

METROPOLITAN COAL LONGWALLS 301-303

EXTRACTION PLAN



MAIN TEXT

METROPOLITAN COAL

LONGWALLS 301-303

EXTRACTION PLAN

Revision Status Register

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All	EP-R01-B	Revised Longwalls 301-303 Extraction Plan	DP&E	-

* The approval allows for the extraction of Longwalls 301 and 302 only.

September 2018

TITLE BLOCK

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Title	Metropolitan Coal Longwalls 301-303 Extraction Plan
Date	19 September 2018
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Name of Authorised Representative	Jon Degotardi
Title of Authorised Representative	Manager – Technical Services
Signature of Authorised Representative	
Name of Mining Engineering Manager	James Hannigan
Signature of Mining Engineering Manager	
Name of General Manager (Acting)	Colin Nevins
Signature of General Manager (Acting)	
Date of Signatures	19 September 2018

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Appendix I	Subsidence Report

1 OVERVIEW OF THE EXTRACTION PLAN

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

The underground mining longwall layout is shown on Figure 1. Following the completion of Longwall 27 in 2017, Longwalls 301, 302 and 303 (herein referred to as Longwalls 301-303) define the next mining sub-domain within the Project underground mining area (Figures 1 and 2).

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 301-303 at Metropolitan Coal.

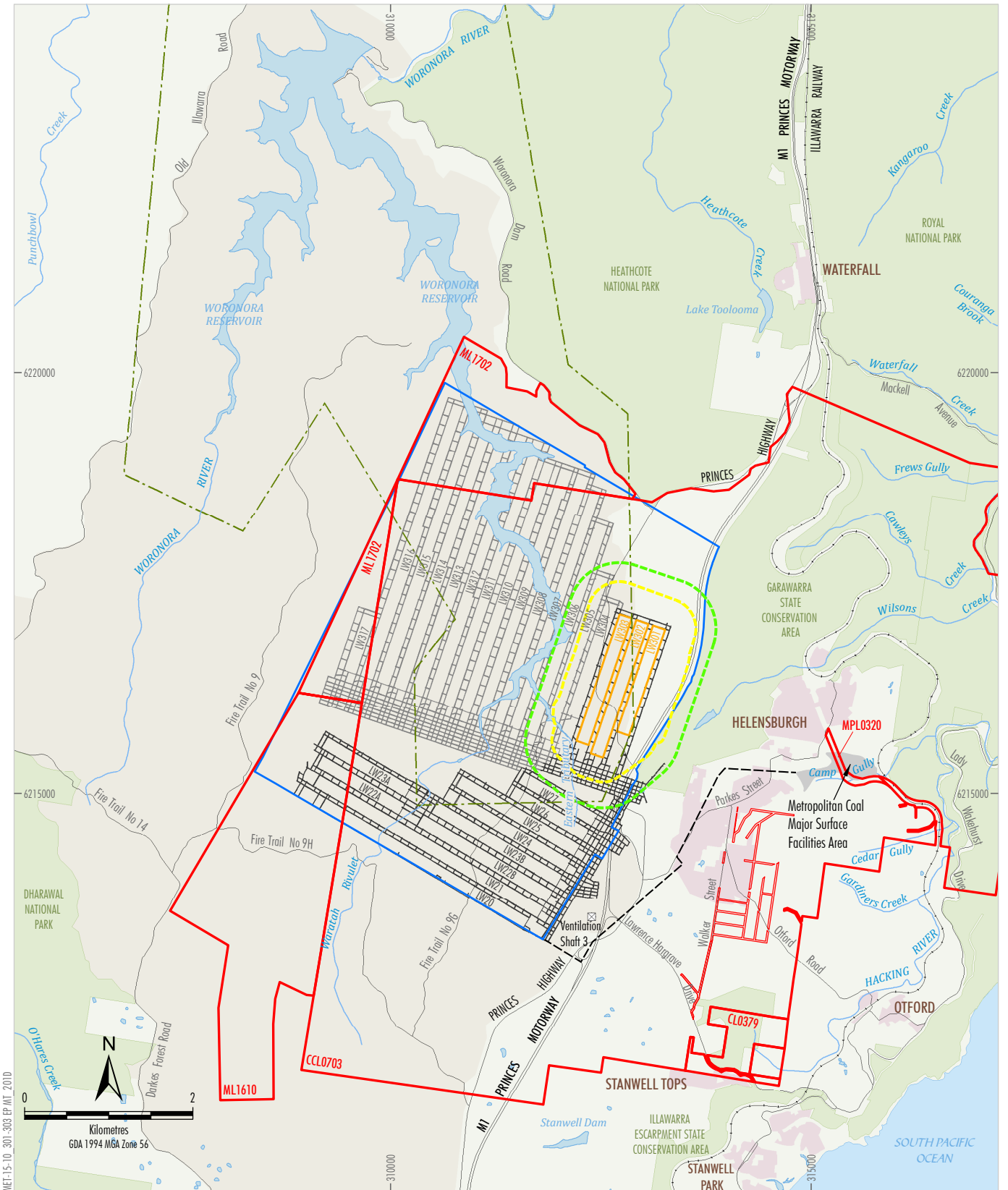
This Extraction Plan has been prepared in consideration of the NSW Department of Planning and Environment (DP&E) and NSW Division of Resources and Energy (DRE) (2015) *Guidelines for the Preparation of Extraction Plans*.

This Extraction Plan includes post-mining monitoring and management of potential subsidence impacts and environmental consequences, subject to the two previously approved Metropolitan Coal Extraction Plans for Longwalls 20-22 and Longwalls 23-27. That is, the Metropolitan Coal Longwalls 20-22 and Longwalls 23-27 Extraction Plans are superseded by this Extraction Plan, consistent with the recommended approach in the DP&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans*.

The objectives of this Extraction Plan are to:

- provide detailed plans of Longwalls 301-303;
- outline potential subsidence effects, subsidence impacts and environmental consequences of Longwalls 301-303;
- describe the measures that will be implemented to manage, mitigate and remediate potential subsidence impacts and environmental consequences during the mining of Longwalls 301-303;
- detail the monitoring of subsidence effects, subsidence impacts and environmental consequences during the mining of Longwalls 301-303; and
- provide a contingency plan for subsidence impacts and environmental consequences in relation to the Project's subsidence impact performance measures.

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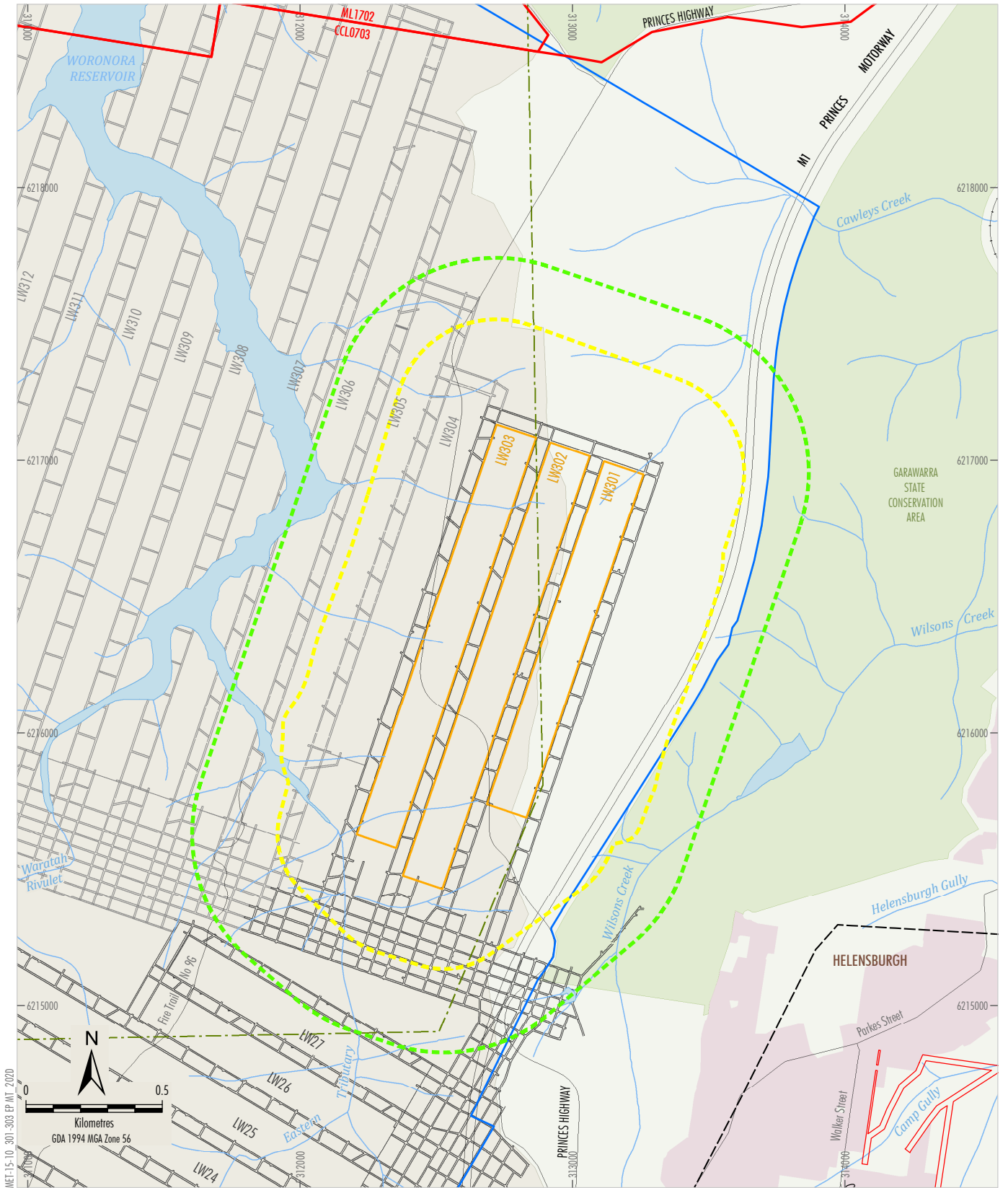
LEGEND

- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area
- Longwalls 20-27 and 301-317
- Longwalls 301-303 Secondary Extraction
- 35° Angle of Draw and/or Predicted
- 20 mm Subsidence Contour
- 600 m from Secondary Extraction of
- Longwalls 301-303
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

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 METROPOLITAN COAL
 Longwalls 301 - 303 and
 Project Underground Mining Area

Figure 1



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LEGEND

- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area
Longwalls 20-27 and 301-317
- Longwalls 301-303 Secondary Extraction
- 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
- 600 m from Secondary Extraction of
Longwalls 301-303
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

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Longwalls 301 - 303 Layout

Figure 2

Longwalls 301-303 are located to the north of Longwalls 20-27 at Metropolitan Coal (Figure 1). The Extraction Plan area for Longwalls 301-303, 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 Mine Subsidence Engineering Consultants (MSEC), HydroSimulations, Hydro Engineering & Consulting, FloraSearch, Eco Logical Australia¹, Cenwest Environmental Services, Niche Environment and Heritage, Bio-Analysis and Resource Strategies. The team of suitably qualified and experienced persons has been endorsed by the Secretary.

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 DP&E 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
Condition 6, Schedule 3	
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 ^[1] . This plan must:	This document
(a) be prepared by a team of suitably qualified experts whose appointment has been endorsed by the Director-General;	Section 1.1 and Attachment 2
(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 ^[2] , 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;	Section 3 and Appendix G

¹ The terrestrial flora components of the Biodiversity Management Plan have been reviewed and revised with assistance from Eco Logical Australia from Version E.

Table 1 (Continued)
Extraction Plan Requirements

Project Approval (08_0149) Condition	Extraction Plan Reference
<p>Condition 6, Schedule 3 (Continued)</p> <p>(e) include the following to the satisfaction of DRE^[2]:</p> <ul style="list-style-type: none"> • a coal resource recovery plan that demonstrates effective recovery of the available resource; • 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 • a Subsidence Monitoring Program to: <ul style="list-style-type: none"> - validate the subsidence predictions; and - analyse the relationship between the subsidence effects and subsidence impacts of the Extraction Plan and any ensuing environmental consequences; <p>(f) include a:</p> <ul style="list-style-type: none"> • Water Management Plan, which has been prepared in consultation with OEH, SCA^[3] and NOW^[4], to manage the environmental consequences of the Extraction Plan on watercourses (including the Woronora Reservoir), aquifers and catchment yield; • Biodiversity Management Plan, which has been prepared in consultation with OEH and DRE (Fisheries)^[5], to manage the potential environmental consequences of the Extraction Plan on aquatic and terrestrial flora and fauna, with a specific focus on swamps; • Land Management Plan, which has been prepared in consultation with SCA^[3], to manage the potential environmental consequences of the Extraction Plan on cliffs, overhangs, steep slopes and land in general; • 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; • 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 <p>(g) include a Public Safety Management Plan, which has been prepared in consultation with DRE^[2] (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>Appendix H</p> <p>Appendix I</p> <p>Appendix G</p> <p>Appendix A</p> <p>Appendix C</p> <p>Appendix B</p> <p>Appendix D</p> <p>Appendix E</p> <p>Appendix F</p>

Table 1 (Continued)
Extraction Plan Requirements

Project Approval (08_0149) Condition	Extraction Plan Reference
Condition 7, Schedule 3	
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 3
(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

¹ The Director-General of the DP&E is now the Secretary of the DP&E.

² The Division of Resources and Energy (DRE) is now the Division of Resources and Geoscience (DRG).

³ The Sydney Catchment Authority (SCA) is now WaterNSW.

⁴ The NSW Office of Water (NOW) is now the Department of Industry – Water.

⁵ DRE (Fisheries) is now the Department of Primary Industries – Fishing (DPI-Fishing).

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 DRG (Division of Resources and Geoscience, previously DRE), under the NSW *Mining Act, 1992* (e.g. Consolidated Coal Lease [CCL] 703, Mining Lease [ML] 1610, ML 1702, Coal Lease [CL] 379 and Mining Purpose Lease [MPL] 320).
- The *Metropolitan Coal Mining Operations Plan 1 October 2012 to 30 September 2019* approved by the DRG.
- 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 Primary Industries – Water (DPI-Water) (now the Department of Industry – 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 (previously the Sydney Catchment Authority [SCA]) for surface activities within the Woronora Special Area (e.g. fire road maintenance activities).

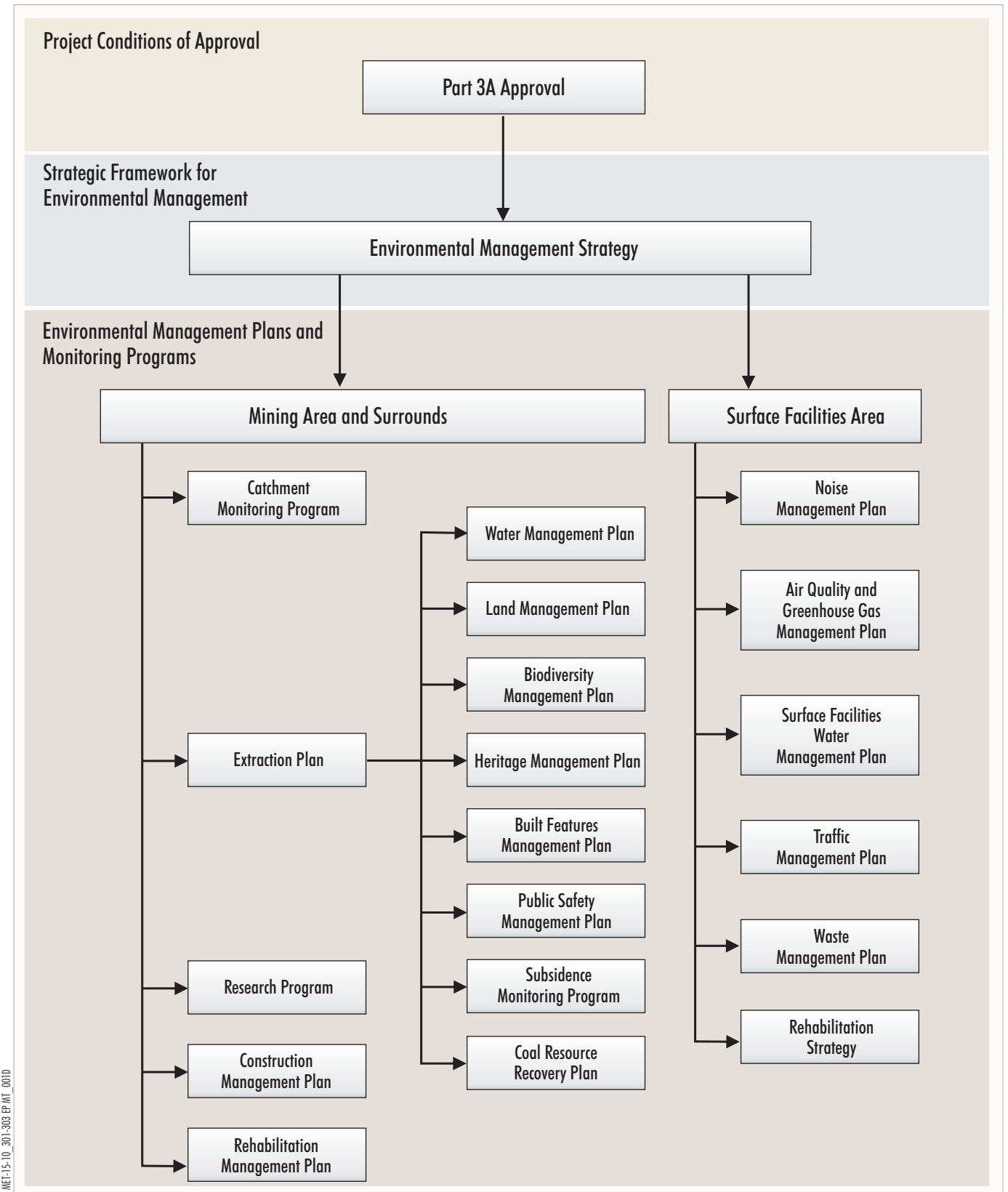
1.2 STRUCTURE OF THE EXTRACTION PLAN

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.
- 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 evidence of Metropolitan Coal's consultation process for the Extraction Plan.
- Attachment 3 Provides details of a program to collect baseline data for the next Extraction Plan (i.e. Longwalls 304-306).
- Attachment 4 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 (2018) *Metropolitan Mine – Longwalls 301 to 303 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 Longwalls 301-303 Water Management Plan (WMP).
- Appendix B Longwalls 301-303 Land Management Plan (LMP).
- Appendix C Longwalls 301-303 Biodiversity Management Plan (BMP).
- Appendix D Longwalls 301-303 Heritage Management Plan (HMP).
- Appendix E Longwalls 301-303 Built Features Management Plan (BFMP).
- Appendix F Longwalls 301-303 Public Safety Management Plan (PSMP).
- Appendix G Longwalls 301-303 Subsidence Monitoring Program (SMP).
- Appendix H Longwalls 301-303 Coal Resource Recovery Plan (CRRP).
- Appendix I Subsidence Report.



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Figure 3

The following graphical plans have been prepared in accordance with the DP&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans*:

Plan 1	Existing, Proposed and Future Workings.
Plan 2	Longwalls 301-303 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 Longwalls 301-303 CRRP (Appendix H of the Extraction Plan).

As there are currently no existing and/or planned future workings in seams above and/or below the proposed workings, Plan 4 (referred to in the DP&E and DRE [2015] *Guidelines for the Preparation of Extraction Plans*) has not been prepared.

Plan 7 is provided in Attachment 1 of the Longwalls 301-303 SMP (Appendix G of the Extraction Plan).

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), 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 major geological features at seam level are shown on Plan 3 in Attachment 1 of Appendix H. The nearest longwall is located approximately 590 m from the Metropolitan Fault. The Metropolitan Fault has a north-west to south-east strike and dips to the north-east.

Drilling in advance of mine development and roadway development has found no evidence of some geological features previously interpolated as possible faults in the Project EA (e.g. the Mini Sosie Fault, Fault A, Fault Y and Fault Z). Such features are therefore no longer included in Plan 3 in Attachment 1 of Appendix H.

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Similarly, the nature and extent of some faults have been determined subsequent to preparation of the Project EA through roadway development and Metropolitan Coals' annual drilling program. For example, the Long Hole Fault (identified on Plan 3 in Attachment 1 of Appendix H as F-0008) has been identified as a strike slip fault and the orientation is materially different to that shown in the Project EA. The Powell Fault, originally projected into the 35° angle of draw of Longwalls 301-303 has been found to be terminated by the Mains West Fault (F-0001) that tracks obliquely 500 m south of Longwall 301.

In addition, while surface lineaments are documented in a geological register as a possible indicator of an underlying structure, their presence on the surface does not necessarily translate to a physical feature in the coal seam. Surface lineaments are therefore not shown on Plan 3 in Attachment 1 of Appendix H. They are, however, incorporated into subsidence modelling as changes in topographical features.

Note in 2017 Metropolitan Coal drilled some 113 km of in-seam exploration holes ahead of development, all designed to either confirm or dismiss the presence of structures. Metropolitan Coals' 2018 drilling program is targeting 120 km and then stepping upwards to greater than 140 km per annum from 2019 onwards to enable timely planning decisions.

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 (previously HCPL) 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 to 317 referred to as the Preferred Project Layout (as described in the Preferred Project Report [HCPL, 2009]). Longwalls 302 and 303 based on the Preferred Project Layout comprised 163 metres (m) panel widths (void) with 45 m pillars (solid) beyond 500 m from the Woronora Reservoir, and 138 m panel widths (void) with 70 m pillars (solid) within 500 m of the Woronora Reservoir.

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

In May 2016, Metropolitan Coal requested the approval of the Secretary of the DP&E to further amend the first workings layout for Longwalls 301-303. The changes to the first workings layout for Longwalls 301-303 were as follows:

- Longwall 301 – reduce the panel void length from 1,680 m to 1,428 m, with no change to the tailgate pillar dimensions.
- Longwall 302 – reduce the panel void length from 2,637 m to 1,954 m, with a reduction in the tailgate pillar width by 25 m for approximately 608 m of the panel length.
- Longwall 303 – reduce the panel void length from 2,760 m to 2,122 m, with a reduction in the tailgate pillar width by 25 m for approximately 728 m of the panel length.

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The commencing (i.e. northern) ends of Longwalls 301 to 303 were shortened based on geological considerations. The finishing end of Longwall 301 was determined in consultation with the Roads and Maritime Services based on the presence of Bridge 2 (M1 Princes Motorway), which is located approximately 330 m to the south-east of the end of Longwall 301 and which is sensitive to small differential movements. The changes to the first workings layout for Longwalls 301-303 described above were approved by the Secretary of the DP&E in June 2016.

Metropolitan Coal further shortened the commencing ends of Longwalls 302 and 303 to reduce subsidence impacts to the Garrawarra Centre Complex, such that they have the same alignment with the commencing end of Longwall 301. The panel void length of Longwall 302 was reduced from 1,954 m to 1,775 m, and the panel void length of Longwall 303 was reduced from 2,122 m to 1,788 m. Further geological considerations with diminishing seam height below 2.5 m, combined with prohibitive carbon dioxide gas content at the northern end of the longwalls necessitated the reduction of Longwall 301 to 1,338 m, Longwall 302 to 1,684 m and Longwall 303 to 1,698 m and for environmental reasons the shortening of the finishing end of Longwall 303 by 98 m adjacent to the Eastern Tributary resulting in a Longwall 303 extraction length of 1,600 m.

The layout of Longwalls 301-303 is shown on Figure 2 in this document and on Plan 1 in Attachment 1 of Appendix H. A summary of the longwall dimensions for Longwalls 301-303 is provided in Table 2. The longwall layout includes 163 m panel widths (void) with 45 m pillars (solid).

