring to the required standard within the specified timeframes and ensure data are adequately checked, processed and recorded.</li> </ul>

## 5 REFERENCES

- 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.
- Hebblewhite, B., Kalf, F. and McMahon T. (2017) *Woronora Reservoir Strategy Report – Stage 1 Report - Metropolitan Coal – Longwall mining near and beneath Woronora Reservoir*.
- Hebblewhite, B., Kalf, F. and McMahon T. (2019) *Woronora Reservoir Strategy Report – Stage 2 Report - Metropolitan Coal – Longwall mining near and beneath Woronora Reservoir*.
- Helensburgh Coal Pty Ltd (2008) *Metropolitan Coal Project Environmental Assessment*.
- Helensburgh Coal Pty Ltd (2009) *Metropolitan Coal Project Preferred Project Report*.
- Independent Expert Panel for Mining in the Catchment (2018) *Initial Report on Specific Mining Activities at the Metropolitan and Dendrobium Coal Mines*. 12 November 2018.
- Mine Subsidence Engineering Consultants (2021) *Metropolitan Mine – Longwalls 308-310 Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan (MSEC Report 1199)*.
- Mine Subsidence Engineering Consultants (2020) *Metropolitan Mine – Modified commencing end Longwall 307 Mine Subsidence Overview*.
- Operational Risk Mentoring (2019) *Metropolitan Collieries Pty Ltd – Longwalls 305-307 Environmental Risk Assessment Report*.
- Risk Mentor (2021) *Metropolitan Collieries Pty Ltd – Longwalls 308-310 Environmental Risk Assessment Report*.
- SP Solutions (2008) *Metropolitan Coal Project Environmental Risk Analysis*. Appendix O in the Helensburgh Coal Pty Ltd (2008) *Metropolitan Coal Project Environmental Assessment*.

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ATTACHMENT 1  
STATUTORY REQUIREMENTS

Metropolitan Coal – Longwalls 308-310 Extraction Plan		
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Document ID: Longwalls 308-310 Extraction Plan Attachment 1		

**ATTACHMENT 1  
STATUTORY REQUIREMENTS**

This Attachment outlines relevant statutory requirements within Project Approval (08\_0149) and provides the relevant section of the Longwalls 308-310 Extraction Plan where the requirements are addressed.

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**Table A1-1  
Project Approval (08\_0149) Requirements**

Condition Number (Schedule 3)	Condition	Document Reference/Comment																		
<b>Performance Measures</b>																				
1.	<p>The Proponent shall ensure that the project does not cause any exceedances of the performance measures in Table 1.</p> <p><i>Table 1: Subsidence Impact Performance Measures</i></p> <table border="1" data-bbox="389 547 1469 1233"> <thead> <tr> <th colspan="2" data-bbox="389 547 1469 592"><b>Water Resources</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="389 592 808 692">Catchment yield to the Woronora Reservoir</td> <td data-bbox="808 592 1469 692">Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir No connective cracking between the surface and the mine</td> </tr> <tr> <td data-bbox="389 692 808 799">Woronora Reservoir</td> <td data-bbox="808 692 1469 799">Negligible leakage from the Woronora Reservoir Negligible reduction in the water quality of Woronora Reservoir</td> </tr> <tr> <th colspan="2" data-bbox="389 799 1469 844"><b>Watercourses</b></th> </tr> <tr> <td data-bbox="389 844 808 963">Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)</td> <td data-bbox="808 844 1469 963">Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases)</td> </tr> <tr> <td data-bbox="389 963 808 1085">Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26</td> <td data-bbox="808 963 1469 1085">Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)</td> </tr> <tr> <th colspan="2" data-bbox="389 1085 1469 1129"><b>Biodiversity</b></th> </tr> <tr> <td data-bbox="389 1129 808 1193">Threatened species, populations, or ecological communities</td> <td data-bbox="808 1129 1469 1193">Negligible impact</td> </tr> <tr> <td data-bbox="389 1193 808 1233">Swamps 76, 77 and 92</td> <td data-bbox="808 1193 1469 1233">Set through condition 4 below<sup>[1]</sup></td> </tr> </tbody> </table>	<b>Water Resources</b>		Catchment yield to the Woronora Reservoir	Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir No connective cracking between the surface and the mine	Woronora Reservoir	Negligible leakage from the Woronora Reservoir Negligible reduction in the water quality of Woronora Reservoir	<b>Watercourses</b>		Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)	Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases)	Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26	Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)	<b>Biodiversity</b>		Threatened species, populations, or ecological communities	Negligible impact	Swamps 76, 77 and 92	Set through condition 4 below <sup>[1]</sup>	<p>Section 3.1 and Appendix A (Water Management Plan)</p> <p>Section 3.1 and Appendix A (Water Management Plan)</p> <p>Section 3.3 and Appendix C (Biodiversity Management Plan)</p>
<b>Water Resources</b>																				
Catchment yield to the Woronora Reservoir	Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir No connective cracking between the surface and the mine																			
Woronora Reservoir	Negligible leakage from the Woronora Reservoir Negligible reduction in the water quality of Woronora Reservoir																			
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Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)	Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases)																			
Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26	Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)																			
<b>Biodiversity</b>																				
Threatened species, populations, or ecological communities	Negligible impact																			
Swamps 76, 77 and 92	Set through condition 4 below <sup>[1]</sup>																			

<sup>1</sup> Condition 4, Schedule 3 of the Project Approval indicates the proponent shall not undermine Swamps 76, 77 and 92 without the written approval of the Director-General.