Table 2
Summary of Longwall Dimensions for Longwalls 301-303

Longwall	Longwall Length (m)	Total Void Width (m)	Tailgate Chain Pillar Width (m)
LW301	1,338	163	0
LW302	1,684	163	45
LW303	1,600	163	45

Figure 2 in this document and Plan 1 in Attachment 1 of Appendix H shows existing Metropolitan Coal longwalls located within 500 m of Longwalls 301-303 (i.e. Longwalls 20-27), as well as future longwalls (i.e. from Longwall 304 on). Metropolitan Coal has submitted a first workings application to the DP&E for the layout of Longwalls 304-306 and this layout is shown on the Extraction Plan figures.

1.3.3 Mining Method

The extraction of Longwalls 301-303 will occur from north to south. Longwalls 301-303 will be extracted using retreating longwall mining methods for secondary extraction of panels with a 163 m void width. The longwall panels 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 gateroads 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 158 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 Figure 2 and key dimensions are summarised in Table 3.

Table 3
Key Mining Parameters

Parameter	LW301	LW302	LW303
ROM Coal Extracted (Mt)	Approx. 3.457		
Gate Road Width (m)	5.2		
Gate Road Height (m)	3.2		
Maingate (MG) Chain Pillar Width (m)	45		
Tailgate (TG) Chain Pillar Width (m)	-	45	45
Longwall Void Width (m) (ribline of goaf edge)	163		
Longwall Void Length (m)	1,338	1,684	1,600
Seam Thickness (m)	2.7 – 2.9		
Extraction Height (m)	Up to 3.2		
Depth of Cover (m)	395 – 555		

LW = longwall.

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 27 and Longwall 301 is complete, with extraction of Longwall 302 underway.

The proposed sequence of mining for Longwalls 301-303 and anticipated start and completion dates are summarised in Table 4.

Table 4
Provisional Extraction Schedule

Longwall	Estimated Start Date	Estimated Duration	Estimated Completion Date
Longwall 301	28 June 2017	8 months	4 February 2018
Longwall 302	29 March 2018	8 months	October 2018
Longwall 303	November 2018	8 months	June 2019

1.3.6 Previous and Future Mining

Mining at Metropolitan Coal commenced in the 1880's 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 primary employed.

Previous longwall mining areas at Metropolitan Coal are located to the south of Longwalls 301-303 and include Longwalls 1-18 and Longwalls 20-27. 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. The location of historic and previous mining at Metropolitan Coal is shown in the Longwalls 301-303 CRRP (Appendix H).

Longwalls 301-303 form the first block of longwalls within the 300 longwall series. Metropolitan Coal has submitted a first workings application to the DP&E for Longwalls 304-306 which includes the narrowing of chain pillars consistent with the Longwalls 301-303 layout. The proposed layout in the Longwalls 304-306 first workings application is shown on Figure 1 in this document, and on Plan 1 in Attachment 1. The proposed layout of Longwalls 304-306 will however be subject to further consideration.

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

1.4 SUBSIDENCE PREDICTIONS

Revised predictions of subsidence effects for Longwalls 301-303 were developed by MSEC (2018) (Appendix I). The process for the development of these predictions is described in Section 2.3.1.

Predicted Conventional Subsidence Movements

MSEC (2018) 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 the longwalls. The report includes the maximum predicted conventional subsidence parameters for the longwalls including:

- Incremental Subsidence Parameters, which are the predicted subsidence parameters due to the extraction of a single longwall.
- Total Subsidence Parameters, which include the accumulated subsidence parameters after the completion of each longwall within a series of longwalls.

The maximum predicted incremental and total subsidence, tilt and curvatures for Longwalls 301-303 are summarised in Table 5. Figures 4, 5 and 6 provide the predicted total subsidence contours after the extraction of Longwalls 301, 302 and 303, respectively.

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Table 5
Maximum Predicted Subsidence, Tilt and Curvature for Longwalls 301-303

Subsidence Parameter	Longwalls 301-303	
	Incremental Subsidence Predictions	Total Subsidence Predictions
Maximum Subsidence (m)	0.65	0.9
Maximum Tilt (mm/m)	5.0	5.5
Maximum Hogging Curvature (km ⁻¹)	0.08	0.06
Maximum Sagging Curvature (km ⁻¹)	0.10	0.15

Source: after MSEC (2018) (Appendix I).

mm/m = millimetre per metre.

km⁻¹ = 1/kilometres.

The predictions of conventional subsidence parameters do not include the valley related upsidence and closure movements, or the effects of faults and other geological structures.


Non-Conventional Ground Movements


MSEC (2018) (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.

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

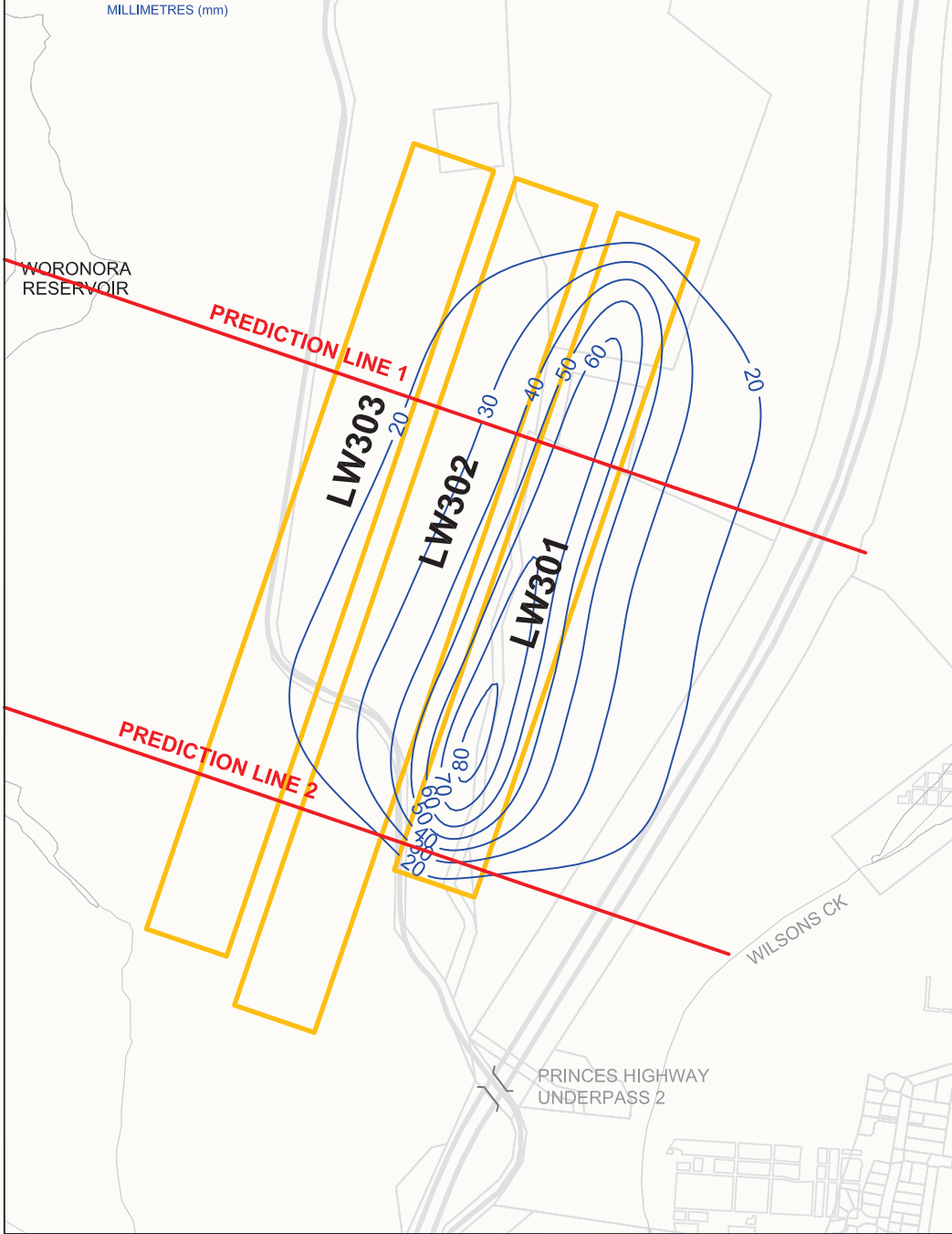
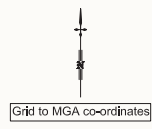
Based on an empirical model for the Southern Coalfield, MSEC (2018) (Appendix I) concluded that the predicted far-field horizontal movements resulting from the extraction of Longwalls 301-303 are very small and could only be detected by precise surveys. While the impacts of far-field horizontal movements on natural and built features within the vicinity of Longwalls 301-303 are not expected to be significant, there are structures which are sensitive to small differential movements, including transmission towers and road bridges to the east of Longwalls 301-303 (Appendix I). The Longwalls 301-303 BFMP (Appendix E) has been developed to manage the potential impact of far-field movements on sensitive infrastructure.


 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 301 TO 303
 PREDICTED SUBSIDENCE CONTOURS DUE TO
 LONGWALL 301

DATE: 11 Sep 2018	SCALE: 1:10000	DRAWING No: MSEC984-11	Rev No A
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PREDICTED SUBSIDENCE CONTOURS ARE IN MILLIMETRES (mm)



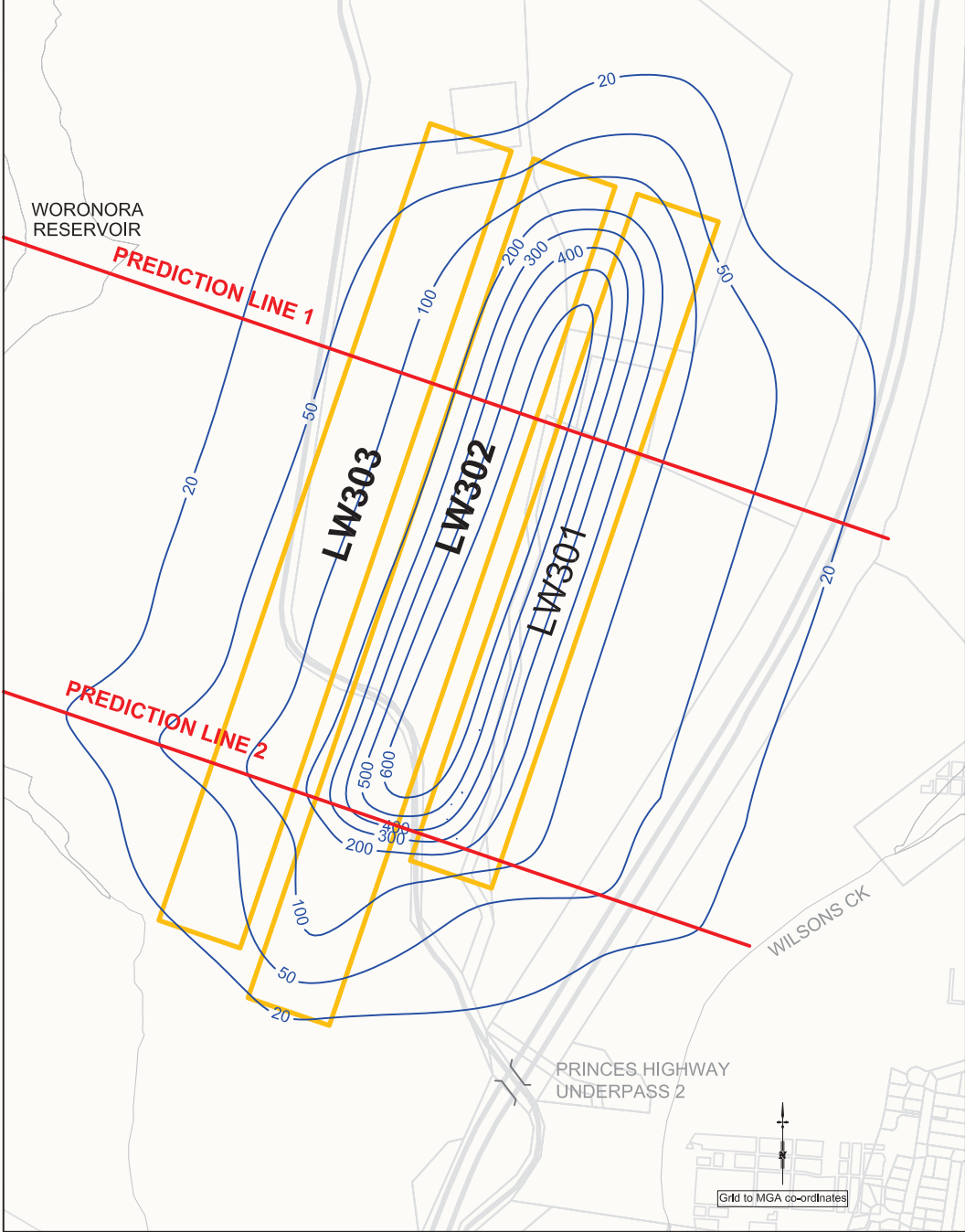
ME1-15-10_301-303 RP.MT_002F

Source: MSEC (2018)

Figure 4

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 METROPOLITAN COLLIERY LONGWALLS 301 TO 303 PREDICTED TOTAL SUBSIDENCE CONTOURS DUE TO LONGWALLS 301 AND 302			
DATE: 11 Sep 2018	SCALE: 1:10000	DRAWING No: MSEC984-12	Rev No A


PREDICTED SUBSIDENCE CONTOURS ARE IN MILLIMETRES (mm)




ME1-15-10_301-303 RP.MT_003F

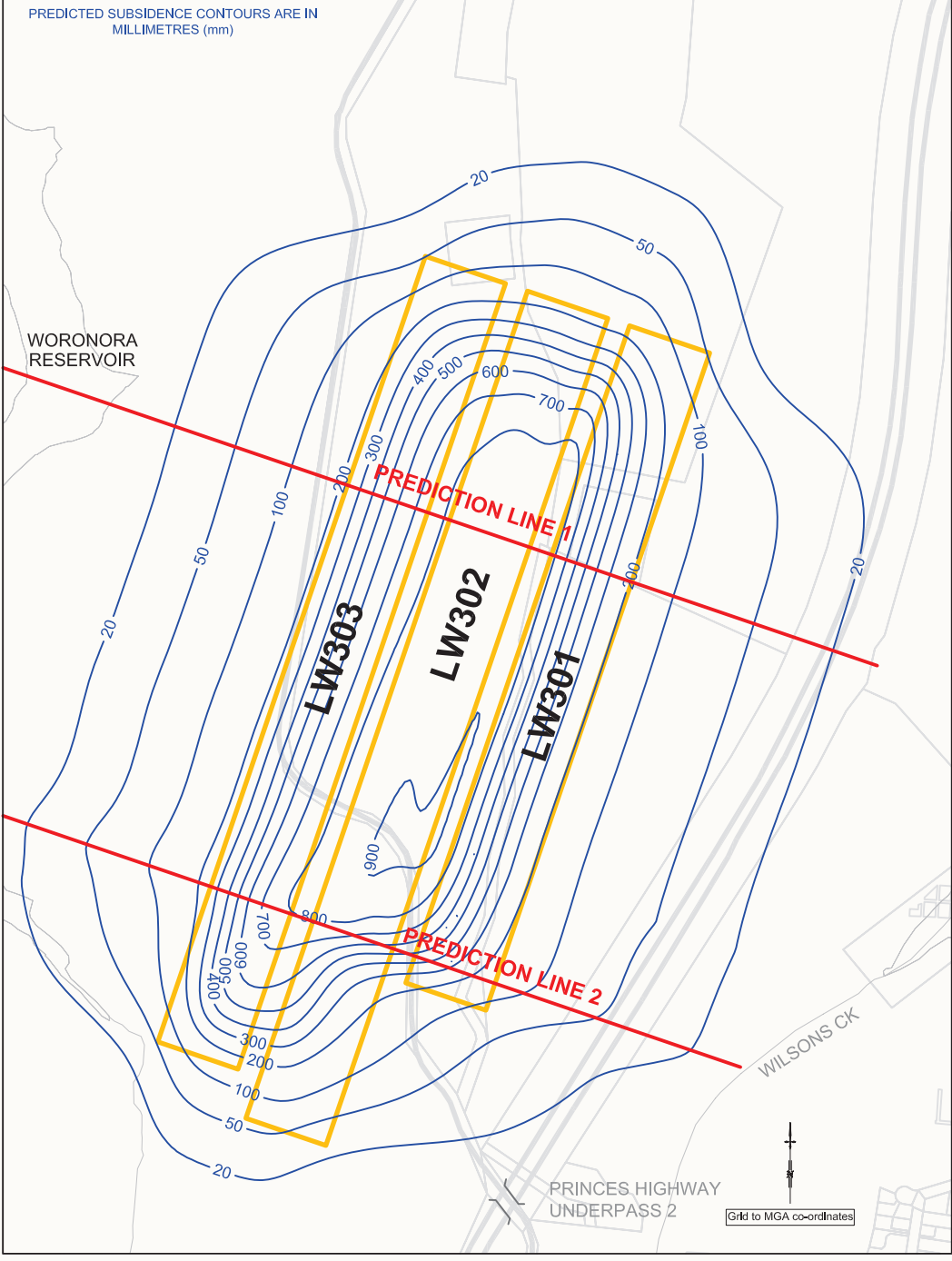
Source: MSEC (2018)

Figure 5


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METROPOLITAN COLLIERY
 LONGWALLS 301 TO 303
 PREDICTED TOTAL SUBSIDENCE
 CONTOURS DUE TO
 LONGWALLS 301 TO 303

DATE: 11 Sep 2018	SCALE: 1:12500	DRAWING No: MSEC984-13	Rev No A
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ME1-15-10_301-303 RP.MT_004F

Source: MSEC (2018)

Figure 6

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

Water Resources	
<i>Catchment yield to the Woronora Reservoir</i>	<i>Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir</i> <i>No connective cracking between the surface and the mine</i>
<i>Woronora Reservoir</i>	<i>Negligible leakage from the Woronora Reservoir</i> <i>Negligible reduction in the water quality of Woronora Reservoir</i>
Watercourses	
<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>
Biodiversity	
<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>
Land	
<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>
Heritage	
<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>
Built Features	
<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 301-303 will be managed in accordance with the relevant requirements of the Project Approval and other approvals, through:

- **Mine Design (including avoidance and subsidence mitigation measures)** – The layout of Longwalls 301-303 has been developed based on geological considerations and to reduce potential subsidence effects at the Garrawarra Centre Complex and at Bridge 2 (M1 Princes Motorway). Longwall 303 has also been shortened at the finishing end to reduce predicted valley closure on the Eastern Tributary.
- **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.
- **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).
- **Adaptive Management** – The implementation of adaptive management where appropriate (Section 4.2).

2 DEVELOPMENT OF THE EXTRACTION PLAN

2.1 RISK ASSESSMENTS

In accordance with the DP&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans*, a number of risk assessments have been undertaken for the Metropolitan Coal Longwalls 301-303 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 HMP.

Suitably qualified and experienced experts endorsed by the Secretary of the DP&E for the preparation of this Extraction Plan participated in the ERA². The ERA process involved the key steps described below.

² Participants included Mr Peter DeBono (Mine Subsidence Engineering Consultants, Subsidence), Dr Noel Merrick (HydroSimulations, Groundwater), Mr Lindsay Gilbert (Hydro Engineering & Consulting, Surface Water), Dr David Goldney (Cenwest Environmental Services, Fauna), Dr Colin Bower (FloraSearch, Flora), Mr Jamie Reeves (Niche Environment and Heritage, Heritage), Mr Joshua Hunt (Resource Strategies, Land), Mr Jon Degotardi (Metropolitan Coal) and Mr Ryan Pascoe (Metropolitan Coal).

Review of Relevant Documentation

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 *Environmental Risk Analysis* (SP Solutions, 2008) conducted for the Project EA (Appendix O of the Project EA).
- The Preferred Project Report (HCPL, 2009).
- The revised subsidence predictions and assessments for the approved changes to the first workings layout for Longwalls 301-303 (Metropolitan Coal, 2016a) (incorporating the rotation of Longwalls 301-317 to be square with the 300 Mains approved in April 2016, and the changes to the first workings layout approved in June 2016).

Risk Identification

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 was conducted on 21 June 2016 via teleconference and was facilitated by an independent specialist, Operational Risk Mentoring.

While the general consensus of the workshop participants was the additional (specific) issues/risks were broadly assessed and ranked as part of the previous *Environmental Risk Analysis* (SP Solutions, 2008) conducted for the Project EA, it was considered necessary to assess some specific potential environmental issues (upland swamps and the Eastern Tributary) in further detail for Longwalls 301-303, considering experience to date from Longwalls 20-27 and other local mines. These were assessed using the same probability, consequence and risk rankings tables as used in the original *Environmental Risk Analysis* (SP Solutions, 2008). The re-assessed risk rankings for Longwalls 301-303 were within the "low" range and consequently it was determined that the potential outcomes could still be integrated into the existing management systems for effective review and monitoring (Metropolitan Coal, 2016b).

ERA Report Review

All ERA participants were asked to review the draft report that was prepared to summarise the outcomes of the risk assessment workshop. Participants' comments were incorporated into the final Metropolitan Coal (2016b) report.

Subsequent to the completion of the ERA, Metropolitan Coal made further revisions to the lengths of Longwalls 302 and 303 (as described in Section 1.3.2).

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2.1.2 Built Features Management Plan Risk Assessments

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

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 DP&E approval for Longwalls 301 and 302 and in consultation with the infrastructure owners, Metropolitan Coal reviewed and where required, revised the risk assessments.

Metropolitan Coal considers all risk control measures and procedures to be feasible to manage all identified risks. The risk control measures and procedures have been incorporated in the Longwalls 301-303 BFMP (Appendix E).

2.1.3 Public Safety Management Plan Risk Assessment

A risk assessment was held for the Longwalls 301-303 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 was held on 2 September 2016 via teleconference and was facilitated by an independent specialist, AXYS Consulting.

A number of 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.

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Monitoring conducted in accordance with the Metropolitan Coal Longwalls 23-27 Water Management Plan identified that the following subsidence 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 minimum iron staining and no diversion of flows/no change in 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**)*

The Secretary of the DP&E and other relevant agencies were notified of the exceedance as soon as practicable after Metropolitan Coal became aware of the exceedance in accordance with Condition 6, Schedule 7 of the Project Approval and in accordance with the Metropolitan Coal Longwalls 23-27 Water Management Plan Contingency Plan. Metropolitan Coal has also provided the Secretary of the DP&E and other relevant agencies with a detailed report on the incident in accordance with Condition 6, Schedule 7 of the Project Approval. Metropolitan Coal is committed to the remediation of pools on the Eastern Tributary.

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 301-303 has been prepared in support of this Extraction Plan by MSEC (2018), with the outcomes of this assessment incorporated into the management plans in Appendices A to D and Appendix F. The Subsidence Report by MSEC (2018) is provided in Appendix I.

The subsidence effects and impacts in the Longwalls 301-303 BFMP (Appendix E) are based on the subsidence assessment prepared for the original Longwalls 301-303 Extraction Plan (Version A), (i.e. prior to the subsequent shortening of Longwalls 301-303). As a result, the subsidence predictions and impact assessments are conservative in Appendix E. Notwithstanding, the Subsidence Report (Appendix I) provides the revised subsidence predictions and impact assessments for built features for the Extraction Plan Layout.

Review of Subsidence Prediction Methodology

The predictions of subsidence effects for Longwalls 301-303 were developed by MSEC (2018) 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 Metropolitan Coal, there is an approximate 90% confidence level that the maximum observed incremental subsidence will be less than the maximum predicted incremental subsidence using the standard model (Appendix I).

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Comparison with Previous Predictions of Subsidence Effects

MSEC (2018) (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 301-303. The maximum predicted total subsidence and tilt for the Extraction Plan Layout are slightly less than predicted based on the Preferred Project Layout. The maximum predicted total hogging curvature for the Extraction Plan Layout is the same as the hogging curvature based on the Preferred Project Layout. The maximum predicted total sagging curvature is also the same for both layouts.

While the predicted maxima are generally similar to those for the Preferred Project Layout for Longwalls 301-303, the predicted subsidence parameters at the southern ends of Longwalls 302 and 303 are greater than those predicted for the Preferred Project Layout. However, these parameters remain below the maximum predicted subsidence parameters based on the Preferred Project Layout across previous Longwalls 20-27 and future 300 series longwalls (e.g. maximum predicted total conventional hogging curvature of 0.11 km^{-1}).

Streams within the 35° angle of draw and/or predicted 20 mm subsidence contour are expected to experience localised and elevated compressive strains resulting from valley related movements (Appendix I). The maximum predicted vertical subsidence, upsidence and closure for the Eastern Tributary, based on the Extraction Plan Layout, are less than the maxima predicted based on the Preferred Project Layout for Longwalls 301-303 (Appendix I). The maximum predicted total closure on the Eastern Tributary within the Longwalls 301-303 35° angle of draw and/or predicted 20 mm subsidence contour is 100 mm.

Predicted Subsidence Impacts

MSEC (2018) (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 301-303. Potential subsidence impacts identified by MSEC (2018) 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.

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At the time of original Longwalls 301-303 Extraction Plan development, the suitably qualified experts (endorsed by the Secretary of the DP&E) conducted a review of the potential environmental consequences due to the extraction of Longwalls 301-303 for the preparation of each management plan. The reviews concluded that there were no additional potential subsidence impacts or environmental consequences resulting from the extraction of Longwalls 301-303 to those identified in the Project EA and Preferred Project Report.

2.4 CONSULTATION

Consultation has been conducted for the Extraction Plan in accordance with the requirements of the Project Approval and in consideration of the DP&E and DRE (2015) *Guidelines for the Preparation of Extraction Plans*. Consultation undertaken with relevant stakeholders to date is described below.

2.4.1 Government Agencies

A summary of the consultation with government agencies and the key issues raised is provided in Table 7. Draft management plans were distributed to relevant government agencies for comment as described in Table 7.

Table 7
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
DP&E	<ul style="list-style-type: none"> • 1 June 2016 – Metropolitan Coal requested the endorsement of Extraction Plan team as suitably qualified and experienced experts. • 15 August 2016 – Draft LMP (Version A) and Draft HMP (Version A) provided. • 9 September 2016 – Draft WMP (Version A) provided. • 20 September 2016 – Draft BMP (Version A) provided. • 10 October 2016 – Draft PSMP (Version A) provided. • 14 October 2016 – revised Draft WMP (Version B), revised Draft LMP (Version B) and Draft MSEC (2016) Subsidence Report provided. • 18 October 2016 – revised Draft BMP (Version B) and revised Draft HMP (Version B) provided. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. • 11 July 2017 – revised Draft BFMPs provided. • 14 November 2017 – revised Draft WMP (Version D) and revised Draft LMP (Version D) provided. • 21 November 2017 – revised Draft HMP (Version D) provided. • January 2018 – proposed approach to Longwall 303 extraction application. • 9 February 2018 – revised Draft BMP (Version D) provided. • 23 February 2018 – revised Draft WMP (Version E) and revised Draft LMP (Version E) provided. • 28 February 2018 – revised Draft HMP (Version F) provided. 	<ul style="list-style-type: none"> • DP&E endorsement of Extraction Plan team. • DP&E indicated support for Extraction Plan to include relevant post-mining requirements of the two previously approved Extraction Plans. • DP&E approved Longwalls 301 and 302, subject to strict conditions (May 2017). • DP&E requested (August 2018).an updated Extraction Plan be submitted addressing stakeholder and DP&E comments.

Table 7
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
DP&E (Cont.)	<ul style="list-style-type: none"> • 8 March 2018 – revised Draft BMP (Version E) provided. • 14 March 2018 – revised Draft BFMP – Garrawarra Centre Complex (Version D) • 6 July 2018 – Longwall 303 Application provided. <p>September 2018 – Submission of Longwalls 301-303 Extraction Plan.</p>	
DRE (now Resources Regulator)	<ul style="list-style-type: none"> • Discussions with the NSW Resources Regulator Principal Subsidence Engineer in relation to the 300 series longwalls, built features and subsidence. • 10 October 2016 – Draft PSMP (Version A) provided. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. • 11 July 2017 – revised Draft BFMPs provided (revised TARPs for Longwalls 301 and 302). • Ongoing consultation in relation to Resources Regulator requirements. • 29 June 2018 and 2 July 2018 – revised Draft BFMPs provided (revised BFMP incorporating Longwall 303). • September 2018 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • Discussions with the NSW Resources Regulator Principal Subsidence Engineer in relation to: <ul style="list-style-type: none"> - 132 kV and 330 kV electricity structures. - Garrawarra Centre Complex – impacts to buildings. - Sydney Trains assets. - Subsidence monitoring.
WaterNSW	<ul style="list-style-type: none"> • 15 August 2016 – Draft LMP (Version A) provided. • 9 September 2016 – Draft WMP (Version A) provided. • 10 October 2016 – Draft PSMP (Version A) provided. • 14 October 2016 – revised Draft WMP (Version B), revised Draft LMP (Version B) and Draft MSEC (2016) Subsidence Report provided. • 18 October 2016 – email from Metropolitan Coal advising the Extraction Plan is required to be submitted prior to the planned workshop, with request for any comments WaterNSW has to date on the draft LMP and draft WMP. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. • 14 November 2017 – revised Draft WMP (Version D) • 23 February 2018 - revised Draft WMP (Version E) • September 2018 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • WaterNSW requested Subsidence Report to assist with review of Draft LMP and Draft WMP. • WaterNSW requested workshop with Metropolitan Coal and relevant specialists to discuss Woronora Reservoir leakage, water quality, subsidence monitoring, and groundwater and subsidence modelling. Workshop with WaterNSW arranged for 17 November 2016. • Key issues raised in WaterNSW's comments on Draft WMP included adaptive management, the revised TARPs, groundwater modelling, and update of relevant information obtained since Project Approval. • Key issues raised on Longwall 303 application submitted to the DP&E included potential impacts on the Eastern Tributary and Woronora Reservoir, monitoring results from Longwalls 301 and 302, and assessment of predicted compliance with performance measures.

Table 7 (Continued)
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
DPI-Water/DPI – CLWD/NRAR	<ul style="list-style-type: none"> • 9 September 2016 – Draft WMP (Version A) provided. • 5 October 2016 – email from DPI-Water with queries and request for water level and quality data. • 7 and 13 October 2016 – emails from Metropolitan Coal responding to DPI-Water's queries and provision of requested data. • 14 October 2016 – revised Draft WMP (Version B) provided. • 26 October 2016 – receipt of DPI-Water's comments on Draft WMP. • November 2016 – Submission of Longwalls 301-303 Extraction Plan and provision of Metropolitan Coal's response to DPI-Water's comments. • 14 November 2017 – revised Draft WMP (Version D) provided to NRAR. • 23 February 2018 – revised Draft WMP (Version E) provided. • 23 May 2018 – Metropolitan Coal responds to NRAR's comments regarding revised Draft WMP (Version E). • September 2018 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • Key issues raised in DPI-Water's comments on Draft WMP included the availability of baseline data, deep groundwater quality monitoring, monitoring sites and equipment, Chart presentation, groundwater model development, and bore census information. • Key issues raised in NRAR's comments included providing Metropolitan Coals WALs in the WMP, an additional bore south of EEC06 and the WMP TARPs.
DPI-Fishing	<ul style="list-style-type: none"> • 20 September 2016 – Draft BMP (Version A) provided. • 14 October 2016 – revised Draft BMP (Version B) provided. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. • 9 February 2018 – revised Draft BMP (Version D) provided. • September 2018 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • No issues raised to date.
OEH	<ul style="list-style-type: none"> • 9 September 2016 – Draft WMP (Version A) provided. • 20 September 2016 – Draft BMP (Version A) provided. • 14 October 2016 – revised Draft WMP (Version B), revised Draft BMP (Version B) and Draft MSEC (2016) Subsidence Report provided. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. • 14 November 2017 – revised Draft WMP (Version D) • 9 February 2018 - revised Draft BMP (Version D) • 23 February 2018 - revised Draft WMP (Version E) • 8 March 2018 - revised Draft BMP (Version E) • September 2018 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • OEH requested Subsidence Report to assist with review of Draft WMP and Draft BMP. • Requested clarification regarding revisions made to swamp vegetation mapping. • Key issues raised by OEH on Version D of WMP include use of up to date information, revised subsidence predictions, subsidence TARP triggers, baseline monitoring data and groundwater modelling. • Key issues raised on Longwall 303 application submitted to the DP&E included updated subsidence modelling, geological features, potential impacts on the Eastern Tributary and comparisons with other mining below reservoirs.

Metropolitan Coal Longwalls 301-303 Extraction Plan

Table 7 (Continued)
Summary of Consultation with Government Agencies

Agency	Consultation Conducted	Key Issues Raised
OEH (Heritage Branch)/OEH (Regional Operations – Illawarra)	<ul style="list-style-type: none"> • 15 August 2016 – Draft HMP (Version A) provided. • 18 October 2016 – revised Draft HMP (Version B) provided. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. • 21 November 2017 – revised Draft HMP (Version D) provided. • 24 January 2018 – revised Draft HMP (Version E) provided. • 28 February 2018 – revised Draft HMP (Version F) provided. • September 2018 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • OEH Regional Operations – Illawarra provided comments on Version E.
Dams Safety Committee (DSC)	<ul style="list-style-type: none"> • 10 October 2016 – Draft PSMP (Version A) provided. • 28 October 2016 – email from DSC indicating the DSC has no comments on the PSMP. • 3 November 2016 – Email sent to DSC confirming DSC had no particular comments on the draft PSMP and that the DSC will consider the mining of Longwalls 301-303 in the Woronora Notification Area as part of the <i>Dams Safety Act, 1978</i> requirements. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. • Ongoing consultation in accordance with DSC approvals. • September 2018 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • Key issues raised on Longwall 303 application submitted to the DP&E included in-seam exploration drilling and a water balance for the 300 area
Mine Subsidence Board (MSB) (now Subsidence Advisory NSW)	<ul style="list-style-type: none"> • 25 July 2016 – Metropolitan Coal letter to MSB requesting confirmation of MSB's consultation requirements. • MSB response (31 July 2016) – Metropolitan Coal to provide a copy of the Extraction Plan on submission. • A representative of the MSB is on the Roads and Maritime Services (RMS) Technical Committee, which has been consulted in relation to the BFMP-RMS. • November 2016 – Submission of Longwalls 301-303 Extraction Plan. 	<ul style="list-style-type: none"> • No issues raised to date.
Environment Protection Authority (EPA)	<ul style="list-style-type: none"> • 25 July 2016 – Metropolitan Coal letter to EPA requesting confirmation of the EPA's consultation requirements. • 15 August 2016 – Email from EPA confirming the EPA has no consultation requirements in regard to the Extraction Plan. • August 2018 – provision of comments to DP&E. 	<ul style="list-style-type: none"> • No requirements for Extraction Plan.
Land and Property Information (LPI) NSW, Department of Lands	<ul style="list-style-type: none"> • 20 July 2016 – Metropolitan Coal letter to LPI-NSW describing potential subsidence effects on survey marks and notification in accordance with the <i>Surveyor General's Directions No.11 Preservation of Survey Infrastructure</i>. 	<ul style="list-style-type: none"> • No issues raised to date.

2.4.2 Landholders

Metropolitan Coal has consulted with all landowners within 600 m of Longwalls 301-303. A title search of land within 600 m of Longwalls 301-303 identified the following (Figure 7):

- two lots are owned by WaterNSW; four lots are owned by The State of NSW (Crown Land);
- two lots are owned by The State of NSW (Garawarra State Conservation Area);
- two lots are owned by the Health Administration Corporation (NSW Health); and
- two lots are owned by Robert and Carolyn Stewart.

Metropolitan Coal also consulted with the Sutherland Shire Sport Flying Association, as the Sutherland Shire Sport Flying Association club house and air strip are located on one of the State of NSW (Crown Land) properties within 600 m of Longwalls 301-303 (although the club house and air strip are located beyond 600 m of Longwalls 301-303).

The Trustees of the Macedonian Orthodox Monastery were also consulted because their land was initially within 600 m of the original planned extent for Longwalls 301-303. The revised extent of Longwalls 301-303 is greater than 600 m from their land (Figure 7).

A summary of consultation undertaken with the landholders (with the exception of WaterNSW and NSW Health) within 600 m of Longwalls 301-303 is provided in Table A2-1 of Attachment 2.

A summary of consultation undertaken with WaterNSW in relation to the Longwalls 301-303 WMP, LMP and PSMP is provided in Table 7 (in Section 2.4.1 above). Consultation undertaken with NSW Health in relation to the Longwalls 301-303 BFMP-Garrawarra Centre Complex is described in Section 2.4.4 and summarised in Table A2-2 and Table A2-3 of Attachment 2.

2.4.3 Aboriginal Groups

A draft of the Longwalls 301-303 HMP was provided to Aboriginal stakeholders registered at Metropolitan Coal for their review and comment on 15 August 2016. Comments were received on the draft Longwalls 301-303 HMP from Cubbitch Barta Native Title Claimants on 22 August 2016.

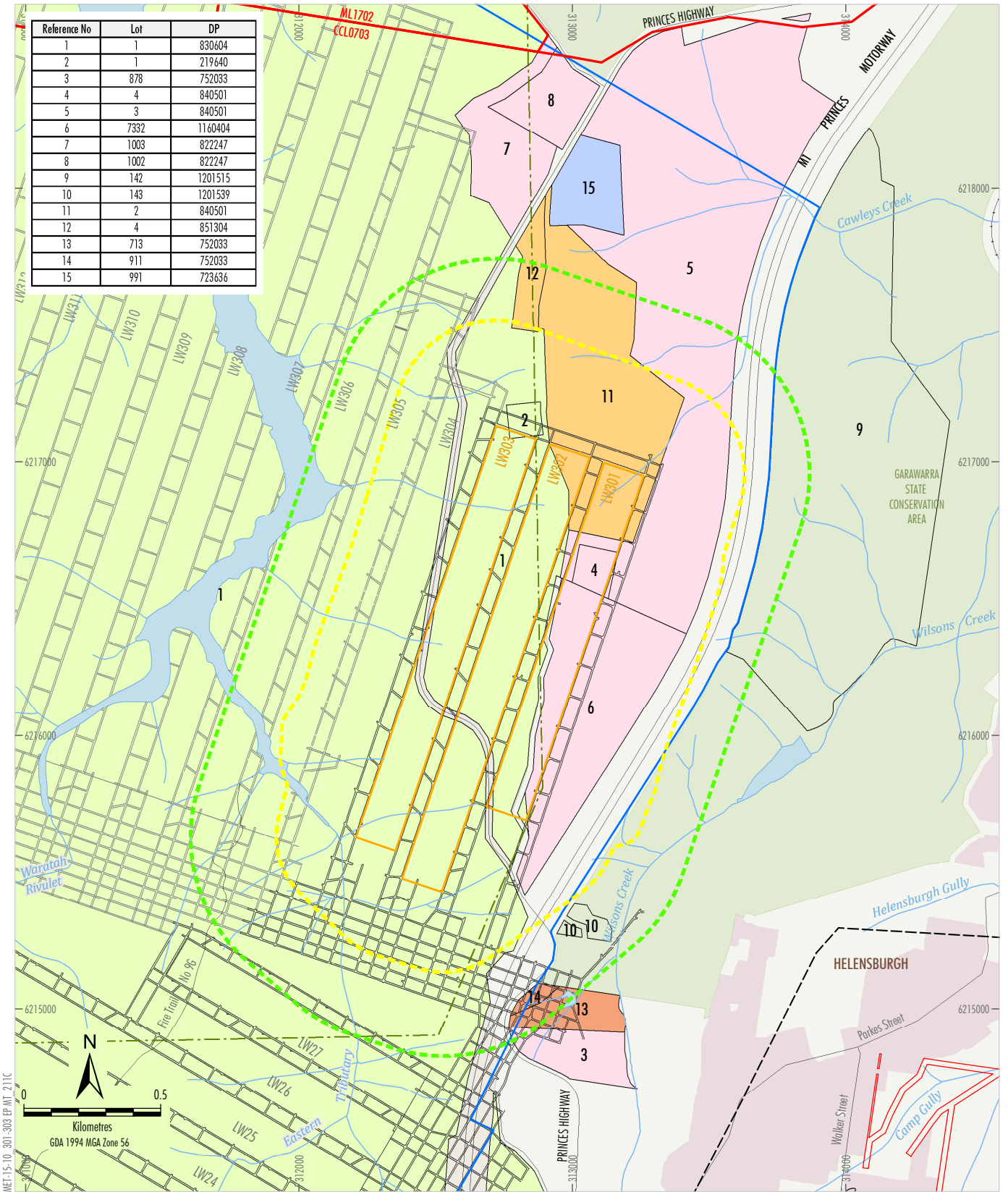
The Longwalls 301-303 HMP was subsequently revised in consideration of the comments received and to reflect the shortening of Longwalls 302 and 303. The revised draft Longwalls HMP was provided to the Aboriginal stakeholders on 18 October 2016.

Metropolitan Coal understands the Illawarra Local Aboriginal Land Council has applied for Aboriginal land claims over Crown Land comprising Lot 878, DP 752033 and Lot 3, DP 840501 (Figure 7). Metropolitan Coal noted the location of these lots in relation to Longwalls 301-303 in their letter to the Illawarra Local Aboriginal Land Council.

Copies of the abovementioned consultation letters are provided in Attachment 2.

The Longwalls 301-303 HMP was subsequently revised in accordance with the conditions of the Longwalls 301 and 302 approval. The revised draft Longwalls HMP (Version D) was provided to the Aboriginal stakeholders on 21 November 2017. No comments were received from the Aboriginal stakeholders.

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- LEGEND**
- Mining Lease Boundary
 - Woronora Special Area
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - 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
(Garawarra State Conservation Area)
 - Health Administration Corporation
 - The Trustees of the
Macedonian Orthodox Monastery
 - R & C Stewart

Source: Land and Property Information (2015, 2016); Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

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METROPOLITAN COAL
Land Ownership Within
600 m of Longwalls 301 - 303

Figure 7

2.4.4 Infrastructure Owners

Consultation with each infrastructure owner/manager was generally conducted in accordance with the following protocol:

- Initial contact to confirm the appropriate infrastructure representative and initial briefing.
- Provision of a specific report by MSEC outlining the subsidence predictions and impact assessment for each infrastructure item.
- Where relevant, Metropolitan Coal funded additional expertise to assist the infrastructure owner to assess appropriate monitoring and management strategies and/or measures.
- Risk assessment workshops were held with representatives from Metropolitan Coal, the infrastructure owner and relevant specialists.
- A draft of the relevant Longwalls 301-303 BFMP was distributed for comment to the relevant infrastructure owner.
- A final draft Longwalls 301-303 BFMP was prepared incorporating comments from the infrastructure owner.

A summary of consultation undertaken with the infrastructure owners for the development of the original Longwalls 301-303 Extraction Plan is provided in Table A2-2 of Attachment 2.

A summary of the draft management plans that were distributed to infrastructure owners since the approval of Longwalls 301 and 302 in May 2017 is provided in Table A2-3 of Attachment 2.

2.4.5 Public Consultation

The Metropolitan Coal Community Consultative Committee (CCC) was advised of the development of the Longwalls 301-303 Extraction Plan at a meeting on 6 April 2016, and was provided with an update on the preparation of the Extraction Plan at a meeting on 10 August 2016. The CCC was informed that submission of the Extraction Plan was anticipated in October 2016.

An electronic copy of the original Extraction Plan (Version A) was provided to the members of the CCC upon submission to the DP&E in November 2016. Metropolitan Coal provided a detailed briefing to the CCC in relation to the Extraction Plan at the December 2016 meeting.

2.4.6 Summary of Management Plans Distributed for Comment

A summary of the draft management plans that have been distributed for comment is provided in Table 8.

Copies of consultation letters provided to the consultees for the original Longwalls 301-303 Extraction Plan development in Table 8 are provided in Attachment 2.

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Table 8
Draft Management Plans Distributed for Comment

Management Plan	Stakeholder	Date Distributed
Water Management Plan	DP&E, WaterNSW, OEH and DPI-Water/CLWD/NRAR	9 September 2016 (Version A) 14 October 2016 (Version B) November 2016 (Version C) 14 November 2017 (Version D) 23 February 2018 (Version E)
Land Management Plan	DP&E and WaterNSW	15 August 2016 (Version A) 14 October 2016 (Version B) November 2016 (Version C) 14 November 2017 (Version D) 23 February 2018 (Version E) - DP&E
Biodiversity Management Plan	DP&E, OEH and DPI-Fishing	20 September 2016 (Version A) 14 October 2016 (Version B) November 2016 (Version C) 9 February 2018 (Version D) 8 March 2018 (Version E) – DP&E
Heritage Management Plan	DP&E, OEH (Heritage Branch)/OEH Regional Operations - Illawarra and Aboriginal Stakeholders	15 August 2016 (Version A) 18 October 2016 (Version B) November 2016 (Version C) 21 November 2017 (Version D) 24 January 2018 (Version E) – DP&E and OEH 28 February 2018 (Version F) – DP&E and OEH
Built Features Management Plan	NSW Health (Garrawarra Centre Complex)	Refer Attachment 2 (Tables A2-2 and A2-3)
	Endeavour Energy	
	TransGrid	
	Vocus (previously Nextgen)	
	Optus	
	Telstra	
	Axicom	
	Sydney Trains	
	Roads and Maritime Services (RMS)	
	Wollongong City Council (WCC) – Old Princes Highway	
	WCC – Waterfall General (Garrawarra) Cemetery	
	Sydney Water	
Public Safety Management Plan	DP&E, DRE (now Resources Regulator), DSC and WaterNSW	10 October 2016 (Version A)

3 SUBSIDENCE MANAGEMENT AND MONITORING

Surface and sub-surface features within the vicinity of Longwalls 301-303 are listed in Table 9. Features within the Study Area (i.e. within the 35° angle of draw and/or 20 mm predicted subsidence contour of Longwalls 301-303) may potentially be impacted by the secondary extraction of Longwalls 301-303. There are also features that lie outside the Study Area 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 (2018) (Appendix I).

The location of natural features and known Aboriginal heritage sites within 600 m of Longwalls 301-303 and surrounds is shown on Figures 8, 9 and 10. The location of surface infrastructure/built features over and adjacent to the Longwalls 301-303 Study Area is shown on Figures 11a, 11b and 12. Descriptions of each of these features are contained within the relevant management plan referenced in Table 9.