**Table A1-1 (Continued)**  
**Project Approval (08\_0149) Requirements**

Condition Number (Schedule 3)	Condition	Document Reference/Comment														
1 (cont.).	<p><i>Table 1: Subsidence Impact Performance Measures (Continued)</i></p> <table border="1"> <thead> <tr> <th colspan="2" data-bbox="389 403 1473 443"><b>Land</b></th> </tr> </thead> <tbody> <tr> <td data-bbox="389 443 808 539">Cliffs</td> <td data-bbox="808 443 1473 539">Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall</td> </tr> <tr> <th colspan="2" data-bbox="389 539 1473 579"><b>Heritage</b></th> </tr> <tr> <td data-bbox="389 579 808 651">Aboriginal heritage sites</td> <td data-bbox="808 579 1473 651">Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts</td> </tr> <tr> <td data-bbox="389 651 808 746">Items of historical or heritage significance at the Garrawarra Centre</td> <td data-bbox="808 651 1473 746">Negligible damage (that is fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing</td> </tr> <tr> <th colspan="2" data-bbox="389 746 1473 786"><b>Built Features</b></th> </tr> <tr> <td data-bbox="389 786 808 850">Built features</td> <td data-bbox="808 786 1473 850">Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing</td> </tr> </tbody> </table> <p><i>Note: The proponent will be required to define more detailed performance indicators for each of these performance measures in the various management plans that are required under this approval (see condition 6 below).</i></p>	<b>Land</b>		Cliffs	Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall	<b>Heritage</b>		Aboriginal heritage sites	Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts	Items of historical or heritage significance at the Garrawarra Centre	Negligible damage (that is fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing	<b>Built Features</b>		Built features	Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing	<p>Section 3.2 and Appendix B (Land Management Plan)</p> <p>Section 3.4 and Appendix D (Heritage Management Plan)</p> <p>Section 3.5 and Appendix E (Built Features Management Plan)</p> <p>Section 3.5 and Appendix E (Built Features Management Plan)</p>
<b>Land</b>																
Cliffs	Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall															
<b>Heritage</b>																
Aboriginal heritage sites	Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts															
Items of historical or heritage significance at the Garrawarra Centre	Negligible damage (that is fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing															
<b>Built Features</b>																
Built features	Safe, serviceable and repairable, unless the owner and the MSB agree otherwise in writing															

**Table A1-1 (Continued)  
Project Approval (08\_0149) Requirements**

Condition Number (Schedule 3)	Condition	Document Reference/Comment
<b>Extraction Plan</b>		
6.	<p>The Proponent shall prepare and implement an Extraction Plan for all second workings in the mining area to the satisfaction of the Director-General. The plan must:</p> <ul style="list-style-type: none"> <li>(a) be prepared by a team of suitably qualified and experienced experts whose appointment has been endorsed by the Director-General<sup>[2]</sup>;</li> <li>(b) be approved by the Director-General before the Proponent is allowed to carry out the second workings covered by the Extraction Plan;</li> <li>(c) include a detailed plan for the second workings, which has been prepared to the satisfaction of DRE, and provides for adaptive management (from Longwall 23 onwards);</li> <li>(d) include detailed plans of any associated surface construction works;</li> <li>(e) include the following to the satisfaction of DRE<sup>[3]</sup>:                             <ul style="list-style-type: none"> <li>• a coal resource recovery plan that demonstrates effective recovery of the available resource;</li> <li>• revised predictions of the conventional and non-conventional subsidence effects and subsidence impacts of the extraction plan, incorporating any relevant information that has been obtained since this approval; and</li> <li>• a Subsidence Monitoring Program to:                                     <ul style="list-style-type: none"> <li>– validate the subsidence predictions; and</li> <li>– analyse the relationship between the subsidence effects and subsidence impacts of the Extraction Plan and any ensuing environmental consequences:</li> </ul> </li> </ul> </li> </ul>	<p>Section 1.1</p> <p>This Application</p> <p>Section 1.3 and Appendix H (Coal Resource Recovery Plan)</p> <p>N/A</p> <p>Appendix H (Coal Resource Recovery Plan)</p> <p>Appendix I (Subsidence Report)</p> <p>Section 3.7 and Appendix G (Subsidence Monitoring Program)</p>

<sup>2</sup> The Director-General of the DP&E is now the Secretary of the Department of Planning and Environment (DPE).

<sup>3</sup> The Division of Resources and Energy (DRE) is now the Resources Regulator.