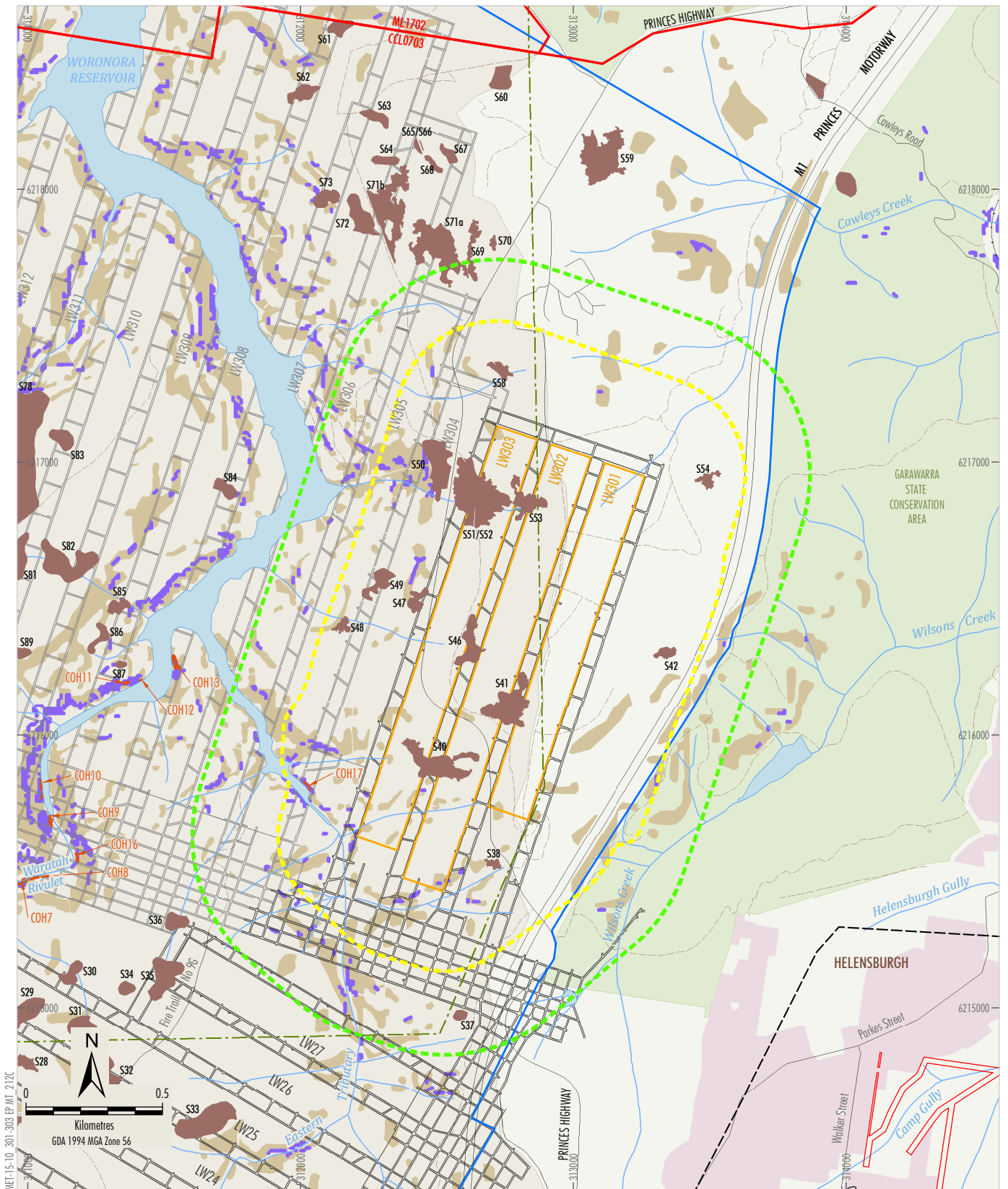
Subsidence predictions and potential impacts to surface and sub-surface features are provided and described in MSEC (2018) (Appendix I).

Management measures and monitoring for each feature are included in each of the management plans as indicated in Table 9 and summarised in Sections 3.1 to 3.6.

The Longwalls 301-303 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.

Table 9
Surface and Sub-surface Features

Feature	Section/Management Plan Reference
Natural Features	
Streams (including Eastern Tributary and other small first and second order tributaries)	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)
Threatened Species, Populations and Ecological Communities and their Habitat	
Natural Vegetation	
Public Utilities and Other Infrastructure	
NSW Health – Garrawarra Centre Complex	Section 3.5 and BFMP (Appendix E)
Endeavour Energy – Electrical Infrastructure	
TransGrid – Electrical Infrastructure	
Vocus – Telecommunications Infrastructure	
Optus – Telecommunications Infrastructure	
Telstra – Telecommunications Infrastructure	
Axicom – Telecommunications Infrastructure	
Sydney Trains – Illawarra Railway and Telecommunications Infrastructure	
RMS – M1 Princes Motorway and Bridges	
WCC – Old Princes Highway	
WCC – Waterfall General (Garrawarra) Cemetery	
Sydney Water – Water Pipelines	
Woronora Reservoir	
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)
Areas of Archaeological and/or Heritage Significance	
Known Aboriginal Heritage Sites	Section 3.4 and HMP (Appendix D)
Waterfall General (Garrawarra) Cemetery	Section 3.5 and BFMP (Appendix E)
Garrawarra Centre Complex	



LEGEND

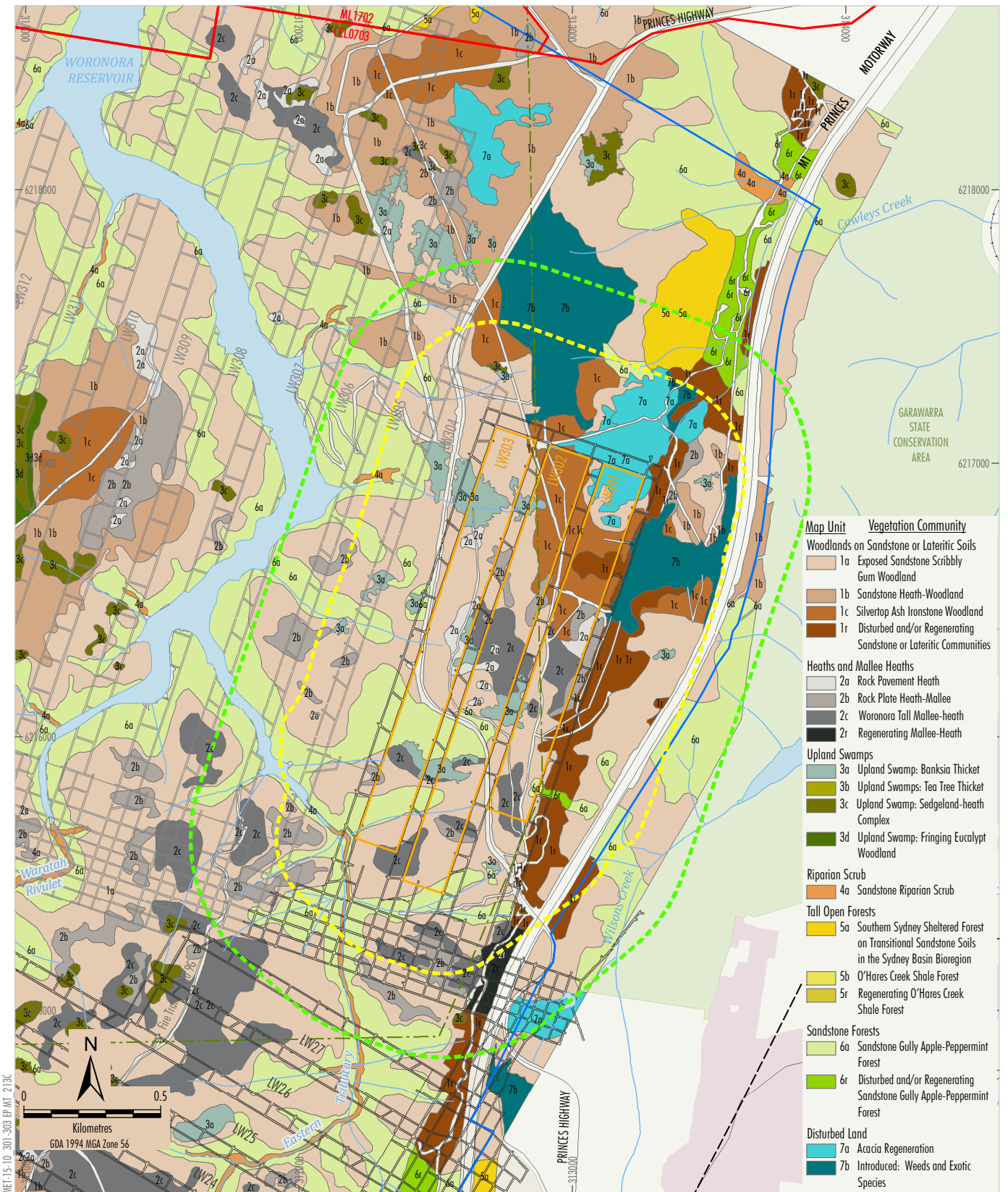
- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area
Longwalls 20-27 and 301-317
- Longwalls 301-303 Secondary Extraction
- 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
- 600 m from Secondary Extraction of
Longwalls 301-303
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)
- Road
- Vehicular Track
- Streams
- Cliffs and Overhangs
- Steep Slopes (Project Approval)
- Steep Slopes (Project Environmental Assessment)
- Upland Swamp

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



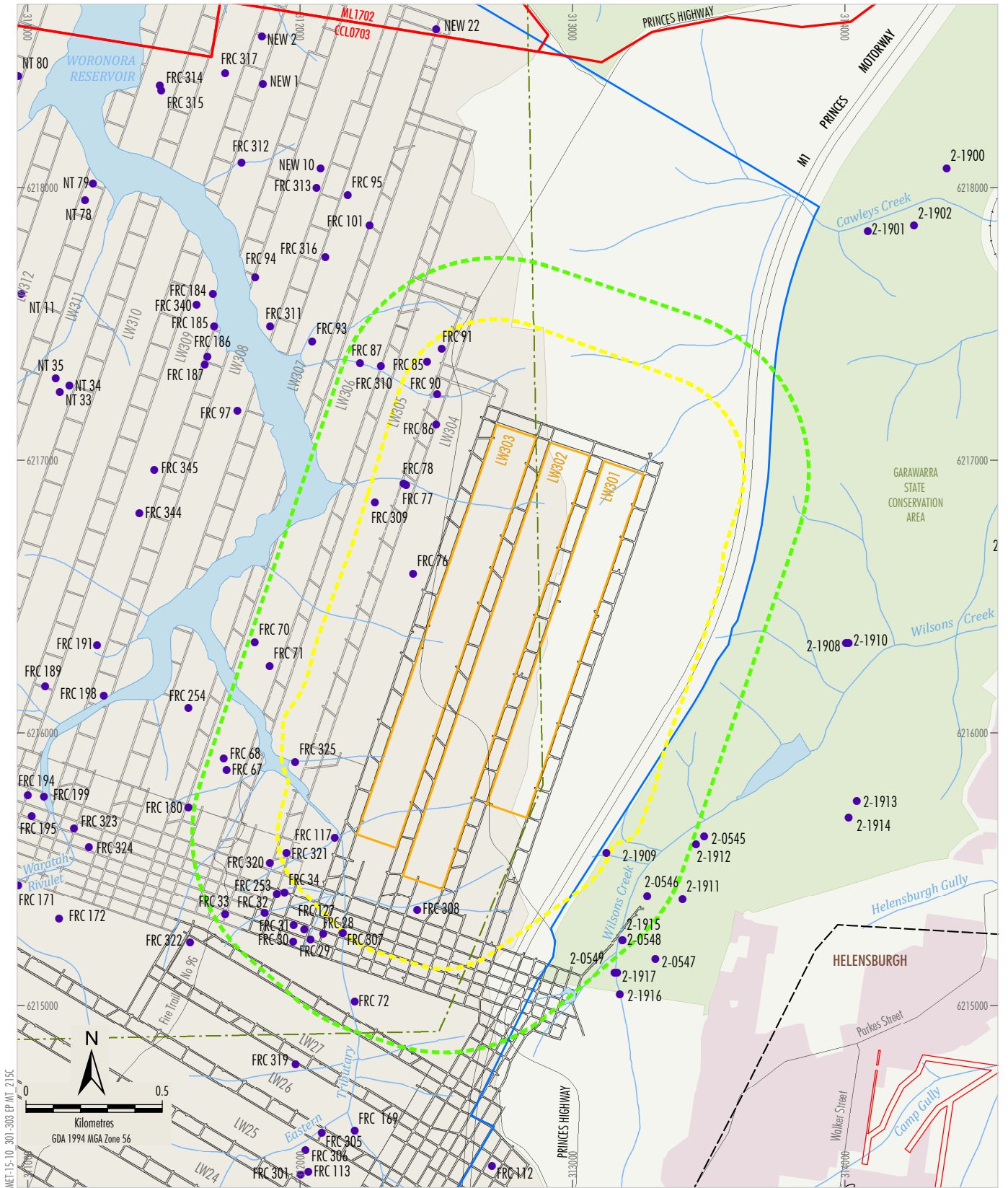
METROPOLITAN COAL
Streams, Cliffs and Overhangs, Steep Slopes
and Upland Swamps within 600 m of
Longwalls 301-303 and Surrounds

Figure 8



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

Figure 9



MEF-15-10-301-303 EP ANT 2.15C

LEGEND

- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area Longwalls 20-27 and 301-317
- Longwalls 301-303 Secondary Extraction
- 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
- 600 m from Secondary Extraction of Longwalls 301-303
- Existing Underground Access Drive (Main Drift)
- Woronora Notification Area
- Aboriginal Heritage Site

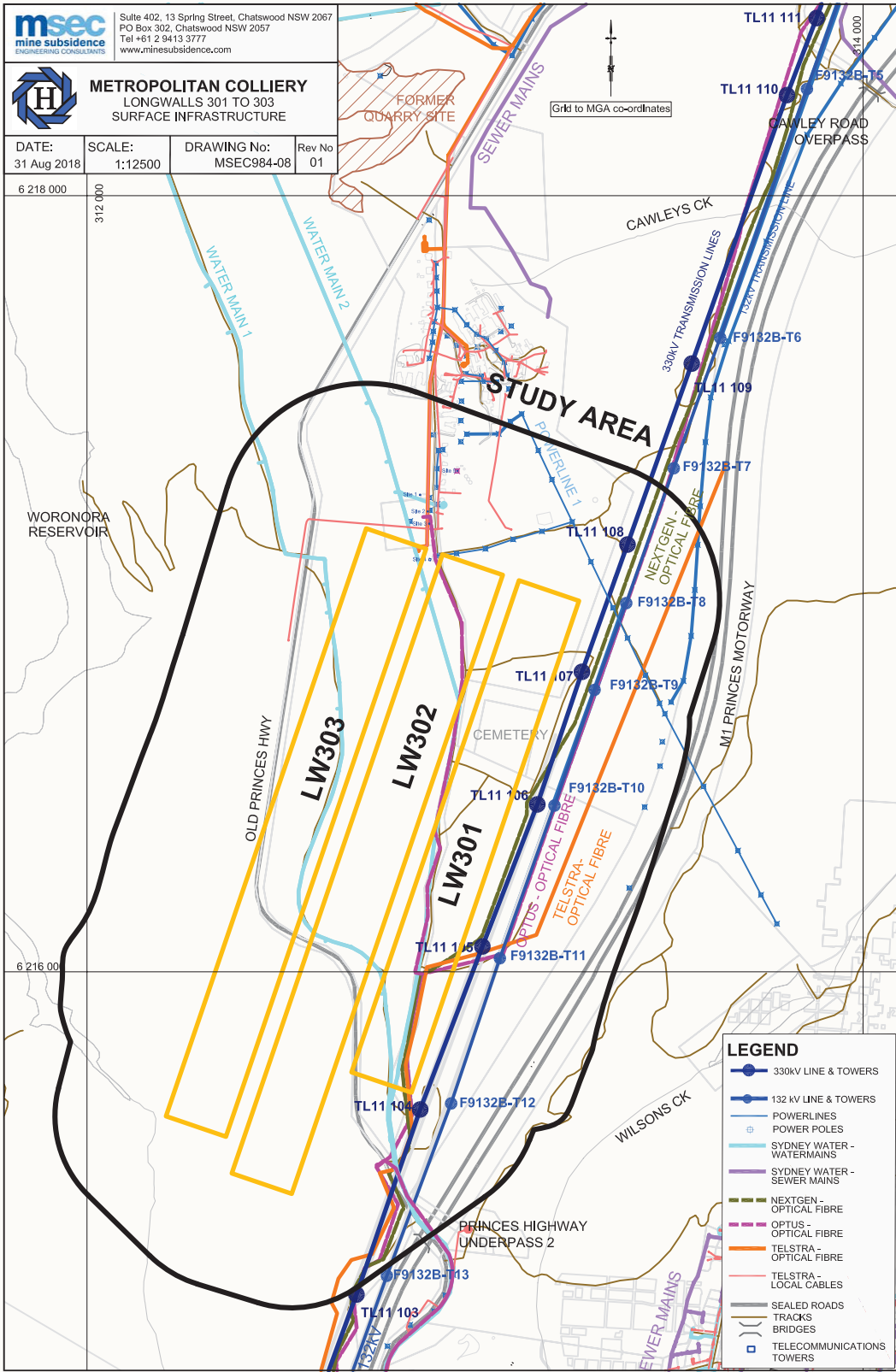
Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018); Illawarra Prehistory Group (2007; 2008); AHIMS (2007); Kayandel Archaeological Services (2006; 2007; 2008); Niche Environmental and Heritage (2013)

Peabody

METROPOLITAN COAL

Known Aboriginal Heritage Sites within 600 m of Longwalls 301 - 303 and Surrounds

Figure 10



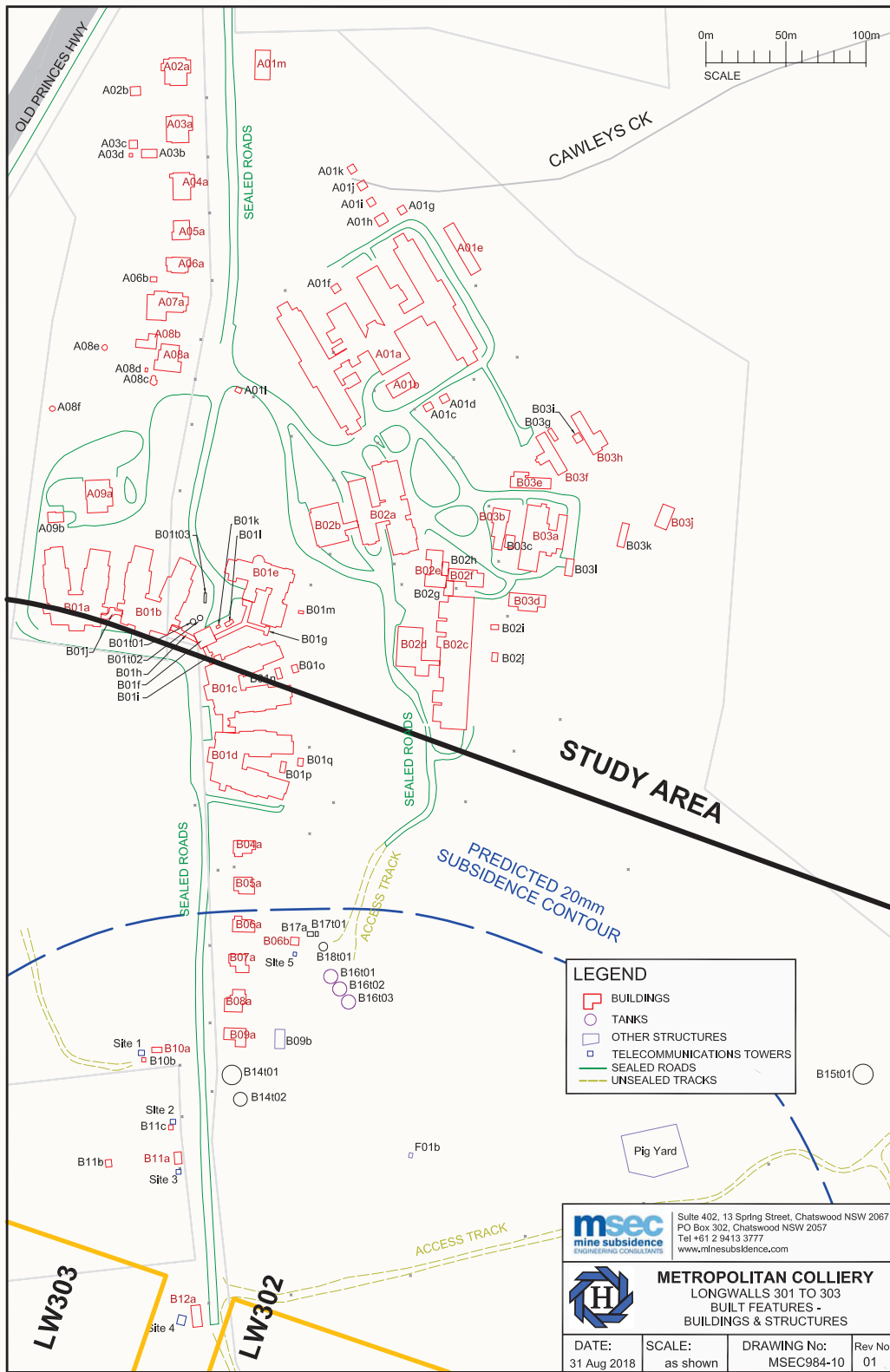
ME1-15-10_301-303 RP.MT_005D

Source: MSEC (2018)



METROPOLITAN COAL
Surface Infrastructure Over and Adjacent to
the Longwalls 301 - 303 Study Area

Figure 11a



ME-15-10_301-303 RP.MT_007D

Source: MSEC (2018)

Peabody

METROPOLITAN COAL
Location of the Garrawarra Centre Complex
Building Structures and Built Features

Figure 12

3.1 WATER MANAGEMENT

3.1.1 Overview

The Longwalls 301-303 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 301-303.

3.1.2 Key Water Issues, Monitoring and Management Measures

The Waratah Rivulet is located approximately 1 km west of Longwall 303, at its closest point to Longwalls 301-303 secondary extraction (Figure 8). At this distance, the Waratah Rivulet is not predicted to experience any measurable subsidence or valley related movements resulting from the extraction of Longwalls 301-303 (Appendix I).

The Eastern Tributary flows in a northerly direction into the Woronora Reservoir. Within the Longwalls 301-303 35° angle of draw and/or predicted 20 mm subsidence contour, the Eastern Tributary flows into the full supply level of the Woronora Reservoir (Figure 8). Longwalls 301-303 do not directly mine beneath the Eastern Tributary (Figure 8). The maximum predicted closure along the Eastern Tributary within the 35° angle of draw and/or predicted 20 mm subsidence contour after Longwall 303 is 100 mm (Appendix I). The maximum predicted total closure on the lower reaches of the Eastern Tributary (i.e. outside of the 35° angle of draw and/or predicted 20 mm subsidence contour) as a result of the Extraction Plan Layout is less than 200 mm.

Small first and second order streams also occur over and adjacent to Longwalls 301-303 (Figure 8) and could experience the full range of predicted subsidence movements.

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 10 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 11. Monitoring against these performance indicators during the mining of Longwalls 301-303 is summarised in Table 10 and Section 3.7 and described in detail in Appendix A.

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Table 10
Management Issues for Water Resources and Watercourses
During the Extraction of Longwalls 301-303

Issue	Approved Impact	Monitoring	Management
Catchment yield to the Woronora Reservoir	<ul style="list-style-type: none"> Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir. No connective cracking between the surface and the mine. 	Monitoring in accordance with the WMP, including: <ul style="list-style-type: none"> Groundwater pressure/level monitoring. Groundwater quality monitoring. Stream flow monitoring. Pool water level monitoring. Surface water quality monitoring. Visual inspections of stream cracking, gas releases, iron staining and drainage behaviour. Inspections of underground workings for water accumulation. Mine water make. Subsidence monitoring in accordance with the SMP.	<ul style="list-style-type: none"> Mine design – shortening of Longwall 303. Stream remediation. Additional monitoring (e.g. increase in monitoring frequency or additional sampling). Offsets. Adaptive management. Revegetation measures.
Woronora Reservoir	<ul style="list-style-type: none"> Negligible leakage from the Woronora Reservoir. Negligible reduction in water quality of Woronora Reservoir. 		
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"> 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	<ul style="list-style-type: none"> 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). 		

Table 11
Water Resources and Watercourses Performance Measures and Performance Indicators

Performance Measure	Performance Indicator(s)
Negligible reduction to the quantity of water resources reaching the Woronora Reservoir	<ul style="list-style-type: none"> 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).
Negligible reduction to the quality of water resources reaching the Woronora Reservoir	<ul style="list-style-type: none"> 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.
No connective cracking between the surface and the mine	<ul style="list-style-type: none"> Visual inspection does not identify abnormal water flow from the goaf, geological structure, or the strata generally. The 20-day average mine water make does not exceed 1 ML/day. Significant departure from the predicted envelopes of vertical potentiometric head profiles at Bores 9GGW2B and F6GW3A do not occur.
No connective cracking between the surface and the mine. Negligible leakage from the Woronora Reservoir.	<ul style="list-style-type: none"> The hydraulic gradient to the Woronora Reservoir at full supply level from Bore F6GW4A is reduced by no more than 20% from that measured to 30 June 2017. The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PHGW2A is reduced by no more than 20% from that measured to 30 June 2017.

Table 11 (Continued)
Water Resources and Watercourses Performance Measures and Performance Indicators

Performance Measure	Performance Indicator(s)
Negligible leakage from the Woronora Reservoir	<ul style="list-style-type: none"> • The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9GGW2B is reduced by no more than 40% from that measured to 30 June 2017. • The hydraulic gradient to the Woronora Reservoir at full supply level from Bore 9EGW2A is reduced by no more than 20% from that measured to 30 June 2017. • The hydraulic gradient to the Woronora Reservoir at full supply level from Bore PM02 is reduced by no more than 20% from that measured to 30 June 2017. • The water level at bore T2 is greater than 170.0 m. • The water level at bore T3 is greater than 171.8 m. • The hydraulic gradient from transect bore T5 to bore T3 is reduced by no more than 10% from that measured on 30 June 2017.
Negligible reduction in the water quality of Woronora Reservoir	<ul style="list-style-type: none"> • Changes in the quality of water in the Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations.
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"> • No change to the natural drainage behaviour of Pools P, Q, R, S, T, U, V and W. • 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. • 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. • 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). • 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.
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"> • No change to the natural drainage behaviour of Pools ETAS, ETAT and ETAU. • Analysis of water level data for Pool ETAU indicates the water levels are above that required to maintain water over the downstream rock bar. • 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.

The procedure that will be followed to assess the extraction of Longwalls 301-303 against the performance indicators and performance measures is outlined in Figure 13 and described in detail in the WMP (Appendix A).

Monitoring conducted in accordance with the Metropolitan Coal Longwalls 23-27 Water Management Plan identified that the following subsidence 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**)*

The Secretary of the DP&E and other relevant agencies were notified of the exceedance as soon as practicable (14 October 2016) after Metropolitan Coal became aware of the exceedance in accordance with Condition 6, Schedule 7 of the Project Approval and in accordance with the Metropolitan Coal Longwalls 23-27 Water Management Plan Contingency Plan. Subsequent incident reports were provided to the DP&E and other relevant agencies on 21 October 2016, 25 November 2016, 21 December 2016, 3 February 2017 and 21 February 2017 and provided a concise summary of information relevant to the performance of the mine relative to its Extraction Plans and Approval Conditions for the Eastern Tributary.

In accordance with the Water Management Plan Contingency Plan, Metropolitan Coal will implement stream remediation measures on the Eastern Tributary.

3.1.4 Contingency Plan

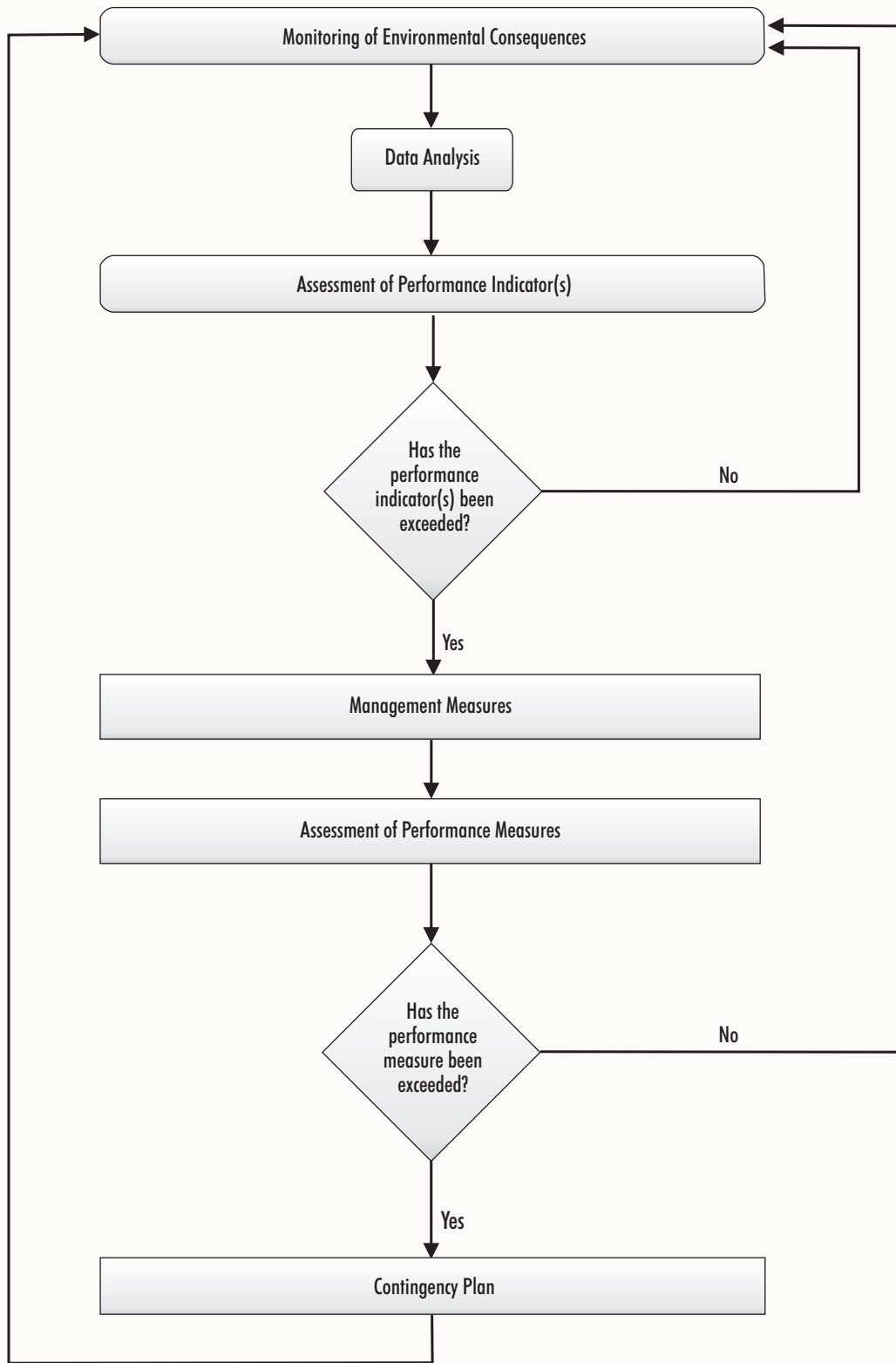
In the event that a water resource or watercourse subsidence impact performance measure is exceeded, Metropolitan Coal will implement a Contingency Plan as described in the WMP and summarised in Section 4.1. Potential contingency measures for an exceedance of the water resource or watercourse performance 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 reduce the extent of fracturing.
- 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 DP&E.
- 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 reducing the thickness of the coal seam extracted, narrowing of the longwall panels and/or increasing the setback of the longwalls from the affected area.

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. Metropolitan Coal has also shortened the finishing end of Longwall 303 to reduce the maximum predicted valley closure on the Eastern Tributary within the 35° angle of draw and/or predicted 20 mm subsidence contour to 100 mm and to maintain the predicted valley closure along the lower reach of the Eastern Tributary (i.e. outside of the 35° angle of draw and/or predicted 20 mm subsidence contour) to less than 200 mm.

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3.2 LAND MANAGEMENT

3.2.1 Overview

The Longwalls 301-303 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 301-303.

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).

One cliff and overhang site (COH17) has been identified within 600 m of Longwalls 301-303 secondary extraction (Figure 8). Detailed baseline recording of this newly identified cliff and overhang site will be undertaken prior to commencement of extraction of Longwall 303. Visual inspections for subsidence impacts on cliff site COH17 will be conducted monthly when Longwall 303 extraction is within 400 m of the site. Following the completion of Longwall 303 extraction, site COH17 will also be inspected to record any additional subsidence impacts to those previously recorded.

The next nearest cliff and overhang sites are located approximately 800 m to the west of Longwalls 301-303 (Figure 8). At this distance, it is unlikely that the cliffs would experience adverse impacts resulting from the extraction of Longwalls 301-303 (Appendix I).

In 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 301-303 (Appendix I). Land in general includes other land features such as fire trails and vehicular tracks (Figure 8), 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 12 and Section 3.7.

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Table 12
Management Issues for Land During the Extraction of Longwalls 301-303

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

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, as specified 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 site COH17 experiences 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 are expected to experience sandstone fracturing and subsequent rock falls consistent with that observed during the extraction of previous longwalls at Metropolitan Coal.

Monitoring against the performance indicators and performance measure during the mining of Longwalls 301-303 is summarised in Table 12 and Section 3.7 and described in detail in Appendix B.

The procedure that will be followed to assess the extraction of Longwalls 301-303 against the performance indicator and performance measure is outlined in Figure 13 and described in detail in the LMP (Appendix B).

3.2.4 Contingency Plan

In the event that 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.

3.3 BIODIVERSITY MANAGEMENT

3.3.1 Overview

The Longwalls 301-303 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 301-303.

3.3.2 Key Biodiversity Issues, Monitoring and Management Measures

Fourteen upland swamps are located within the 35° angle of draw and/or predicted 20 mm subsidence contour, including six located directly above Longwalls 301-303 (Figure 8). All of the upland swamps are valley side swamps.

Riparian vegetation and habitats for aquatic biota occur along streams which flow to the Woronora Reservoir (including the 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 301-303 secondary extraction include woodlands on sandstone or lateritic soils, heaths and mallee heaths, tall open forests, 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 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 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. An occurrence of the Southern Sydney Sheltered Forest on Transitional Sandstone Soils in the Sydney Basin Bioregion EEC is situated to the north of Longwall 301 and outside of the Longwalls 301-303 35 ° angle of draw and/or 20 mm subsidence contour (Figure 9).

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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 13 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.

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 14. Monitoring against these performance indicators during the mining of Longwalls 301-303 is summarised in Table 13 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 301-303 against the performance indicators and performance measures is outlined in Figure 13 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.

Table 13
Management Issues for Biodiversity During the Extraction of Longwalls 301-303

Issue	Approved Impact	Monitoring	Management
Threatened species, populations, or ecological communities	Negligible impact	<i>Upland Swamps</i> <ul style="list-style-type: none"> • Vegetation monitoring. <ul style="list-style-type: none"> - Visual inspections. - Transect/Quadrat monitoring. - Indicator species. • Groundwater monitoring. 	<ul style="list-style-type: none"> • Swamp remediation techniques. • Additional monitoring (e.g. increase in monitoring frequency or additional sampling).
		<i>Riparian Vegetation</i> <ul style="list-style-type: none"> • Vegetation monitoring. <ul style="list-style-type: none"> - Visual inspections. - Quadrat monitoring. - Indicator species. 	<ul style="list-style-type: none"> • Stream remediation. • Weed control measures. • Planting of endemic species. • Stream bank erosion control measures in accordance with the WMP. • Management measures for impacts associated with cliffs and overhang sites include: <ul style="list-style-type: none"> – the implementation of erosion and sediment control measures; and – stabilisation techniques; in accordance with the LMP. • Additional monitoring (e.g. increase in monitoring frequency or additional sampling).

Table 13 (Continued)
Management Issues for Biodiversity During the Extraction of Longwalls 301-303

Issue	Approved Impact	Monitoring	Management
Threatened species, populations, or ecological communities (Cont.)	Negligible impact (Cont.)	<p>Slopes and Ridgetops</p> <ul style="list-style-type: none"> • Visual inspections of cliffs and overhangs, steep slopes and land in general. 	<ul style="list-style-type: none"> • Management measures for impacts associated with cliffs and overhang sites include: <ul style="list-style-type: none"> – the implementation of erosion and sediment control measures; and – stabilisation techniques; in accordance with the LMP. • Filling of surface tension cracks in accordance with the LMP.
		<p>Aquatic Biota and their Habitats</p> <ul style="list-style-type: none"> • Watercourses (i.e. aquatic habitats) in accordance with WMP. • Aquatic biota stream monitoring. • Aquatic biota pool monitoring. 	<ul style="list-style-type: none"> • Stream remediation. • Additional monitoring (e.g. increase in monitoring frequency or additional sampling). • Adaptive management.
		<p>Terrestrial Fauna and their Habitats</p> <ul style="list-style-type: none"> • Terrestrial fauna habitats, as discussed for upland swamps, riparian vegetation, slopes and ridgetops and aquatic habitats above. • Amphibian monitoring. 	<ul style="list-style-type: none"> • Swamp remediation techniques. • Stream remediation. • Weed control measures. • Planting of endemic species. • Stream bank erosion control measures in accordance with the WMP. • Management measures for impacts associated with cliffs and overhang sites include: <ul style="list-style-type: none"> – the implementation of erosion and sediment control measures; and – stabilisation techniques; in accordance with the LMP. • Filling of surface tension cracks in accordance with the LMP. • Additional monitoring (e.g. increase in monitoring frequency or additional sampling). • Adaptive management.

Table 14
Biodiversity Performance Measure and Performance Indicators

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

3.4 HERITAGE MANAGEMENT

3.4.1 Overview

The Longwalls 301-303 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 301-303.

3.4.2 Key Aboriginal Heritage Issues, Monitoring and Management Measures

No known Aboriginal heritage sites occur directly above Longwalls 301-303 (Figure 10). One open site with grinding grooves (FRC 307) is located within the Longwalls 301-303 35° angle of draw and/or predicted 20 mm subsidence contour. Thirteen known sandstone overhang sites are located within the Longwalls 301-303 35° angle of draw and/or predicted 20 mm subsidence contour (Figure 10). Of the 13 sites with overhangs, six have art only and seven have art and/or artefacts and/or Potential Archaeological Deposit (PAD).

No Aboriginal heritage sites of high archaeological significance are located within the 35° angle of draw and/or predicted 20 mm subsidence contour of Longwalls 301-303. No sites or areas of particular cultural significance have been identified within the area bound by the Longwalls 301-303 35° angle of draw and/or predicted 20 mm subsidence contour. Notwithstanding, 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 15 and Section 3.7.

Table 15
Management Issues for Aboriginal Heritage During the Extraction of Longwalls 301-303

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

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 16. Monitoring against the performance indicator during the mining of Longwalls 301-303 is summarised in Table 15 and Section 3.7 and described in detail in the HMP (Appendix D).

Table 16
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"> overhang collapse; cracking of sandstone that coincides with Aboriginal art or grinding grooves; and rock fall that damages Aboriginal art.

The procedure that will be followed to assess the extraction of Longwalls 301-303 against the performance indicator and performance measure is outlined in Figure 13 and described in detail in the HMP (Appendix D).

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 Longwalls 301-303 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 301-303.

3.5.2 Key Built Features Issues, Monitoring and Management Measures

Built features within the vicinity of Longwalls 301-303 consist of (Figures 11a, 11b and 12):

- telecommunication towers and compounds (Telstra, Axicom and Sydney Trains);
- telecommunication (e.g. optical fibre, copper) cabling (Telstra, Vocus, Optus, Garrawarra Centre Complex);
- underground water mains (Sydney Water);
- Waterfall General (Garrawarra) Cemetery;
- public roads (M1 Princes Motorway [RMS] and Old Princes Highway [WCC]) and associated infrastructure (e.g. culverts, cuttings, roadside furniture);
- private roads (Garrawarra Centre Complex);
- bridges (RMS);
- Illawarra Railway (Sydney Trains);
- local power distribution and wooden poles (Endeavour Energy, Garrawarra Centre Complex);
- electricity transmission lines and transmission structures (330 kilovolt [kV] [TransGrid] and 132 kV [Endeavour Energy]);
- access roads/tracks (including fire trails and vehicular tracks);
- water storage tanks (Garrawarra Centre Complex);
- gas storage tank and connecting pipelines (Garrawarra Centre Complex);
- aged care (occupied) buildings (Garrawarra Centre Complex);
- abandoned buildings (Garrawarra Centre Complex); and
- houses and associated infrastructure (Garrawarra Centre Complex).

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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)³. The relevant monitoring and management measures for these built features are summarised in Table 17 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 17. Monitoring against the performance indicators is described in detail in the component plans of the BFMP and summarised in Table 17 and Section 3.7.

Of specific relevance to the Garrawarra Centre Complex, a subsidence impact performance measure outlined in Table 1 of Condition 1, Schedule 3 in relation to items of historical or heritage significance at the Garrawarra Centre Complex is:

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.

Performance indicators developed for the subsidence impact performance measure relating to items of historical or heritage significance are presented in the Garrawarra Centre Complex component of the BFMP, and are summarised in Table 17. Monitoring conducted against the performance indicators is described in detail in the Garrawarra Centre Complex component of the BFMP and is summarised in Table 17 and Section 3.7.

The procedure followed to assess the extraction of Longwalls 301-303 against the performance indicators and performance measures is outlined in Figure 13 and described in detail in the component plans of the BFMP (Appendix E).

³ As described in Section 2.3.1, the subsidence predictions and impact assessments are conservative in Appendix E.

Table 17
Built Features Performance Indicators, Monitoring and Management Measures

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
<p>Garrawarra Centre Complex (NSW Health) abandoned hospital buildings, aged care building structures and houses and associated infrastructure, water storage tanks, trickle filter tank, gas storage tank, kiln and telecommunications towers and associated compounds</p>	<ul style="list-style-type: none"> • No greater tilt impacts to buildings than Category A or B for items of historical or heritage significance. • No greater strain impact to buildings than Category 0 or 1 for items of historical or heritage significance. • No more than repairable (minor) defects (cracks, etc.) in the structural integrity for all other buildings, houses, structures and other services due to mining. • The electrical clearance from vegetation is maintained. • Serviceability of the private roads and access roads/tracks has been maintained. • The land in general is expected to experience minor cracking consistent with that observed during the extraction of previous longwalls at Metropolitan Coal (i.e. no more than minor cracking). 	<ul style="list-style-type: none"> • Subsidence, tilt, tensile strain and compressive strain. • Structural integrity. • Cracking at pre-existing rock joints. • Tilt at pre-existing tilted piers. • Opening and closing of joints. • Leaks. • Cracking in columns, elevated ring beam or central access shaft. • Structural integrity of the kiln chimney. • Structural integrity of the telecommunications tower and compound. • Degradation of structure. • Vegetation, land and road clearance. • Cracks or leaks in the pipelines. • Surface cracks, buckling and general safety. 	<p>A number of potential management measures in relation to the Garrawarra Centre Complex are considered to be applicable. These include:</p> <ul style="list-style-type: none"> • For buildings or houses requiring repairs, normal building maintenance techniques could be applied in consultation with NSW Health and relevant authorities. • For the water storage tanks, if the tank base or lower sections of the tank walls were to develop leakage or if pre-existing leakage were to increase, the tank could be temporarily drained and lined with high-density polyethylene (HDPE) to establish a watertight envelope. For water pipelines, leaks could be remediated by locally exposing the pipeline and repairing or replacing the affected section. • For powerlines and poles, management measures may include alteration of conductor tensions or strengthening of timber poles footings. • For the kiln, a barrier fence will be erected to maintain an exclusion zone with a radius of 1.5 times the chimney height during active mining (i.e. which may result in impact on the kiln). <p>Management measures for access roads/tracks will be implemented in accordance with the LMP.</p> <p>Management measures for other services at the Garrawarra Centre Complex have also been developed separately with each asset owner in the BFMPs (e.g. Endeavour Energy, Sydney Water, Telstra, Axicom and Sydney Trains).</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>

Table 17 (Continued)
Built Features Performance Indicators, Monitoring and Management Measures

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
<p>Endeavour Energy 132 kV transmission line and towers and other high voltage powerlines and poles</p>	<ul style="list-style-type: none"> • The structural integrity of the 132 kV transmission lines and towers is maintained. • The structural integrity of the timber poles and high voltage powerlines is maintained. • The electrical clearance from vegetation is maintained. • The serviceability of the access roads/tracks is maintained. 	<ul style="list-style-type: none"> • Subsidence, tilt, tensile strain, compressive strain, absolute horizontal translation, and differential leg movement. • Degradation of tower structure. • Degradation of tower foundations/footings. • Vegetation, land and road clearance. • Integrity and function of support clamps or other items. • Movement of insulator strings/conductors. • Surface cracks, buckling, and general safety. 	<p>A number of potential management measures in relation to 132 kV towers and transmission lines and other high voltage powerlines and poles are considered to be applicable. These include:</p> <ul style="list-style-type: none"> • alteration of conductor tensions; • modification to attachment points such as placement of stringing sheaves to earth wires and/or phase conductors; • strengthening of tower structures through installation of cruciform footings; and • strengthening of timber poles' footings. <p>Management measures for access roads/tracks will be implemented in accordance with the LMP.</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>
<p>TransGrid 330 kV transmission line and towers</p>	<ul style="list-style-type: none"> • The structural integrity of the transmission line and towers is maintained. • The electrical clearance from vegetation is maintained. • The serviceability of access roads/tracks is maintained. 	<ul style="list-style-type: none"> • Subsidence, tilt, tensile strain, compressive strain, absolute horizontal translation and differential leg movement. • Surface cracks, buckling and general safety. • Real-time survey monitoring trial. • Degradation of tower foundations/footings. • Movement of insulator strings. • Vegetation, land and road clearance. • Integrity and function of support clamps. • Visual check by TransGrid of earthwire/optical ground wire and conductor movement. • Calculation of differential leg movement. 	<p>A number of potential management measures considered to be applicable to transmission lines, include:</p> <ul style="list-style-type: none"> • alteration of conductor tensions; • installation of temporary structures; • modification to attachment points such as placement of stringing sheaves to earth wires and/or phase conductors; and • strengthening of tower structures (e.g. through installation of cruciform footings). <p>Management measures for access roads/tracks will be implemented in accordance with the LMP.</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>

Table 17 (Continued)
Built Features Performance Indicators, Monitoring and Management Measures

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
Vocus optical fibre cable	<ul style="list-style-type: none"> Negligible transmission loss in fibre optic cables from mine subsidence impacts. Structural integrity of the cable line and associated joint housing pit is maintained. Serviceability of the access roads/tracks is maintained. 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain. Signal integrity. Movement of conduit, degree of freedom of cable in conduit, ground compression/tension. Surface cracks, buckling and general safety. 	<p>A number of potential management measures in relation to fibre optic cables are considered to be applicable. These are described in the Vocus Management Plan Agreement (Appendix E).</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>
Optus optical fibre cables	<ul style="list-style-type: none"> Negligible transmission loss from mine subsidence impacts. The structural integrity of the cable lines and associated facilities is maintained. The serviceability of the access roads/tracks is maintained. 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain. Signal integrity. Movement of conduit, degree of freedom of cable in conduit, ground compression/tension. Surface cracks, buckling and general safety. 	<p>A number of potential management measures in relation to cable lines are considered to be applicable.</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>
Telstra telecommunications tower and compound, optical fibre cables, associated infrastructure and copper telecommunication cables	<ul style="list-style-type: none"> Negligible transmission loss in fibre optic cables from mine subsidence impacts. Structural integrity of the cable line and associated facilities is maintained. Structural integrity of the telecommunications tower and compound is maintained. Serviceability of the access roads/tracks is maintained. 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain. Signal integrity. Structural integrity of the telecommunications tower and compound. Surface cracks, buckling and general safety. 	<p>A number of potential management measures in relation to cable lines are considered to be applicable. These are described in the Telstra Management Plan Agreement (Appendix E).</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>

Table 17 (Continued)
Built Features Performance Indicators, Monitoring and Management Measures

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
RMS M1 Princes Motorway, Bridge 2 and Cawley Road Overbridge	<ul style="list-style-type: none"> • Measured absolute horizontal movements. • Distortion of bridge elements. • Cracking of bridge elements. • Pavement cracking and deformation. • Visual consequence of slope movement. • Defects in culverts. 	<ul style="list-style-type: none"> • Subsidence, tilt, tensile strain and compressive strain. • Horizontal movement. <p><i>Bridge 2</i></p> <ul style="list-style-type: none"> • Real-time survey monitoring. • Monitoring of movements including: Absolute three dimensional (3D) movement of the survey reference pillar, relative 3D movements of all bridge monitoring points, changes in length of Fibre Bragg Grating (FBG) sensors and tilts of FBG tiltmeters. • 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. <p><i>Cawley Road Overbridge</i></p> <ul style="list-style-type: none"> • Real-time survey monitoring. • Monitoring of movements including: absolute 3D movement of the survey reference pillar and relative 3D movements of all bridge monitoring points. • Visual inspection for impacts on: abutments, pier blade wall, Tetron bearings, deck expansion joints, steel traffic barrier joints and safety screen joints. 	<p>A number of general management measures in relation to RMS assets are applicable. These include:</p> <ul style="list-style-type: none"> • review of scope and frequency of monitoring; • site inspections; • review by relevant specialists; • initiate traffic management procedures; • review of potential factors contributing to the exceedance of the performance trigger including review of subsidence measurements and predictions; and • review of effectiveness of management measures. <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 17 (Continued)
Built Features Performance Indicators, Monitoring and Management Measures

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
RMS 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"> • Monitoring of movements including absolute 3D movement of the survey reference pillar, and relative 3D movements of Towers TL11-103 to TL11-108, including: <ul style="list-style-type: none"> - subsidence line along the transmission line corridor within 600 m of Longwalls 301-303 extraction; - tower legs; - four ground points at each tower; and - top of tower at fixed point. • 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. 	<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"> • mill and replace pavement layers; • slotting; and • crack sealing. <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"> • rock bolting; • scaling; • shotcreting; • installation of rockfall mesh; • installation of barriers; and • trimming of the cut face. <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"> • point repairs; • lining; • grouting; and • culvert replacement.