**Table A1-1 (Continued)**  
**Project Approval (08\_0149) Requirements**

Condition Number (Schedule 3)	Condition	Document Reference/Comment
6 (cont.).	<p>(f) include a;</p> <ul style="list-style-type: none"> <li>• Water Management Plan, which has been prepared in consultation with OEH, SCA<sup>[4]</sup> and NOW<sup>[5]</sup>, to manage the environmental consequences of the Extraction Plan on watercourses (including the Woronora Reservoir), aquifers and catchment yield;</li> <li>• Biodiversity Management Plan, which has been prepared in consultation with OEH and DPI (Fisheries)<sup>[6]</sup>, to manage the potential environmental consequences of the Extraction Plan on aquatic and terrestrial flora and fauna, with a specific focus on swamps;</li> <li>• Land Management Plan, which has been prepared in consultation with SCA, to manage the potential environmental consequences of the Extraction Plan on cliffs, overhangs, steep slopes and land in general;</li> <li>• Heritage Management Plan, which has been prepared in consultation with the OEH and the relevant Aboriginal groups, to manage the potential environmental consequences of the Extraction Plan on heritage sites or values;</li> <li>• Built Features Management Plan, which has been prepared in consultation with the owner of the relevant feature, to manage the potential environmental consequences of the Extraction Plan on any built features; and</li> </ul> <p>(g) include a Public Safety Management Plan, which has been prepared in consultation with DRE and the DSC (for any Mining within the DSC notification area), to ensure public safety in the mining area.</p> <p><i>Note: In accordance with condition 12 of schedule 2, the preparation and implementation of Extraction Plans for second workings may be staged, with each plan covering a defined area of second workings. In addition, these plans are only required to contain management plans that are relevant to the specific second workings that are being carried out.</i></p>	<p>Section 2.4, Section 3.1 and Appendix A (Water Management Plan).</p> <p>Section 2.4, Section 3.3 and Appendix C (Biodiversity Management Plan).</p> <p>Section 2.4, Section 3.2 and Appendix B (Land Management Plan).</p> <p>Section 2.4, Section 3.4 and Appendix D (Heritage Management Plan).</p> <p>Section 2.4, Section 3.5 and Appendix E (Built Features Management Plan).</p> <p>Section 2.4, Section 3.6 and Appendix F (Public Safety Management Plan).</p>

<sup>4</sup> The Sydney Catchment Authority (SCA) is now WaterNSW.

<sup>5</sup> The NSW Office of Water (NOW) is now the Department of Planning, Industry and Environment – Water (DPIE-Water).

<sup>6</sup> DRE (Fisheries) is now the Department of Primary Industries – Fisheries (DPI-Fisheries).

<sup>7</sup> Dams Safety Committee (DSC) is now Dams Safety NSW.

**Table A1-1 (Continued)**  
**Project Approval (08\_0149) Requirements**

<b>Condition Number (Schedule 3)</b>	<b>Condition</b>	<b>Document Reference/Comment</b>
7.	In addition to standard requirements for management plans (see condition 2 of schedule 7), the Proponent shall ensure that the management plans required under condition 6(f) above include: <ul style="list-style-type: none"> <li>(a) a program to collect sufficient baseline data for future Extraction Plans;</li> <li>(b) a revised assessment of the potential environmental consequences of the Extraction Plan, incorporating any relevant information that has been obtained since this approval;</li> <li>(c) a detailed description of the measures that would be implemented to remediate predicted impacts; and</li> <li>(d) a contingency plan that expressly provides for adaptive management.</li> </ul>	Appendices A to F and Attachment 2 Section 2.3 and Appendices A to F Section 3 and Appendices A to F Section 4.1 and Appendices A to F
<b>Condition Number (Schedule 7)</b>	<b>Condition</b>	<b>Document Reference/Comment</b>
<b>Management Plan Requirements</b>		
2.	The Proponent shall ensure that the management plans required under this approval are prepared in accordance with any relevant guidelines, and include: <ul style="list-style-type: none"> <li>(a) detailed baseline data;</li> <li>(b) a description of:               <ul style="list-style-type: none"> <li>• the relevant statutory requirements (including and relevant approval, licence or lease conditions);</li> <li>• any relevant limits or performances measures/criteria;</li> <li>• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;</li> </ul> </li> <li>(c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performances measures/criteria;</li> <li>(d) a program to monitor and report on the:               <ul style="list-style-type: none"> <li>• impacts and environmental performance of the project;</li> <li>• effectiveness of any management measures (see c above);</li> </ul> </li> </ul>	Appendices A to F Section 1.1.1, Appendices A to F and Attachment 1 Section 3 and Appendices A to F Section 3 and Appendices A to F Section 3 and Appendices A to F Sections 3 and 4.3 and Appendices A to G

**Table A1-1 (Continued)**  
**Project Approval (08\_0149) Requirements**

Condition Number (Schedule 7)	Condition	Document Reference/Comment
<b>Management Plan Requirements (Continued)</b>		
2. (Cont.)	(e) a contingency plan to manage any unpredicted impacts and their consequences; (f) a program to investigate and implement ways to improve the environmental performance of the project over time; (g) a protocol for managing and reporting any: <ul style="list-style-type: none"> <li>• incidents;</li> <li>• complaints;</li> <li>• non-compliances with statutory requirements; and</li> <li>• exceedances of the impact assessment criteria and/or performance criteria and</li> </ul> (h) a protocol for review of the plan.	Section 4.1 and Appendices A to F Sections 4.1, 4.2 and 4.4 and Appendices A to F Sections 4.1 and 4.3 and Appendices A to F Section 4.4 and Appendices A to G

ATTACHMENT 2

PROGRAM TO COLLECT BASELINE DATA FOR FUTURE EXTRACTION PLANS

Metropolitan Coal – Longwalls 308-310 Extraction Plan		
Revision No. EP-R01-B		
Document ID: Longwalls 308-310 Extraction Plan Attachment 2		

**ATTACHMENT 2**  
**PROGRAM TO COLLECT BASELINE DATA FOR FUTURE EXTRACTION PLANS**

Longwalls 308-310 (the subject of this Extraction Plan) are the eighth, ninth and tenth longwalls within the 300 longwall series. Longwalls 311 to 317 are located to the west of Longwall 310. The program proposed to be undertaken to collect baseline data for the next Extraction Plan (i.e. Longwalls 311 on) is summarised in Table A2-1 and described in detail in Appendices A to F of the Longwalls 308-310 Extraction Plan.