Table 17 (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"> No pavement cracking exceeding 5 mm, or other defects of the road pavement resulting in deterioration of ride quality. No ponding of water on the road surface as a result of changes in grade from subsidence associated with Longwalls 301-303. No joint displacement or cracking or other defects of the drainage structure (e.g. pipes/culverts) in excess of 5 mm. Serviceability of guard rails, marker posts and signage is maintained. 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain. Impacts to the surface including cracks, buckling and stepping. Impacts to the visible surfaces of pipes/culverts including cracking, buckling, shearing and collapse. Visible impacts to furniture. 	<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"> mill and/or replace pavement layers; crack sealing/repair; point repairs; replace sections of pipe/culvert; grouting/sealing of cracks; and repair/replacement of furniture. <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>
WCC Waterfall General (Garrawarra) Cemetery	<ul style="list-style-type: none"> No defects to the structural integrity of headstones or fencing (beyond the baseline [pre-mining] conditions). The land in general is expected to experience minor cracking consistent with that observed during the extraction of previous longwalls at Metropolitan Coal (i.e. no more than minor cracking). 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain. Pre and post mining audits (photographic record and commentary). Surface cracks, buckling and general safety. 	<p>A number of potential management measures in relation to the Waterfall Cemetery are considered to be applicable and are summarised in the relevant rectification plan/protocol (Appendix E).</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>

Table 17 (Continued)
Built Features Performance Indicators, Monitoring and Management Measures

Built Features	Performance Indicator(s)	Monitoring	Relevant Management Measures
Sydney Water water pipelines	<ul style="list-style-type: none"> No more than repairable (minor) leakages of the water pipelines occur due to mining. No more than repairable (minor) defects (cracks, etc.) in the structural integrity of the pipes and associated connections occur due to mining. 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain. Surface ground cracks. Cracks or leaks in the pipelines. Leakage in pipeline. Acoustic monitoring. 	<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"> repair of broken pipes or fittings by Sydney Water maintenance staff; and 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 process. <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 Trains Illawarra Railway Line and telecommunications tower (and compound)	<ul style="list-style-type: none"> No defects or deformation of the Illawarra Railway Line due to mining. The structural integrity of the telecommunications tower (and compound) is maintained. 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain. Any defects or deformation of the rail line and associated infrastructure. Structural integrity of the telecommunications tower and compound. 	<p>A number of potential management measures in relation to the rail line are considered to be applicable, if required. These may include:</p> <ul style="list-style-type: none"> speed restriction of trains; and minor repair of track. <p>Potential management measures for the telecommunications tower and compound include pre-mining bracing and/or strengthening members to the frame and/or implementation of building maintenance techniques.</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>
Axicom telecommunications tower (and compound)	<ul style="list-style-type: none"> Structural integrity of the telecommunications towers and compounds has been maintained. Serviceability of the access roads/tracks has been maintained. 	<ul style="list-style-type: none"> Subsidence, tilt, tensile strain and compressive strain, absolute horizontal translation, and differential leg movements. Structural integrity of the telecommunications tower and compound. Surface cracks, buckling and general safety. 	<p>A number of potential management measures in relation to telecommunications towers and compounds are considered to be applicable and further measures are summarised in the BFMP (Appendix E).</p> <p>Management measures for access roads/tracks will be implemented in accordance with the LMP.</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>

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.

3.6 PUBLIC SAFETY MANAGEMENT

3.6.1 Overview

The Longwalls 301-303 PSMP is provided in Appendix F. The purpose and scope of the PSMP are summarised below:

Purpose: To ensure public safety in 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 301-303 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 301-303 is owned and/or managed by WaterNSW or The State of New South Wales (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 301-303.

Longwalls 301-303 are located partly within the Woronora Notification Area (Figure 2). No risks have been identified to public safety as a result of the extraction of Longwalls 301-303 within the Woronora Notification Area. The Woronora Dam wall is located approximately 7.1 km to the commencing end of Longwall 303 and the distance from the labyrinth spillway, which is to the south of the dam wall, is approximately 6.7 km (Figure 1). The dam wall and spillway are located at large distances from Longwalls 301-303. It is not expected that measurable conventional subsidence movements would occur at the dam wall and spillway (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 301-303 (Appendix I).

Metropolitan Coal is required to obtain all necessary approvals from the Minister administering the NSW *Mining Act, 1992* in accordance with the requirements of the NSW *Dams Safety Act, 1978* and the DSC.

The key issues relating to potential risks to public safety during the extraction of Longwalls 301-303 are described in the PSMP (Appendix F). The relevant monitoring and management measures are summarised in Table 18 and Section 3.7.

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Table 18
Management Issues for Public Safety During the Extraction of Longwalls 301-303

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

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 301-303 is summarised in Table 18 and Section 3.7 and described in detail in Appendix F.

The procedure that will be followed to assess the extraction of Longwalls 301-303 against the performance indicator and performance measure is outlined in Figure 13 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 19. The location of environmental monitoring sites included in Metropolitan Coal's various environmental monitoring programs as detailed in Table 19 are presented on Figure 10 and Figures 14 to 22.

Plan 7 in Attachment 1 of Appendix G shows the subsidence monitoring locations for Longwalls 301-303.

Table 19
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
WMP	Stream Features	<ul style="list-style-type: none"> The Eastern Tributary from full supply level of the Woronora Reservoir to the maingate of Longwall 26. The Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir. 	<ul style="list-style-type: none"> 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.). Nature of iron staining (e.g. whether isolated or across the entire streambed). Extent of iron staining (e.g. the length of stream affected). Description of gas release (e.g. isolated bubbles or continuous stream, and type of gas [methane or carbon dioxide]). Nature of scouring, for example the depth of scouring, type of soil exposed, any obvious vegetation impact, potential for severe erosion, etc. Water discoloration or opacity if present. Rock bar characteristics such as extent of cracking, seepage, underflow. Any other relevant information. 	<ul style="list-style-type: none"> Visual inspection and photographic survey of the Eastern Tributary conducted monthly when mining is within 400 m of the stream and within three months of the completion of each longwall. Visual inspection and photographic survey of the Waratah Rivulet within 3 months of the completion of each longwall. Weekly monitoring at pools observed with gas releases on the Eastern Tributary and Waratah Rivulet, until no gas releases have been observed at the pool for three consecutive weeks.
	Surface Water Flow	<ul style="list-style-type: none"> Eastern Tributary (GS 300078). Waratah Rivulet (GS 2132102). Sub-catchment I (GS 300092). Sub-catchment K (GS 300093). <p><i>Control Sites</i></p> <ul style="list-style-type: none"> Woronora River (GS 2132101). Honeysuckle Creek (GS 300077). O'Hares Creek (GS 213200). 	<ul style="list-style-type: none"> Stream flow data. 	<ul style="list-style-type: none"> Continuous (downloaded monthly).

Table 19 (Continued)
Longwalls 301-303 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"> Eastern Tributary Pools ETG, ETJ, ETM, ETU, ETW, ETAF, ETAG, ETAH, ETAI, ETAQ, ETAT and ETAU. Waratah Rivulet Pools A, F, J, K, L, M, N, O, P, Q, R, S, T, U, V and W. 	<ul style="list-style-type: none"> Pool water levels. 	<ul style="list-style-type: none"> Continuous water level sensor and logger (downloaded monthly). 	
		<p><i>Control Sites</i></p> <ul style="list-style-type: none"> Woronora River Control Pools WRP1, WRP2, WRP3 and WRP4. 		<ul style="list-style-type: none"> Manually monitored daily, until such time that continuous sensors are installed. 	
		<ul style="list-style-type: none"> Waratah Rivulet Pools B, C, E, G, G1, H and I. 		<ul style="list-style-type: none"> Evidence of new cracking within the stream bed or rock bar. 	<ul style="list-style-type: none"> Visual inspections conducted weekly when mining is within 400 m of the stream.
		<ul style="list-style-type: none"> Pools ETAS, ETAT and ETAU on the Eastern Tributary. Pools on the Waratah Rivulet from Pool P to the full supply level of the Woronora Reservoir. 		<ul style="list-style-type: none"> Whether the pools continue to flow over, through and/or below the rock bars (where relevant). Whether surface flow is evident along the length of the pools prior to flowing over/through/below the rock bars or boulder fields. 	<ul style="list-style-type: none"> Visual inspections conducted at the time of download (monthly).
	Stream Water Quality	<ul style="list-style-type: none"> Eastern Tributary sites ETWQF, ETWQJ, ETWQN, ETWQU, ETWQW, ETWQAF, ETWQAH, ETWQAQ and ETWQAU. Waratah Rivulet sites WRWQ2, WRWQ6, WRWQ8, WRWQ9, WRWQM, WRWQN, WRWQP, WRWQR, WRWQT, WRWQU, WRWQV, and WRWQW. Tributary B site RTWQ1. Tributary D site UTWQ1. Far Eastern Tributary site FEWQ1. Honeysuckle Creek site HCWQ1. Bee Creek site BCWQ1. <p><i>Control Sites</i></p> <ul style="list-style-type: none"> Woronora River control sites WOWQ1 and WOWQ 2. 	<ul style="list-style-type: none"> Water quality parameters as described in the WMP (samples collected for metal analysis to be field filtered). 	<ul style="list-style-type: none"> Monthly. 	

Table 19 (Continued)
Longwalls 301-303 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"> Eastern Tributary sites ETWQF, ETWQJ, ETWQN, ETWQAF and ETWQAQ. Waratah Rivulet sites WRWQ2, WRWQ6, WRWQ8, WRWQ9, WRWQM, WRWQN and WRWQP. <p><i>Control Site</i></p> <ul style="list-style-type: none"> Woronora River site WOWQ2. 	<ul style="list-style-type: none"> Unfiltered water quality samples analysed for total iron. 	<ul style="list-style-type: none"> Monthly.
	Woronora, Nepean and Cataract Reservoir Water Quality	<ul style="list-style-type: none"> Woronora Reservoir (site DW01). Nepean Reservoir. Cataract Reservoir. 	<ul style="list-style-type: none"> Total iron, total manganese and total aluminium. 	<ul style="list-style-type: none"> As made available by WaterNSW.
	Shallow Groundwater Levels Near Streams	<ul style="list-style-type: none"> Eastern Tributary site ETGW1. Waratah Rivulet sites WRGW1, WRGW2 and WRGW7. 	<ul style="list-style-type: none"> Groundwater levels. 	<ul style="list-style-type: none"> Data downloaded monthly; analysis on a six monthly basis.
	Groundwater Levels/Pressures	<ul style="list-style-type: none"> Transect sites T1, T2, T3, T4, T5 and T6. A survey bench mark installed to measure Woronora Reservoir water level. Site 9HGW0 (Longwall 10 Goaf Hole). Site 9EGW1B. Site 9FGW1A. Site 9GGW2B. Site 9HGW1B. Site PM02. Site 9GGW1-80. Site PM01 (9DGW1B). Site 9EGW2A. Site PM03. Site PHGW1B. Site PHGW2A. 	<ul style="list-style-type: none"> Groundwater levels. Woronora Reservoir level. Groundwater levels/pressures. 	<ul style="list-style-type: none"> Transect data downloaded/reading monthly; analysis of sites T2, T3 and T5 quarterly. Data downloaded from bores 9GGW2B, F6GW3A, F6GW4A, PHGW2A, 9EGW2A, PM02 monthly; quarterly analysis.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
WMP (Cont.)	Groundwater Levels/Pressures (cont.)	<ul style="list-style-type: none"> Site F6GW3A. Site F6GW4A. Site 9EGW2-4. Site 302GW01. Site TBS02-15. Site TBS02-80. Site TBS02-250. Site TBS03-15. Site TBS03-230. 		
	Groundwater Quality	<ul style="list-style-type: none"> Eastern Tributary site ETGW2. Waratah Rivulet sites WRGW1, WRGW2 and WRGW7. 	<ul style="list-style-type: none"> Water quality parameters as described in the WMP (samples collected for metal analysis to be field filtered). 	<ul style="list-style-type: none"> Monthly.
	Mine Water Make	Underground.	<ul style="list-style-type: none"> Groundwater inflow to the mine (20 day average). Visual inspections. Water balance for 300 area 	<ul style="list-style-type: none"> Mine water balance inputs (as described in the WMP). Weekly statutory inspections. Localised water balance for 300 area monthly.
LMP	Cliffs and overhangs	<ul style="list-style-type: none"> Cliff site COH17 	<ul style="list-style-type: none"> Subsidence impacts (e.g. cliff instabilities or cracking) compared against the cliffs and overhang performance indicator. 	<ul style="list-style-type: none"> Visual inspections monthly when Longwall 303 extraction is within 400 m of the site. As part of routine works conducted in the catchment. Following the completion of Longwall 303 extraction.
	Steep slopes and land in general	<ul style="list-style-type: none"> Steep slopes and other land within 600 m of Longwalls 20-27 and Longwalls 301-303 secondary extraction. 	<ul style="list-style-type: none"> Sandstone fracturing and rock falls (nature and extent of surface tension cracks and rock ledge collapse, compared against the land subsidence impact performance indicator). 	<ul style="list-style-type: none"> Visual inspections as part of routine works conducted in the catchment.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP	Upland Swamps – Vegetation	<p><i>Longwalls 301-303</i></p> <ul style="list-style-type: none"> Swamps 38, 40, 41, 46, 47, 48, 49, 50, 51/52, 53 and 58. Control Swamps 101, 111a, 125, 135, 136, 137a, 137b and 138. <p><i>Previous Longwalls</i></p> <ul style="list-style-type: none"> Swamps 16, 17, 19, 20, 24, 25, 30, 31, 32, 33, 34, 35, 36 and 95. 	<ul style="list-style-type: none"> Cracking of exposed bedrock areas and/or swamp substrate. Areas of increased erosion, particularly along any existing drainage line. Any changes in water colour, particularly evidence of iron precipitation. Changes in vegetation condition, including areas of stressed vegetation (i.e. plants that demonstrate symptoms of stress) and dead/dying plants that appear unusual. 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). 	<ul style="list-style-type: none"> Visual inspections bi-annually in spring and autumn.
		<p><i>Longwalls 301-303</i></p> <ul style="list-style-type: none"> Swamps 40, 41, 46, 51/52 and 53. Control Swamps 101, 135, 136, 137a and 137b. <p><i>Previous Longwalls</i></p> <ul style="list-style-type: none"> Swamps 16, 17, 18, 20, 24 and 25 (Longwalls 20-22). Swamps 28, 30, 33, 35 and 94 (Longwalls 23-27). Control Swamps 101, 111a, 125, 135, 136, 137a, 137b, 138, Bee Creek Swamp, Woronora River 1, Woronora River south arm and Dahlia Swamp. 	<ul style="list-style-type: none"> Vegetation structure. Dominant species. Estimated cover and height for each stratum. Full floristics. Estimated cover abundance for each species using seven point Braun-Blanquet scale. Condition/health rating for each species in the quadrat. 	<ul style="list-style-type: none"> Transect and quadrat monitoring bi-annually in spring and autumn.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP (Cont.)	Upland Swamps - Vegetation (Cont.)	<p><i>Longwalls 301-303</i></p> <ul style="list-style-type: none"> • Twenty tagged individuals (<i>Epacris obtusifolia</i> and <i>Sprengelia incarnata</i>) in each of Swamps 40 and 53. • Twenty tagged individuals (<i>Epacris obtusifolia</i>) in each of Control Swamps 101, 136 and 137a. • Twenty tagged individuals (<i>Sprengelia incarnata</i>) in each of Control Swamps 101, 136 and 137b. <p><i>Previous Longwalls</i></p> <ul style="list-style-type: none"> • Twenty tagged individuals (<i>Epacris obtusifolia</i>) in each of Swamps 18, 24 and 25 (Longwalls 20-22) and Control Swamps 101, 111a and 125. • Twenty tagged individuals (<i>Epacris obtusifolia</i>) in each of Swamps 19, 30, 33, 35 and 94 (Longwalls 23-27) and Control Swamps 135, 136, 137a, 137b and 138. • Twenty tagged individuals (<i>Sprengelia incarnata</i>) in each of Swamps 24 (Longwalls 20-22) and Control Swamps 101 and 125. • Twenty tagged individuals (<i>Sprengelia incarnata</i>) in each of Swamps 19, 33, 35 and 94 (Longwalls 23-27) and Control Swamps 135, 136, 137a and 138. • Twenty tagged individuals (<i>Pultenaea aristata</i>) in each of Swamps 18, 24 and 25 (Longwalls 20-22) and Control Swamps 101 and 111a. • 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. 	<ul style="list-style-type: none"> • Population monitoring data including condition/health rating for each plant and reproductive rating. 	<ul style="list-style-type: none"> • Indicator species monitoring bi-annually in spring and autumn.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP (Cont.)	Upland Swamps - Vegetation (Cont.)	<p><i>Previous Longwalls (cont.)</i></p> <ul style="list-style-type: none"> 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. Twenty tagged individuals (<i>Banksia robur</i> and <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. 	<ul style="list-style-type: none"> Population monitoring data including condition/health rating for each plant and reproductive rating. 	<ul style="list-style-type: none"> Indicator species monitoring bi-annually in spring and autumn.
	Upland Swamps - Groundwater	<p><i>Longwalls 301-303</i></p> <ul style="list-style-type: none"> 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) in Swamps 40, 41, 46, 51, 52 and 53. <p><i>Previous Longwalls</i></p> <ul style="list-style-type: none"> Swamp substrate monitoring in Swamps 20 and 25 (Longwalls 20-22). Swamp substrate monitoring in Swamps 28, 30, 33 and 35 (Longwalls 23-27). Swamp substrate monitoring in Control Swamps 101, 137a, 137b, Bee Creek Swamp and Woronora River 1. 	<ul style="list-style-type: none"> Groundwater levels. 	<ul style="list-style-type: none"> Datalogger (continuous).
	Riparian Vegetation	<ul style="list-style-type: none"> Sites MRIP01 to MRIP12. 	<ul style="list-style-type: none"> Areas of new water ponding. Any cracking or rock displacement. Changes in vegetation condition, including areas of stressed vegetation that appear unusual. 	<ul style="list-style-type: none"> Visual inspections bi-annually in spring and autumn.

Table 19 (Continued)
Longwalls 301-303 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"> Sites MRIP01 to MRIP08, MRIP11 and MRIP12. 	<ul style="list-style-type: none"> Vegetation structure. Dominant species. Estimated cover and height for each stratum. Full floristics. Estimated cover abundance for each species using seven point Braun-Blanquet scale. Condition/health rating for each species in the quadrat. 	<ul style="list-style-type: none"> Permanent quadrat (20 m x 2 m) monitoring bi-annually in spring and autumn.
		<ul style="list-style-type: none"> Existing tagged individuals (<i>Prostanthera linearis</i>, <i>Schoenus melanostachys</i> and <i>Lomatia myricoides</i>) at sites MRIP01 to MRIP12. 	<ul style="list-style-type: none"> Population monitoring data including condition/health rating for each plant and reproductive rating. 	<ul style="list-style-type: none"> Indicator species monitoring bi-annually in spring and autumn.
	Aquatic Biota and their Habitats	<ul style="list-style-type: none"> Surface water resources and watercourses in accordance with the WMP. 	<ul style="list-style-type: none"> Monitoring of aquatic habitats in accordance with the WMP. 	<ul style="list-style-type: none"> In accordance with the WMP.
		<ul style="list-style-type: none"> Stream monitoring at following Locations; <ul style="list-style-type: none"> WT3, WT4 and WT5, ET1, ET2, ET3, ET4, B1 and B2. Control Locations: WR1; OC; BC; and WOT. 	<ul style="list-style-type: none"> Impacts on aquatic ecology: <ul style="list-style-type: none"> Habitat Characteristics. Water Quality Aquatic Macroinvertebrates Aquatic Macrophytes 	<ul style="list-style-type: none"> Biannually in spring (15 September to 15 December) and autumn (15 March to 15 June) at sites on Waratah Rivulet, Eastern Tributary, Woronora River and O'Hares Creek if sufficient aquatic habitat is available for sampling. Biannually in spring (15 September to 15 December) and autumn (15 March to 15 June) up to and including spring 2018, and thereafter every three years at sites on Tributary B, Bee Creek and Woronora Tributary if sufficient aquatic habitat is available for sampling.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BMP (Cont.)	Aquatic Biota and their Habitats (cont.)	<ul style="list-style-type: none"> Pool monitoring at the following Pools: <ul style="list-style-type: none"> - Larger pools J, M1, N and ETAH. - Larger control pools (Pool WP and Pool OC). Smaller pools K, L, M, ETAG, ETAI and ETAK. Smaller control pools (Pools WP-A, WP-B, WP-C, OC-A, OC-B and OC-C). 	<p>The response of aquatic ecosystems to the implementation of potential future stream remediation works:</p> <ul style="list-style-type: none"> Habitat Characteristics. Water Quality Aquatic Macroinvertebrates Aquatic Macrophytes 	<ul style="list-style-type: none"> Biannually in spring (15 September to 15 December) and autumn (15 March to 15 June) if sufficient aquatic habitat is available for sampling.
	Amphibian Monitoring	<p><i>Longwalls 301-303</i></p> <ul style="list-style-type: none"> Sites 23-28. <p><i>Previous Longwalls</i></p> <ul style="list-style-type: none"> Sites 1-6 (Longwalls 20-22) and 13-17 (Longwalls 23-27). Control Sites 7, 8, 9, 10, 11, 12, 18, 19, 20, 21 and 22. 	<ul style="list-style-type: none"> Species assigned to relative abundance categories for tadpole and adult stages. 	<ul style="list-style-type: none"> Survey annually in spring/summer (i.e. October to February) during suitable weather conditions.
HMP	Aboriginal Heritage	<p><i>Longwalls 301-303</i></p> <ul style="list-style-type: none"> Sites FRC 76 and FRC 117 <p><i>Previous Longwalls</i></p> <ul style="list-style-type: none"> Sites MET 1, FRC 176, FRC 28, FRC 29, FRC 34 and FRC60. 	<ul style="list-style-type: none"> Inspections of rock surfaces for cracking and/or exfoliation and/or blockfall. Inspection of art motifs for damage or deterioration. Identification of any natural weathering processes that may result in deterioration (e.g. fire, vegetation growth and water seepage). Comparison of the physical characteristics of the site at the time of monitoring against the previous monitoring and the baseline record. 	<ul style="list-style-type: none"> Within three months of the completion of Longwall 303.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-Garrawarra Centre Complex	Subsidence impacts	Hospital buildings	<ul style="list-style-type: none"> Structural integrity. Cracking at pre-existing rock joints (at buildings prescribed in the BFMP). Tilt at pre-existing tilted piers (Seamstress building). 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction, or as otherwise agreed with NSW Health. Within 3 months following the completion of extraction of Longwalls 302 and 303. At the completion of Longwall 302 and Longwall 303 (unless removed prior in accordance with the Memorandum of Understanding) (house structures and kiln). Weekly visual inspection of water storage tank (B14t02) on commencement of Longwall 303 until wall has retreated away 400 m from tank. Weekly visual inspection of kiln on commencement of Longwall 302 until wall has retreated 400 m away from kiln chimney.
		Aged care buildings	<ul style="list-style-type: none"> Structural integrity. Cracking at pre-existing rock joints (at buildings prescribed in the BFMP). Opening and closing of joints (at buildings prescribed in the BFMP). 	
		House structures	<ul style="list-style-type: none"> Structural integrity. Cracking at pre-existing rock joints. 	
		Water storage tanks	<ul style="list-style-type: none"> Structural integrity. Leaks. Cracking in columns, elevated ring beam or central access shaft (at tank prescribed in the BFMP). 	
		Gas storage tank	<ul style="list-style-type: none"> Structural integrity. Leaks. 	
		Kiln	<ul style="list-style-type: none"> Structural integrity of the kiln chimney. 	
		Other services (powerlines and poles)	<ul style="list-style-type: none"> As per Endeavour Energy BFMP. 	

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-Garrawarra Centre Complex (cont.)	Subsidence impacts (cont.)	Powerlines and poles	<ul style="list-style-type: none"> As per Endeavour Energy BFMP. 	<ul style="list-style-type: none"> As per Endeavour Energy BFMP.
		Other services (pipelines)	<ul style="list-style-type: none"> Monitor for cracks or leakage in the pipelines and surface ground cracks. As per Sydney Water BFMP. 	<ul style="list-style-type: none"> Once at the completion of Longwall 302 and Longwall 303. As per Sydney Water BFMP.
		Private roads and access roads/tracks	<ul style="list-style-type: none"> Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Once at the completion of Longwall 302 and Longwall 303. Visual observations during catchment visits as per the LMP.
BFMP-Endeavour Energy	Subsidence impacts	132 kV Towers (T7 to T13).	<ul style="list-style-type: none"> Degradation of tower structure. Degradation of tower foundations/footings. Movement of insulator strings. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Within 3 months following the completion of extraction of each of Longwalls 301, 302 and 303. Weekly at each tower within 400 m of the active longwall face until subsidence negligible. Routinely as per Endeavour Energy inspections (annual ground inspection, climbing inspection next scheduled post mining). At any time in case of fault or emergency.
		132 kV Transmission Line from Towers T7 to T13. <ul style="list-style-type: none"> Ground survey. Climbing inspection. 	<ul style="list-style-type: none"> Vegetation clearance. Land clearance. Road clearance. Evidence of subsidence effects (subsidence, tilt, absolute horizontal translation and movement of insulator strings). 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Within 3 months following the completion of extraction of Longwall 303. Routinely as per Endeavour Energy inspections (annual ground inspection, climbing inspection next scheduled post mining). At any time in case of fault or emergency.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP- Endeavour Energy (Cont.)	Subsidence impacts (Cont.)	Timber poles.	<ul style="list-style-type: none"> Degradation of structure. Movement of conductors. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction.
		High Voltage Powerline. <ul style="list-style-type: none"> Ground survey. 	<ul style="list-style-type: none"> Vegetation clearance. Land clearance. Road clearance. Integrity and function of support clamps or other items. 	<ul style="list-style-type: none"> Within 3 months following the completion of extraction of Longwalls 301-303. Routinely as per Endeavour Energy inspections. At any time in case of fault or emergency.
		Access roads/tracks within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Within 3 months following the completion of extraction of Longwalls 301-303. Visual observations during catchment visits as per the LMP. Routinely as per Endeavour Energy inspections.
BFMP - TransGrid	Subsidence impacts	Towers TL11-103 to TL11-108.	<ul style="list-style-type: none"> Subsidence effects during mining (subsidence, tilt strain, absolute horizontal translation). Degradation of tower foundations/footings. Visual check by TransGrid of earthwire/optical ground wire and conductor movement. Calculation of differential leg movement Real time absolute 3D monitoring at TransGrid Towers, sites #4 through #8 corresponding with TL11-104 to TL11-108. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Weekly at each tower within 400 m of the active longwall face until subsidence negligible. Within 3 months following the completion of extraction of Longwalls 302 and 303. Routinely as per TransGrid inspections At any time in case of fault or emergency.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP - TransGrid	Subsidence impacts	Transmission Line from Towers TL11-103 to TL11-108. <ul style="list-style-type: none"> Ground survey. Climbing inspection. 	<ul style="list-style-type: none"> Vegetation, land and road clearance. Movement of insulator strings. 	<ul style="list-style-type: none"> Routinely as per TransGrid inspections. At the completion of Longwalls 301-303. At each tower within 400 m of the active longwall face until subsidence negligible. Within 3 months of the completion of Longwalls 302 and 303.
		Access roads/tracks within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. At the completion of each longwall. Within 3 months of the completion of Longwalls 302 and 303. Visual observations during catchment visits as per the LMP. Routinely as per TransGrid inspections.
BFMP-Vocus	Remote Fibre Monitoring System (RFMS) Monitoring	Optical Fibre Cable.	<ul style="list-style-type: none"> Signal integrity (utilising Optical Time Domain Reflectometer [OTDR]). 	<ul style="list-style-type: none"> Continuous.
	Subsidence impacts	Access roads/tracks within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Following the completion of extraction of Longwalls 301-303.
		Monitoring of cable line and/or joint housing pit for point loss or area of loss within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Movement of conduit, degree of freedom of cable in conduit, ground compression/tension. 	<ul style="list-style-type: none"> If RFMS records loss event ± 0.3 dB; ± 0.5 dB; or exceeds ± 1.0 dB.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-Optus	RFMS Monitoring (Fibre Optic Cable Loss Signal)	Optical Fibre Cables.	<ul style="list-style-type: none"> Signal integrity. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 302. Weekly when within 400 m of active longwall face. At the completion of Longwall 303.
	Subsidence impacts	Access roads/tracks within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Visual observations as part of routine works and inspections. Following the completion of extraction of Longwalls 301-303.
BFMP-Telstra	RFMS Monitoring	Optical fibre cables.	<ul style="list-style-type: none"> Signal integrity. 	<ul style="list-style-type: none"> Continuous – to commence when longwall face approaches within 400 m of the cables.
	Subsidence impacts	Monitoring of cable lines and/or joint housing pits for point loss or areas of loss within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Movement of conduit, degree of freedom of cable in conduit, ground compression/tension. 	<ul style="list-style-type: none"> Weekly until movement stabilises.
		Telecommunications tower.	<ul style="list-style-type: none"> Structural integrity of the telecommunications tower and compound. Tower tilt (> 1 degree). 	<ul style="list-style-type: none"> At the completion of Longwall 301. On commencement of Longwalls 302 & 303. Weekly during Longwalls 302 and 303 until effects of subsidence are no longer detectable. Within 3 months following the completion of extraction of each longwall.
		Access roads/tracks within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Visual observations as part of routine works and inspections. Following the completion of extraction of Longwalls 301-303.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-RMS	Movements	Bridge 2.	<p>Monitoring of movements including:</p> <ul style="list-style-type: none"> Absolute 3D movement of the survey reference pillar. Relative 3D movements of all bridge monitoring points. <p>To measure absolute ground movement at survey reference pillar and hence potential for relative movement of bridge elements and to measure distortion of structure.</p>	<ul style="list-style-type: none"> Real-time (continuous) monitoring subject to review of current trial. Monthly when active longwall mining is within 600 m of the bridge. Greater frequency or commencing earlier if determined in consultation with the Technical Committee.
		Bridge 2 (cont.).	<p>Monitoring of movements including:</p> <ul style="list-style-type: none"> Changes in length of FBG sensors and tilts of FBG tiltmeters. <p>To determine the range of movements due to environmental effects, (diurnal and seasonal) and to measure distortion of structure.</p>	<ul style="list-style-type: none"> Program of varying (diurnal and seasonal) sampling rates. Weekly from the commencement of Longwall 301 extraction for a duration determined in consultation with the Technical Committee. Greater frequency if determined in consultation with the Technical Committee.
		Cawley Road Overbridge.	<p>Monitoring of movements including:</p> <ul style="list-style-type: none"> Absolute 3D movement of the survey reference pillar. Relative 3D movements of all bridge monitoring points. <p>To measure absolute ground movement at survey reference pillar and hence potential for relative movement of bridge elements and to measure distortion of structure.</p>	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Real-time (continuous) monitoring subject to review of current trial. Following the completion of extraction of each Longwall 301, 302 and 303.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-RMS (cont.)	Movements (cont.)	Other relevant infrastructure (adjacent transmission line/towers).	<p>Monitoring of movements including:</p> <ul style="list-style-type: none"> Subsidence line along the transmission line corridor within 600 m of Longwalls 301-303 extraction. Tower legs (TL11-103 to TL11-108). TL11-103 to TL11-108 four ground points at each tower. TL11-103 to TL11-108 top of tower at fixed point. <p>To measure the following mine subsidence parameters for comparison with predicted parameters:</p> <ul style="list-style-type: none"> Subsidence, tilt, tensile strain, compressive strain. Absolute horizontal translation. Differential leg movement. 	<ul style="list-style-type: none"> Once per Longwalls 301, 302 and 303. Weekly at each tower within 400 m of the active longwall face until subsidence negligible. Within 3 months following the completion of extraction of Longwalls 301-303.
	Visual Impact Monitoring	Bridge 2.	<p>Visual inspection for impacts on:</p> <ul style="list-style-type: none"> Abutments. Pier frames. Elastomeric bearings. Soffits of girders. Deck expansion joints. Steel traffic barrier joints. Other areas of substructure and adjoining areas including concrete paths, stairs, and slope protection. <p>To identify development of, or changes in existing:</p> <ul style="list-style-type: none"> Surface cracks, buckling, closing or opening of joints or distortion or damage to elastomeric bearings. 	<ul style="list-style-type: none"> Following the completion of each of Longwalls 301, 302 and 303. Greater frequency if determined in consultation with the Technical Committee.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-RMS (cont.)	Visual Impact Monitoring (cont.)	Cawley Road Overbridge.	Visual inspection for impacts on: <ul style="list-style-type: none"> • Abutments. • Pier blade wall. • Tetron bearings. • Deck expansion joints. • Steel traffic barrier joints. To identify development of, or changes in existing: <ul style="list-style-type: none"> • Surface cracks, buckling, closing or opening of joints or distortion or damage to Tetron bearings. 	<ul style="list-style-type: none"> • Following completion of each of Longwalls 301, 302 and 303. • Greater frequency if determined in consultation with the Technical Committee.
	Visual Impact Monitoring (cont.)	Pavement and Other.	Visual inspection for impacts on: <ul style="list-style-type: none"> • Asphaltic concrete surface. • Kerbs, gutters and pits. • Signs or other road infrastructure. To identify development of, or changes in existing: <ul style="list-style-type: none"> • Asphaltic concrete surface including cracks, buckling and stepping. • Kerbs and gutters including cracking, buckling and joint movement. 	<ul style="list-style-type: none"> • Prior to the commencement of Longwall 301 extraction. • Following the completion of extraction of each Longwall 301, 302 and 303. • At a frequency determined in consultation with the Technical Committee. • Network Safety Inspection twice weekly during the extraction of Longwalls 301-303. • RoadCrack, Gipsicam and Laser Profilometer surveys in accordance with RMS inspection program.
		Cuttings.	Visual inspection for impacts on: <ul style="list-style-type: none"> • Cuttings along the M1 Princes Motorway. To identify: <ul style="list-style-type: none"> • Changes in cutting condition, including opening of cracks, spalling. • Changes in groundwater seepage or surface water flows. • Rockfalls. • Changes in RMS risk ranking. 	

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-RMS (cont.)	Visual Impact Monitoring (cont.)	Culverts.	CCTV inspection for impacts on internal surfaces. To identify changes to the visible surfaces of the culverts including cracking, buckling, shearing, and collapse.	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Following the completion of extraction of each Longwall 301, 302 and 303 or more frequent if determined in consultation with the Technical Committee.
BFMP-WCC [Old Princes Highway]	Subsidence impacts	Road pavement from Bridge 2 to the entrance to the Garrawarra Centre Complex.	<ul style="list-style-type: none"> Impacts to the surface including cracks, buckling and stepping. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Progress monitoring (visual inspections) to occur weekly when longwall face is within 400 m of passing under asset to establish more frequent communications. Within 3 months following the completion of extraction of Longwalls 302 and 303. Routinely as per WCC inspections (quarterly).
		Old Princes Highway drainage structures and other furniture.	<ul style="list-style-type: none"> Impacts to the visible surfaces of pipes/culverts including cracking, buckling, shearing and collapse. Visible impacts to furniture. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 302 extraction. Progress monitoring (visual inspections) to occur as longwall face is within 400 m of passing under asset to establish more frequent communications. Within 3 months following the completion of extraction of Longwalls 302 and 303. Routinely as per WCC inspections.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

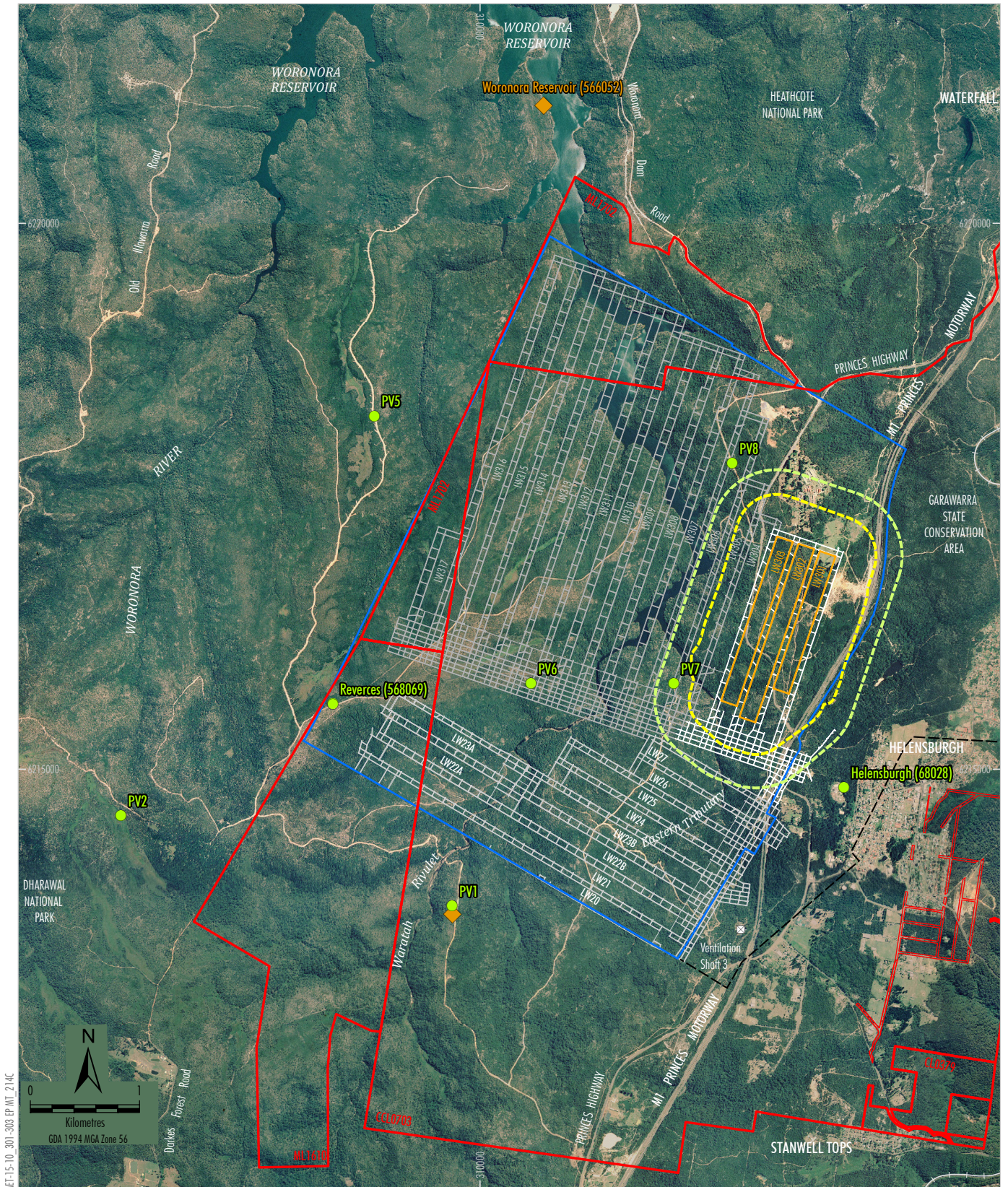
Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-WCC [Waterfall General (Garrawarra) Cemetery]	Subsidence impacts	Waterfall Cemetery site.	<ul style="list-style-type: none"> Pre and post mining audits (photographic record and commentary). Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Following the completion of extraction of Longwalls 301-303.
		Access roads/tracks within 600 m of Longwalls 301-303 extraction.	<ul style="list-style-type: none"> Surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Following the completion of extraction of Longwalls 301-303. Visual observations during catchment visits as per the LMP.
BFMP-Sydney Water	Subsidence impacts	Survey lines along the Old Princes Highway and the Optic / Water Line.	<ul style="list-style-type: none"> Surface ground cracks. Cracks or leaks in the pipelines. 	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Routinely as per Sydney Water inspections. Weekly when longwall within 400 m of passing under pipeline. Following the completion of extraction of Longwalls 301, 302 and 303.
		Sydney Water pipelines.	<p>Monitor subsidence effects during mining (subsidence, tilt, strain).</p> <p>Routine visual inspections by Sydney Water will also be conducted of the pipelines in accordance with the Sydney Water inspection program.</p> <p>Acoustic monitoring to monitor for leak detection – <i>additional option to be confirmed in consultation with Sydney Water.</i></p>	<ul style="list-style-type: none"> Prior to the commencement of Longwall 301 extraction. Weekly when longwall within 400 m of passing under pipeline. At the completion of each longwall.
		Reservoir.	Storage Levels (Sydney Water): Monitor for sudden reduction in water levels.	<ul style="list-style-type: none"> 24 hours, 7 days per week (Sydney Water).

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-Sydney Trains	Subsidence impacts	Illawarra Rail Line.	<ul style="list-style-type: none"> Any defects of deformation of the rail line and associated infrastructure. Valley closure monitoring using remote continuous survey with GNSS telemetry. 	<ul style="list-style-type: none"> In accordance with the Sydney Trains inspection program (two times per week and annual inspection). Daily measurement.
		Telecommunications tower (and compound).	Structural integrity of the telecommunications tower and compound.	<ul style="list-style-type: none"> On commencement of Longwalls 302 and 303. Weekly on commencement of Longwalls 302 and 303 until subsidence reduces below level of survey accuracy. Within 3 months following the completion of extraction of Longwalls 301, 302 and 303.
		Railway culverts (Wilson's Creek and Cawley Creek).	<ul style="list-style-type: none"> Visual inspection to monitor for signs of change. Relative monitoring of brick culverts using survey points. 	<ul style="list-style-type: none"> Once per longwall. Two times per longwall. Within 3 months of the completion of Longwall 303.
		Access roads/tracks.	<ul style="list-style-type: none"> Visual inspection (including notes on general condition of access roads/tracks). Monitor for surface cracks, buckling and general safety. 	<ul style="list-style-type: none"> On commencement of Longwalls 302 and 303. Weekly until effects of subsidence no longer detectable. In accordance with Longwalls 301-303 LMP.
BFMP-Axicom	Subsidence impacts	Telecommunications towers (and compounds).	Structural integrity of the telecommunications towers and compounds.	<ul style="list-style-type: none"> Prior to the commencement of Longwall 302 extraction. Weekly on commencement of Longwalls 302 and 303 until subsidence reduces below level of survey accuracy.

Table 19 (Continued)
Longwalls 301-303 Environmental Monitoring Program Summary

Management Plan	Monitoring Component	Sites	Monitoring Parameter/Analysis	Monitoring Frequency
BFMP-Axicom	Subsidence impacts	Access roads/tracks within 600 m of Longwalls 301-303 extraction.	Surface cracks, buckling and general safety.	<ul style="list-style-type: none"> • Prior to the commencement of Longwall 301 extraction. • Following the completion of extraction of Longwalls 301-303. • Visual observations during catchment visits as per the LMP.
PSMP	Cliffs and overhangs, steep slopes and land in general	In accordance with the LMP.	In accordance with the LMP.	In accordance with the LMP.
	Built Features	In accordance with the BFMPs.	In accordance with the BFMPs.	In accordance with the BFMPs.