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**Table A2-1**  
**Program to Collect Baseline Data for the Next Extraction Plan (i.e. Longwalls 311 on)**

Aspect of Next Extraction Plan	Proposed Data Collection
Surface Water	<p>Metropolitan Coal will collect surface water baseline data for the next Extraction Plan (i.e. Longwalls 311 on) in accordance with Section 11.1 of the Water Management Plan (WMP) (Appendix A of the Longwalls 308-310 Extraction Plan). In summary:</p> <ul style="list-style-type: none"> <li>• Meteorological data for the next Extraction Plan is available from the existing pluviometers, pan evaporimeter and climate stations (described in Section 8.1 of the WMP).</li> <li>• Streams relevant to the next Extraction Plan include the Waratah Rivulet, Eastern Tributary and the first and second order streams that flow into the Woronora Reservoir (locations shown on Figure 8 in the Extraction Plan Main Text). <ul style="list-style-type: none"> <li>– The baseline visual and photographic surveys of the Waratah Rivulet and Eastern Tributary conducted prior to the commencement of Longwall 20 are provided in Appendices 1 and 2 of the WMP.</li> <li>– Prior to the commencement of Longwall 301, Gilbert &amp; Associates (now Hydro Engineering &amp; Consulting) conducted a visual inspection and photographic survey of streams in the vicinity of Longwalls 301-303 in July 2015.</li> <li>– Hydro Engineering &amp; Consulting (2019) conducted a visual inspection and photographic survey of streams in the vicinity of Longwalls 304-310 (not previously inspected for Longwalls 301-303) in April 2018 (provided in Appendix 5 of the WMP).</li> </ul> </li> <li>• To monitor predicted impacts on pools/aquatic habitat in advance of future mining, Metropolitan Coal has investigated the installation of pool water level sensors in: <ul style="list-style-type: none"> <li>– the large pool mapped on the lower reaches of the stream that overlies Longwalls 309 to 311, downstream of Swamp 92; and</li> <li>– two of the large pools mapped on the lower reaches of the stream that overlies Longwall 311, downstream of Swamp 77,</li> </ul> </li> <li>• The pool water level sensors were installed on 23 May 2019 (Pool SR1 and Pool SR2) and 3 June 2019 (Pool SP1), respectively, and will provide baseline data for the next Extraction Plan.</li> <li>• Metropolitan Coal has investigated the potential to install a small flow measuring flume immediately downstream of Swamp 92, Swamp 77 and Swamp 76 (shown on Figure 18 of the Extraction Plan Main Text). Based on the initial site investigations, there is potential to install flow measuring flumes immediately downstream of Swamp 92 and Swamp 76. Further investigations determined that it was not feasible to install a flow measuring flume downstream of Swamp 77. In November 2020, Metropolitan Coal installed flow measuring flumes (i.e. established gauging stations) immediately downstream of Swamps 76 and 92 consistent with the recommendations of Hydro Engineering &amp; Consulting (2019).</li> <li>• The gauging station downstream of Swamp 76 is located outside the predicted 20 mm subsidence contour and/or the 35° angle of draw line from Longwalls 308-310. Therefore this gauging station will provide baseline information against which comparisons can be made of the impacts of future longwalls on Swamp 76 and of the impacts to Swamp 92. The gauging station downstream of Swamp 92 is located within the predicted 35° angle of draw line from Longwalls 308-310 but outside the predicted 20 mm subsidence contour. As such, limited impact is expected to Swamp 92 as a result of mining of Longwalls 308-310 and then likely not until late in the period of mining of Longwall 310 (in 2025). Therefore there is a significant period available for obtaining baseline information on flow from Swamp 92 ahead of any potential impacts from longwall mining.</li> </ul>

**Table A2-1 (Continued)**  
**Program to Collect Baseline Data for the Next Extraction Plan (i.e. Longwalls 311 on)**

Aspect of Next Extraction Plan	Proposed Data Collection
Surface Water (Continued)	<ul style="list-style-type: none"> <li>• Consideration of the environmental performance and management of the WMP will also inform the appropriate type and frequency of monitoring of water resources and watercourses relevant to the next Extraction Plan.</li> <li>• Surface water quality data for the Woronora Reservoir (site DW01, measurements taken from 0 to 9 m below the water surface level), Nepean Reservoir and Cataract Reservoir will continue to be sourced from WaterNSW.</li> </ul>
Groundwater	<p>Metropolitan Coal will collect groundwater baseline data for the next Extraction Plan (i.e. Longwalls 311 on) in accordance with Section 11.1 of the Biodiversity Management Plan (BMP) (Appendix C of the Longwalls 308-310 Extraction Plan) and Section 11.2 of the WMP (Appendix A of the Longwalls 308-310 Extraction Plan). In summary:</p> <ul style="list-style-type: none"> <li>• Metropolitan Coal installed paired piezometers in Swamps 60, 62, 64, 133 and 134 overlying or proximal to the commencing ends of Longwalls 308 and 309 in October 2018.</li> <li>• Metropolitan Coal completed Surface Works Assessment Forms for the proposed installation of upland swamp piezometers in Swamps 76, 77, 81, 82, 89 and 92, which were submitted to the DPIE in early 2020. DPIE subsequently approved these works and piezometers were installed in all of these upland swamps in November 2020</li> <li>• Metropolitan Coal installed soil moisture probes (linked to a datalogger) at various depth intervals to monitor the vertical profile of soil moisture in the swamp substrate of Swamps 76, 77, 81, 82, 89, 92, 101, 137a and 137b.</li> <li>• Metropolitan Coal does not anticipate that any additional groundwater monitoring sites will be required for the next Extraction Plan; however, consideration of the environmental performance and management of this WMP will inform the appropriate type and frequency of groundwater monitoring relevant to the next Extraction Plan, and additional groundwater bores may be installed on the basis of the monitoring and modelling results.</li> </ul>

**Table A2-1 (Continued)**  
**Program to Collect Baseline Data for the Next Extraction Plan (i.e. Longwalls 311 on)**

Aspect of Next Extraction Plan	Proposed Data Collection
Cliffs and Overhangs, Steep Slopes and Land in General	<p>Metropolitan Coal will collect baseline data in relation to cliffs and overhangs, steep slopes and land in general for the next Extraction Plan (i.e. Longwalls 311 on) in accordance with Section 10 of the Land Management Plan (LMP) (Appendix B of the Longwalls 308-310 Extraction Plan). In summary:</p> <ul style="list-style-type: none"> <li>• A number of cliff and overhang sites (locations shown on Figure 8 in the Extraction Plan Main Text) have been identified by Mine Subsidence Engineering Consultants (2008) adjacent to the Waratah Rivulet and Woronora Reservoir in the vicinity or adjacent to Longwalls 308 -310.</li> <li>• Detailed baseline data has been obtained for Cliffs COH1, COH2, COH3, COH4, COH5, COH6, COH6A, COH7, COH8, COH9, COH10, COH11, COH12, COH13, COH14, COH15, COH16, and COH17 (provided in Appendix 1 of the LMP), including: <ul style="list-style-type: none"> <li>- photographic records of each cliff and overhang;</li> <li>- sketches of overhangs; and</li> <li>- mapping of the approximate location of the cliff/overhang face and the rear extent of the overhang/undercut.</li> </ul> </li> <li>• Baseline data collection for the next Extraction Plan will also include a description of steep slopes and land in general and a description of the recorded subsidence impacts (i.e. where mining of Longwall 306, Longwall 307 or Longwalls 308-310 has resulted in subsidence impacts overlying the next Extraction Plan longwall layout [if any] at the time of Extraction Plan preparation).</li> <li>• Consideration of the environmental performance and management measures of the LMP will also inform the appropriate type and frequency of monitoring for land features relevant to the next Extraction Plan.</li> </ul>
Upland Swamps	<p>Metropolitan Coal will collect baseline data in relation to upland swamps for the next Extraction Plan (i.e. Longwalls 311 on) in accordance with Section 11.1 of the BMP (Appendix C of the Longwalls 308-310 Extraction Plan). In summary:</p> <ul style="list-style-type: none"> <li>• The upland swamps situated to the north or north-west of Longwalls 305-307 (Figure 18 of the Extraction Plan Main Text) were inspected by Eco Logical to confirm the extent of the upland swamps and the vegetation communities present in July/August 2015 (Swamps 59, 69, 70, 71a and 71b) or July/August 2016 (Swamps 60, 61, 62, 63, 64, 65, 66, 67, 68a, 68b, 72, 73, 133 and 134). This mapping was included in the Longwalls 301-303 BMP.</li> <li>• Upland swamps situated to the west of the Woronora Reservoir overlying or proximal to Longwalls 307-310 (Swamps 81, 82, 83, 84, 86, 88 and 89, Figure 18 of the Extraction Plan Main Text) were inspected in July 2017 by Eco Logical. This mapping is included in Appendix 2 of the Longwalls 308-310 BMP.</li> <li>• Field surveys of the larger headwater Swamps 76, 77, 92 and 106 located to the west of Longwall 310 (Figure 18 of the Extraction Plan Main Text) were conducted by FloraSearch in February 2016 to confirm the extent of the upland swamps and the vegetation communities present.</li> </ul>

**Table A2-1 (Continued)**  
**Program to Collect Baseline Data for the Next Extraction Plan (i.e. Longwalls 311 on)**

Aspect of Next Extraction Plan	Proposed Data Collection
Upland Swamps (Continued)	<ul style="list-style-type: none"> <li>• Field inspections of upland swamp vegetation mapped by Bangalay Botanical Surveys (2008) and headwater swamps mapped by FloraSeach (2016c) overlying or proximal to Longwalls 311-317 was conducted by Ecoplanning in 2019 to confirm the upland swamp vegetation communities present and swamp boundaries. Similar to the revised upland swamp vegetation mapping conducted for Longwalls 301-303 and Longwalls 304-310, for each upland swamp a description of the vegetation was recorded including the different strata present, the dominant species and an estimation of percent foliage cover for each stratum to assign vegetation communities described by the NPWS (2003) and Bangalay Botanical Surveys (2008). Final delineation of vegetation community boundaries was undertaken by interpretation of recent aerial photographs. Patterns identified on aerial photographs were related to the field observations and used to delineate the boundaries of vegetation communities. The upland swamp vegetation mapping and characterisation overlying or proximal to Longwalls 311-317 is detailed in Ecoplanning (2021c), which is provided in Appendix 4 on the Longwalls 308-310 BMP.</li> <li>• The <i>NSW Native Vegetation Interim Type Standard</i> (Sivertsen 2009) requires patches of vegetation to be mapped if the dimensions of the representative polygon on a map sheet are 2 mm x 2 mm or greater (i.e. at a map scale of 1:25,000, patches of vegetation equal to or greater than 0.25 ha). However, the revised swamp vegetation mapping boundaries (including those swamps less than 0.25 ha in area) are shown on Figures 9 and 15 of the Longwalls 308-310 BMP to document the changes to the previous Bangalay Botanical Surveys (2008) vegetation mapping. It is noted that many of the revised swamp boundaries comprising vegetation characteristic of the upland swamp vegetation communities are very small in size and doubtfully represent an upland swamp (Appendix 2 of the Longwalls 308-310 BMP). For example, Swamps 61, 63, 65/66, 67, 68a, 73, 83, 86 and 88 are all less than 0.25 ha in area.</li> <li>• Further to the above, Swamp 84 and Swamp 86 are considered to be marginal upland swamps in that they contain non-swamp vegetation more consistent with sandstone woodland (Figure 15 and Appendix 2 of the Longwalls 308-310 BMP).</li> <li>• Metropolitan Coal will also assess the logistics/access and suitability of Swamps 75, 76, 77, 91, 106, 107, 108, 113, 114, 115, and 130 for vegetation transect/quadrat monitoring for the next Extraction Plan. Consistent with baseline data collected for the Longwalls 20-22, 23-27, 301-303, 304 and 305-307 BMP's, the timing for the baseline data in relation to the next Extraction Plan (i.e. Longwalls 311 on) is to ensure that at least two years of baseline data is collected before extraction occurs within 600 m of these swamps.</li> <li>• A program will also be developed to collect baseline vegetation data for the three larger swamps (Swamps 76, 77 and 92) located further to the west by the completion of Longwall 306.</li> <li>• A program to collect baseline groundwater information in upland swamps is described in 'Groundwater' above.</li> </ul>
Riparian Vegetation	<p>As described in Section 11.2 of the BMP (Appendix C of the Longwalls 308-310 Extraction Plan), no significant streams (i.e. streams which are third order or higher) are located over or proximal to Longwalls 311-317.</p> <p>Riparian vegetation monitoring data is available for Waratah Rivulet which is located to the south of Longwalls 308-312 (as described in Section 7 of the BMP).</p>

**Table A2-1 (Continued)**  
**Program to Collect Baseline Data for the Next Extraction Plan (i.e. Longwalls 311 on)**

Aspect of Next Extraction Plan	Proposed Data Collection
Aquatic Biota and their Habitats	<p>As described in Section 11.4 of the BMP, streams relevant to the next Extraction Plan include the Waratah Rivulet and the first and second order streams that flow into the Woronora Reservoir. In summary:</p> <ul style="list-style-type: none"> <li>• The results of visual and photographic surveys of the Waratah Rivulet prior to the commencement of Longwall 20, and during the mining of Longwalls 20-27, Longwalls 301-304 and Longwalls 305-307 provide information on aquatic habitats. Monitoring of macroinvertebrates and macrophytes has been conducted at sites on the Waratah Rivulet (as described in Section 4.3.3 of the BMP).</li> <li>• Hydro Engineering &amp; Consulting (2019) conducted a visual inspection and photographic survey of the first and second order streams in the vicinity of Longwalls 304-310 (not previously inspected for Longwalls 301-303) in April 2018. The visual inspection and photographic survey report provides information on the aquatic habitats available (Appendix 3 of the BMP). Visual inspection and photographic survey of the larger first order streams located further to the west of the Woronora Reservoir (over Longwalls 313-316) will be conducted in advance of future longwalls.</li> <li>• To monitor predicted impacts on pools/aquatic habitat in advance of future mining, Metropolitan Coal investigated the potential to install pool water level meters in: <ul style="list-style-type: none"> <li>– the large pool mapped on the lower reaches of the stream that overlies Longwalls 309 to 311, downstream of Swamp 92; and</li> <li>– two of the large pools mapped on the lower reaches of the stream that overlies Longwall 311, downstream of Swamp 77,</li> </ul> </li> </ul> <p>The pool water level meters were installed on 23 May 2019 (Pool SR1 and Pool SR2) and 3 June 2019 (Pool SP1), respectively.</p>
Terrestrial Fauna and their Habitats	<p>Metropolitan Coal will collect baseline data for terrestrial fauna and their habitats for the next Extraction Plan (i.e. Longwalls 311 on) in accordance with Section 11.5 of the BMP (Appendix C of the Longwalls 308-310 Extraction Plan). In summary:</p> <ul style="list-style-type: none"> <li>• Baseline data has been, or will be, collected for terrestrial fauna habitats (i.e. upland swamps, riparian vegetation, slopes and ridgetops, and aquatic habitats), as described above.</li> <li>• An additional nine amphibian monitoring sites (sites 31 to 39) have been established proximal to Longwalls 310-317. Monitoring of these sites commenced in spring 2019/summer 2020. No additional control sites are required to ensure a continually robust experimental design.</li> <li>• A total of 39 amphibian survey sites have been established to date, including 28 test sites overlying or adjacent to longwalls to monitor amphibian species, with a focus on the habitats of the Giant Burrowing Frog, Red-crowned Toadlet and Littlejohn's Tree Frog.</li> </ul>
Aboriginal Heritage	<p>Metropolitan Coal will collect baseline data for Aboriginal heritage sites for the next Extraction Plan (i.e. Longwalls 311 on) in accordance with Section 12 of the Heritage Management Plan (HMP) (Appendix D of the Longwalls 308-310 Extraction Plan). In summary:</p> <ul style="list-style-type: none"> <li>• Detailed baseline recording for an additional 13 Aboriginal heritage sites overlying or proximal to Longwalls 310-312 not previously subject to baseline recording, namely sites FRC 61, FRC 164, FRC 189, FRC 314, FRC 315, FRC 317, NT 11, NT 33, NT 34, NT 35, NT 78, NT 79 and NEW 2 (locations shown on Figure 10 in the Extraction Plan Main Text). The baseline record for these sites are provided in Appendix 1 of the Longwalls 308-310 HMP.</li> </ul>

**Table A2-1 (Continued)**  
**Program to Collect Baseline Data for the Next Extraction Plan (i.e. Longwalls 311 on)**

Aspect of Next Extraction Plan	Proposed Data Collection
Aboriginal Heritage (Continued)	<ul style="list-style-type: none"> <li>• Prior to the commencement of secondary extraction associated with the next Extraction Plan baseline data will be obtained for Aboriginal heritage sites located within the relevant 35° angle of draw and/or predicted 20 mm subsidence contour of the Extraction Plan longwall layout. The collection of baseline data will include photographic records, detailed scaled plans including physical characteristics and features, and detailed information regarding the dimensions, composition and features.</li> <li>• In addition to the baseline data collection, consideration of the environmental performance and management measures in accordance with the review(s) conducted as part of the HMP will inform the appropriate type and frequency of monitoring of Aboriginal heritage sites relevant to the next Extraction Plan.</li> </ul>
Built Features	<ul style="list-style-type: none"> <li>• Prior to the commencement of secondary extraction associated with the next Extraction Plan, baseline data (e.g. pre-mining inspections) will be obtained for built features located within the relevant 35° angle of draw and/or predicted 20 mm subsidence contour of the Extraction Plan longwall layout.</li> <li>• Metropolitan Coal will also collect baseline data relevant to built features for the next Extraction Plan in accordance with each component plan of the Built Features Management Plan (BFMP) (Appendix E of the Longwalls 308-310 Extraction Plan). In general, the baseline data that has been collected for Longwalls 301-310 will also be relevant to Longwalls 311 on as longwall mining progressively moves further away from many of the built features.</li> <li>• In addition to baseline data collection, consideration of the environmental performance and management measures in accordance with the review(s) conducted as part of the BFMP will inform the appropriate type and frequency of monitoring of the assets relevant to the next Extraction Plan.</li> </ul>

ATTACHMENT 3  
KEY CONTACT REGISTER

Metropolitan Coal – Longwalls 308-310 Extraction Plan		
Revision No.EP-R01-B		
Document ID: Longwalls 308-310 Extraction Plan Attachment 3		

### ATTACHMENT 3 KEY CONTACT REGISTER

**Table A3-1  
Emergency Contacts**

Organisation	Phone Number
Emergency Services (Police, Fire Ambulance)	000
NSW Environment Protection Authority	131 555
State Emergency Services	132 500
WorkCover Authority	13 10 50
Subsidence Advisory NSW (24-hour Emergency Service)	1800 248 083
Dams Safety NSW Executive Engineer (24-hour Emergency Contact)	(02) 9842 8070 0403 681 645
Wollongong City Council	(02) 4227 7111

**Table A3-2  
Internal Metropolitan Coal Contact Details**

Position	Contact Name	Phone Number
Executive General Manager	James Middleton	(02) 4294 7201
Mining Engineering Manager	James Hannigan	(02) 4294 7234
Manager – Technical Services	Jon Degotardi	(02) 4294 7233
Environment & Community Superintendent	Stephen Love	(02) 4294 7384
Metropolitan Control Room (Manned 24 hours)	Control Operator	(02) 4294 7333
Community Hotline (24 hours)		1800 115 003



**Table A3-3  
Stakeholder Contact Details**

Stakeholder	Position	Contact Name	Email/Contact Phone Number	Postal Address
<b>NSW Government Agencies</b>				
Department of Planning, Industry and Environment (DPIE)	Director Resource Assessments	Jessie Evans	Jessie.Evans@dpi.e.nsw.gov.au	Locked Bag 5022 Paramatta NSW 2124
	Team Leader, Resource Assessments	Gabrielle Allan	Gabrielle.Allan@dpi.e.nsw.gov.au	
Resources Regulator	Project Coordinator, Royalties and Advisory Services	Alex Love	industry.coordination@industry.nsw.gov.au	GPO Box 5477 Maitland NSW 2320 PO Box 674 Wollongong NSW 2520
	Manager & Principal Inspector Environment	Greg Kininmonth	Greg.Kininmonth@planning.nsw.gov.au	
Subsidence Advisory NSW	Manager, Claimant Outcomes - South	Matthew Montgomery	Matthew.Montgomery@customerservice.nsw.gov.au 24hr contact 1800 248 083	PO Box 488G, Newcastle 2300
Dams Safety NSW	Manager, Mining Projects	Heather Middleton	Heather.Middleton@dpi.e.nsw.gov.au dsc.mining@damsafety.nsw.gov.au (02) 9842 8077	Locked Bag 5123 Parramatta NSW 2124
WaterNSW	Manager, Catchment Protection	Daryl Gilchrist	Daryl.Gilchrist@waternsw.com.au	PO Box 398 Parramatta NSW 2124
Natural Resources Access Regulator	-	-	nrar.servicedesk@industry.nsw.gov.au	Locked Bag 5123 Parramatta NSW 2124
Biodiversity, Conservation and Science Directorate	Director, South-East Conservation and Regional Delivery Division	Michael Saxon	Michael.Saxon@environment.nsw.gov.au	PO Box 513 Wollongong NSW 2520
	Senior Team Leader, Ecosystems and Threatened Species	James Dawson	James.Dawson@environment.nsw.gov.au (02) 4224 4125	
Heritage NSW	Archaeologist (Illawarra)	Rose O'Sullivan	heritagemailbox@environment.nsw.gov.au	Locked Bag 5020 Paramatta NSW 2124
Department of Primary Industries – Fisheries	Regional Manager, Central/Metro Aquatic Ecosystems	Scott Carter	Scott.Carter@dpi.nsw.gov.au	Locked Bag 1 Nelson Bay NSW 2315
NSW Environment Protection Authority	Manager Regional Operations Illawarra	Peter Bloem	Andrew.Couldridge@epa.nsw.gov.au (02) 4224 4100	PO Box 513 Wollongong NSW 2520
	Senior Operations Officer	Andrew Couldridge		

**Table A3-3 (Continued)**  
**Stakeholder Contact Details**

Stakeholder	Position	Contact Name	Email/Contact Phone Number	Postal Address
<b>Aboriginal Groups</b>				
Cubbitch Barta Native Title Claimants	-	Glenda Chalker	-	55 Nightingale Road Pheasants Nest NSW 2574
Korewal Elouera Jerrungurah Tribal Elders Corporation	-	Reuben Brown	-	86 Hertford Street Berkeley NSW 2506
Caines Family	-	Gary Caines	-	28 Gowan Brae Road Mount Ousley NSW 2519
La Perouse Botany Bay Aboriginal Corporation	-	Yvonne Simms	-	10 Murrong Place La Perouse NSW 2036
Woronora Plateau Gundungara Elders Councils	-	Kayla Williamson	-	11 Garnett Grove Flinders NSW 2529
Tharawal Local Aboriginal Land Council	-	Rebecca Ede	-	PO Box 245 Thirlmere NSW 2572
Wodi Wodi Elders Corporation	-	James Davis	-	2 Poplar Avenue Unanderra NSW 2526
Illawarra Local Aboriginal Land Council	Chief Executive Officer	Paul Knight	-	3 Ellen Street Wollongong NSW 2500
<b>Infrastructure Owners</b>				
Transport for New South Wales	Pavement Maintenance Planner Traffic Commander	Cyril Gunaratne	Cyril.Gunaratne@transport.nsw.gov.au 24hr contact Transport Management Centre 131 700	PO Box 477 Wollongong NSW 2520
Wollongong City Council – Princes Highway	Civil Asset Management Unit Leader Senior Civil Assets Engineer	Nur Joy Stephen Pemberton	NJoy@wollongong.nsw.gov.au Spemberton@wollongong.nsw.gov.au Wollongong City Council 24hr Contact Number (02) 4227 7111	Locked Bag 8821 Wollongong DC NSW 2500
Sydney Water	Area Manager Networks South (Acting) Lead Network Operations Engineer	Andrzej Krawiec Brendan Cantlon	Andrzej.Krawiec@sydneywater.com.au Brendan.Cantlon@sydneywater.com.au Sydney Water 24 hr Contact 13 20 90	73 Gardeners Road Daceyville NSW 2032

**Table A3-3 (Continued)**  
**Stakeholder Contact Details**

<b>Stakeholder</b>	<b>Position</b>	<b>Contact Name</b>	<b>Email/Contact Phone Number</b>	<b>Postal Address</b>
<b>Community</b>				
Wollongong City Council	Development Project Officer	Nina Kent	nkent@wollongong.nsw.gov.au	Locked Bag 8821 Wollongong DC NSW 2500
Metropolitan Coal Community Consultative Committee	Independent Chair	Lisa Andrews	lisaandrews.ic@gmail.com	PO Box 6017 Lake Munmorah NSW 2259