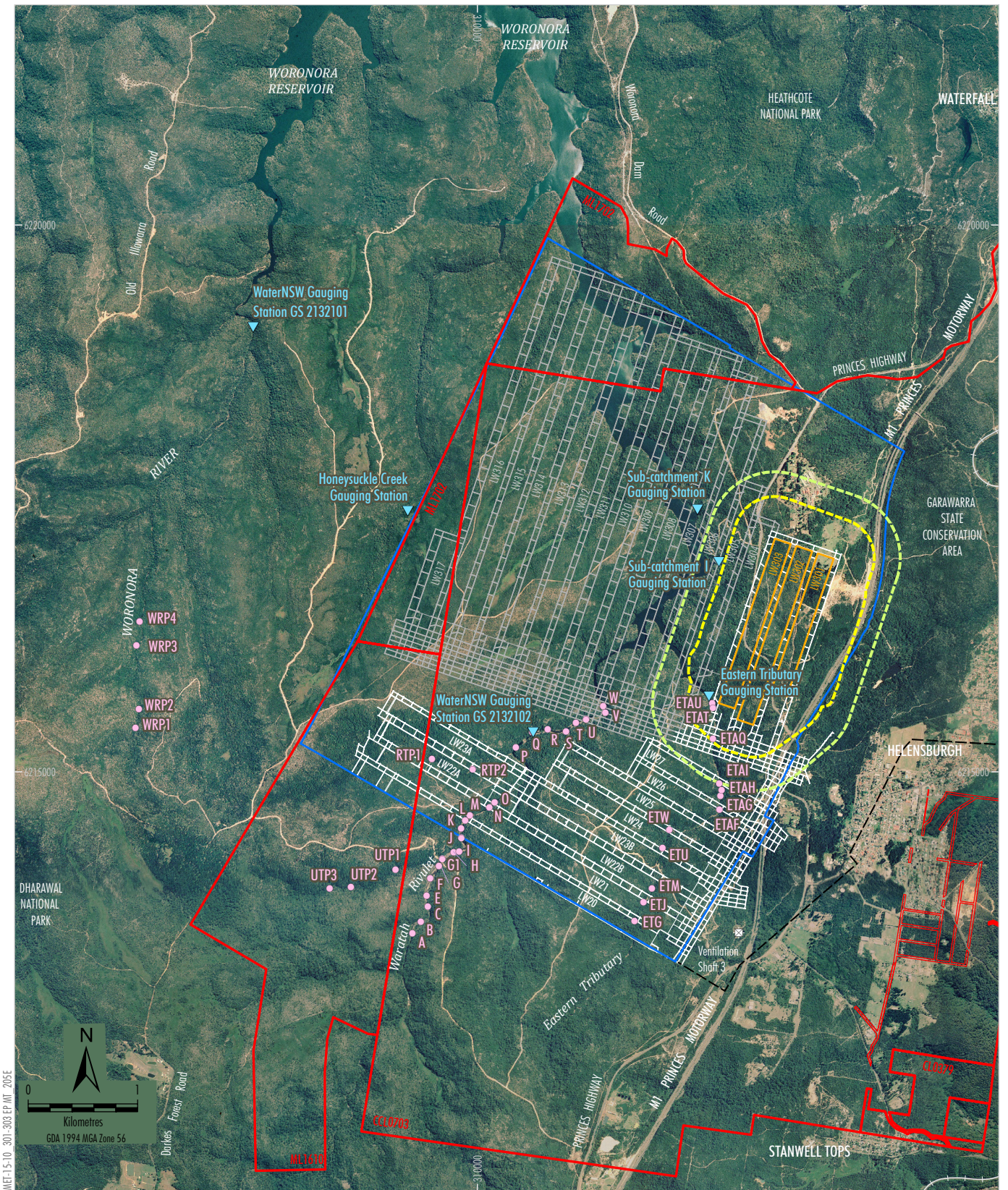
- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
 - Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
 - 600 m from Secondary Extraction of Longwalls 301-303
 - Existing Underground Access Drive (Main Drift)
 - ◆ Evaporimeter
 - Pluviometer

Note: 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).

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

Peabody
METROPOLITAN COAL
Meteorological Sites

Figure 14



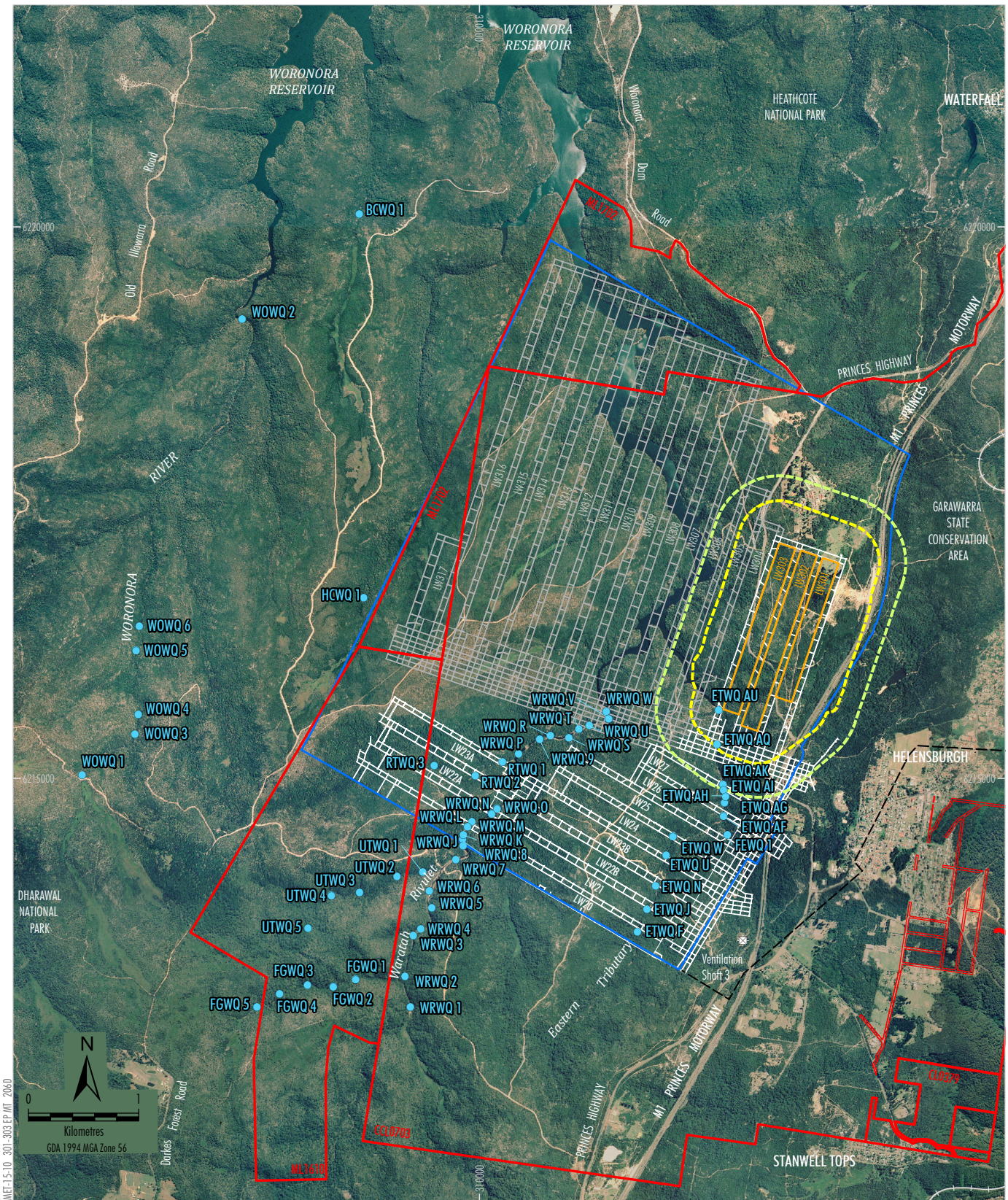
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- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - 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 (2018);
MSEC (2008; 2018)

Peabody
METROPOLITAN COAL
Surface Water Quantity Sites

Figure 15

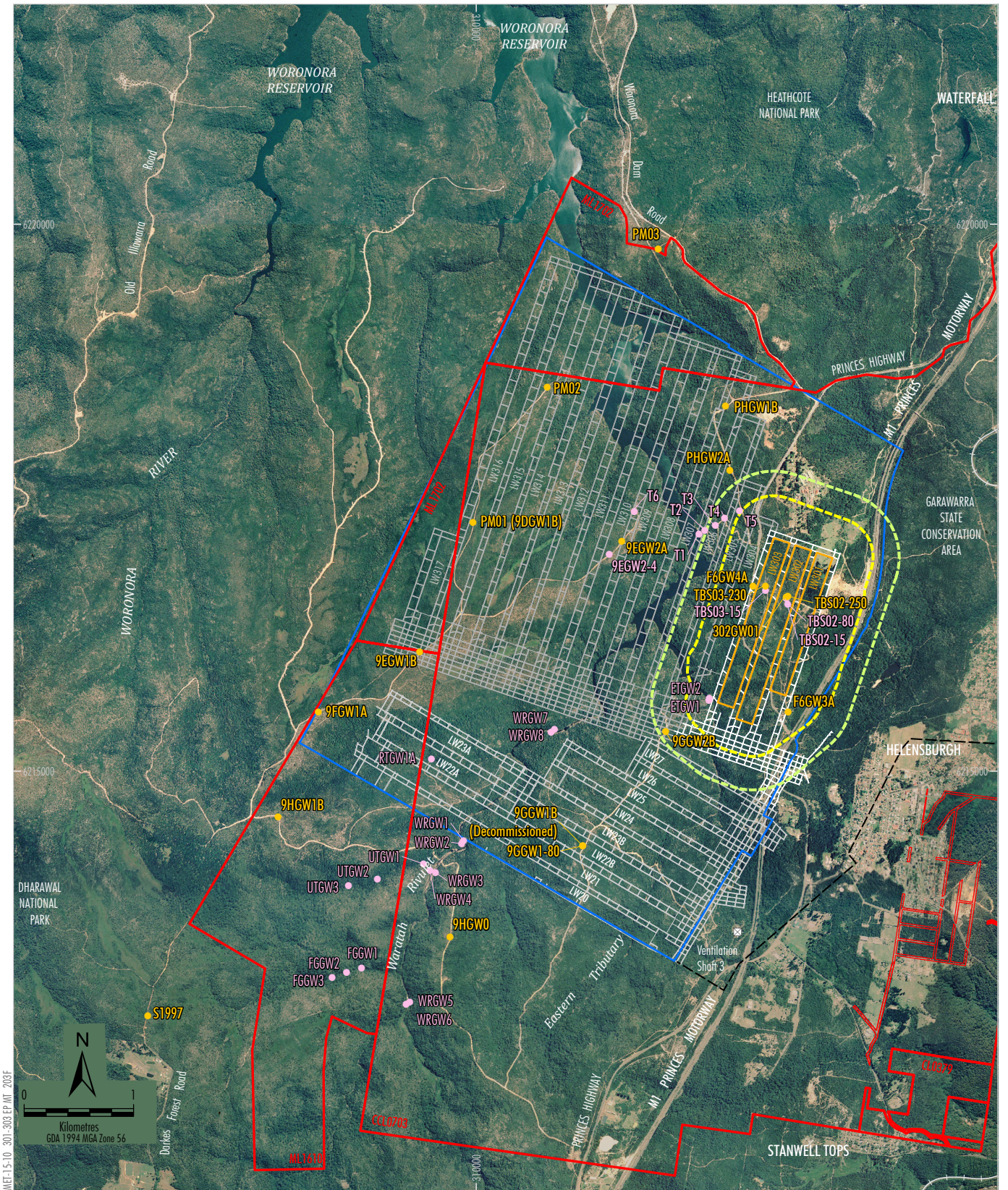


- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - Existing Underground Access Drive (Main Drift)
 - Surface Water Quality Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;
Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

Peabody
METROPOLITAN COAL
Surface Water Quality Sites

Figure 16



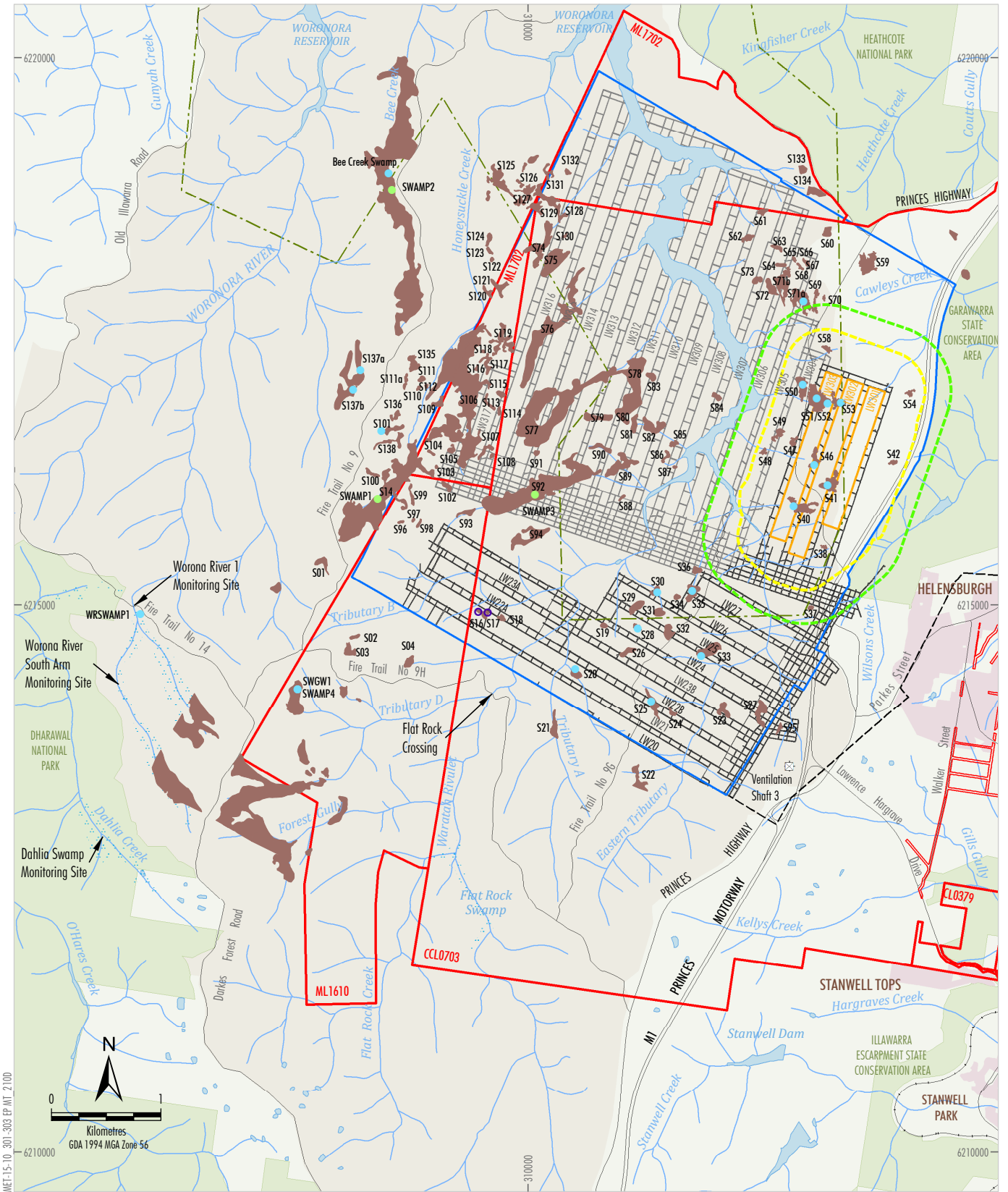
MET-15-10-301-303 EP.MT. 203F

Source: Land and Property Information (2015); Date of Aerial Photography 1998; Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
 - Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
 - 600 m from Secondary Extraction of Longwalls 301-303
 - Existing Underground Access Drive (Main Drift)
 - Groundwater Level/Pressure Bore
 - Groundwater Level Bore

Peabody
METROPOLITAN COAL
Groundwater Level
and/or Pressure Bore Locations

Figure 17



MEF-15-10-301-303 EP INT. 2.100
6210000
6210000

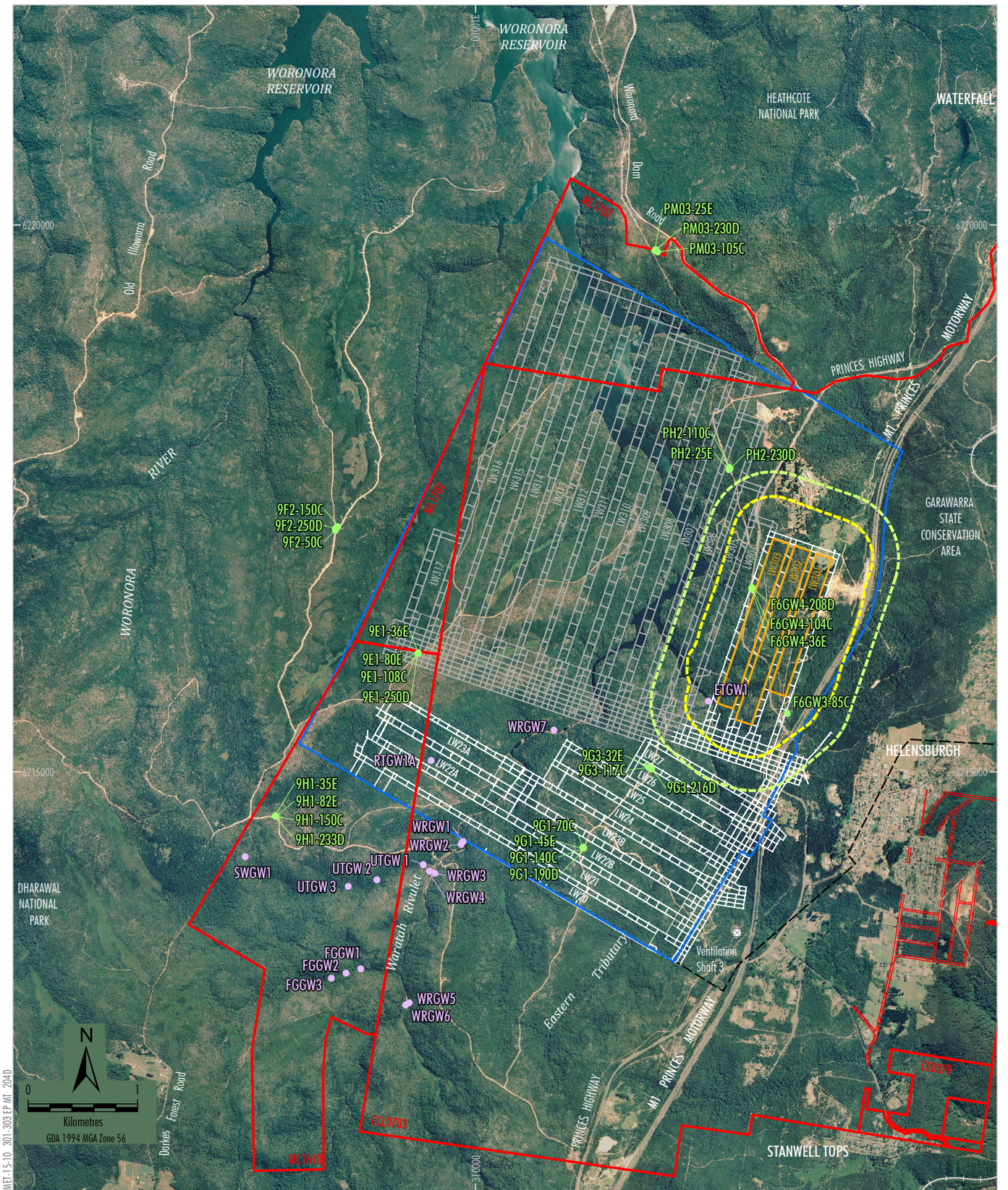
- LEGEND**
- Mining Lease Boundary
 - Woronora Special Area
 - Railway
 - Project Underground Mining Area Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
 - 600 m from Secondary Extraction of Longwalls 301-303
 - Woronora Notification Area
 - Existing Underground Access Drive (Main Drift)

- Upland Swamp
- Swamp Substrate and Shallow Groundwater Piezometer
- Swamp Substrate Groundwater Piezometer
- Swamp Shallow Groundwater Piezometer

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

Peabody
METROPOLITAN COAL
Upland Swamps Mapped over
Longwalls 20-27, Longwalls 301-317
and Surrounds

Figure 18

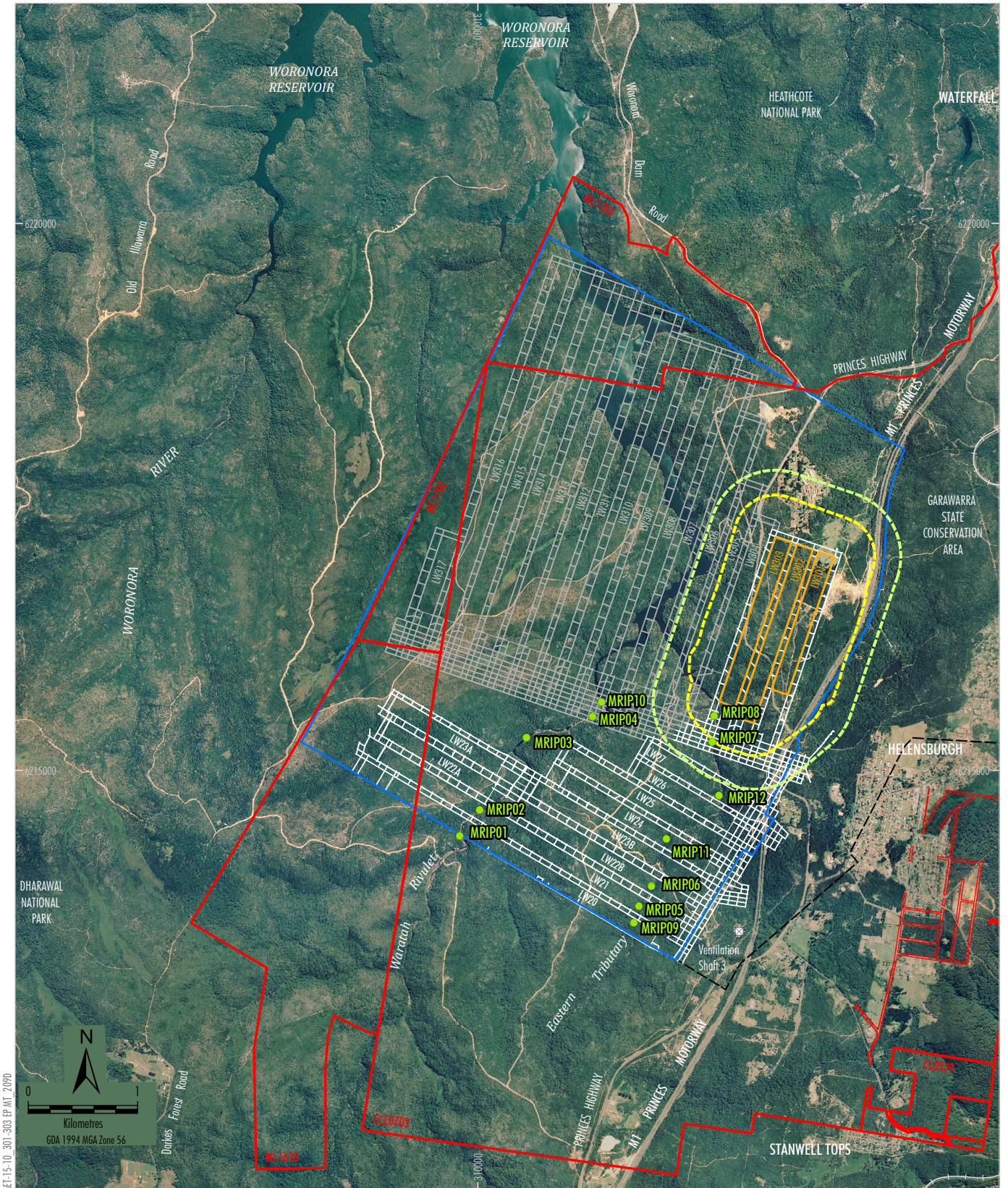


- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - Existing Underground Access Drive (Main Drift)
 - Deep Groundwater Chemistry Site
 - Shallow Groundwater Quality Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;
Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

Peabody
METROPOLITAN COAL
Groundwater Quality Sites

Figure 19



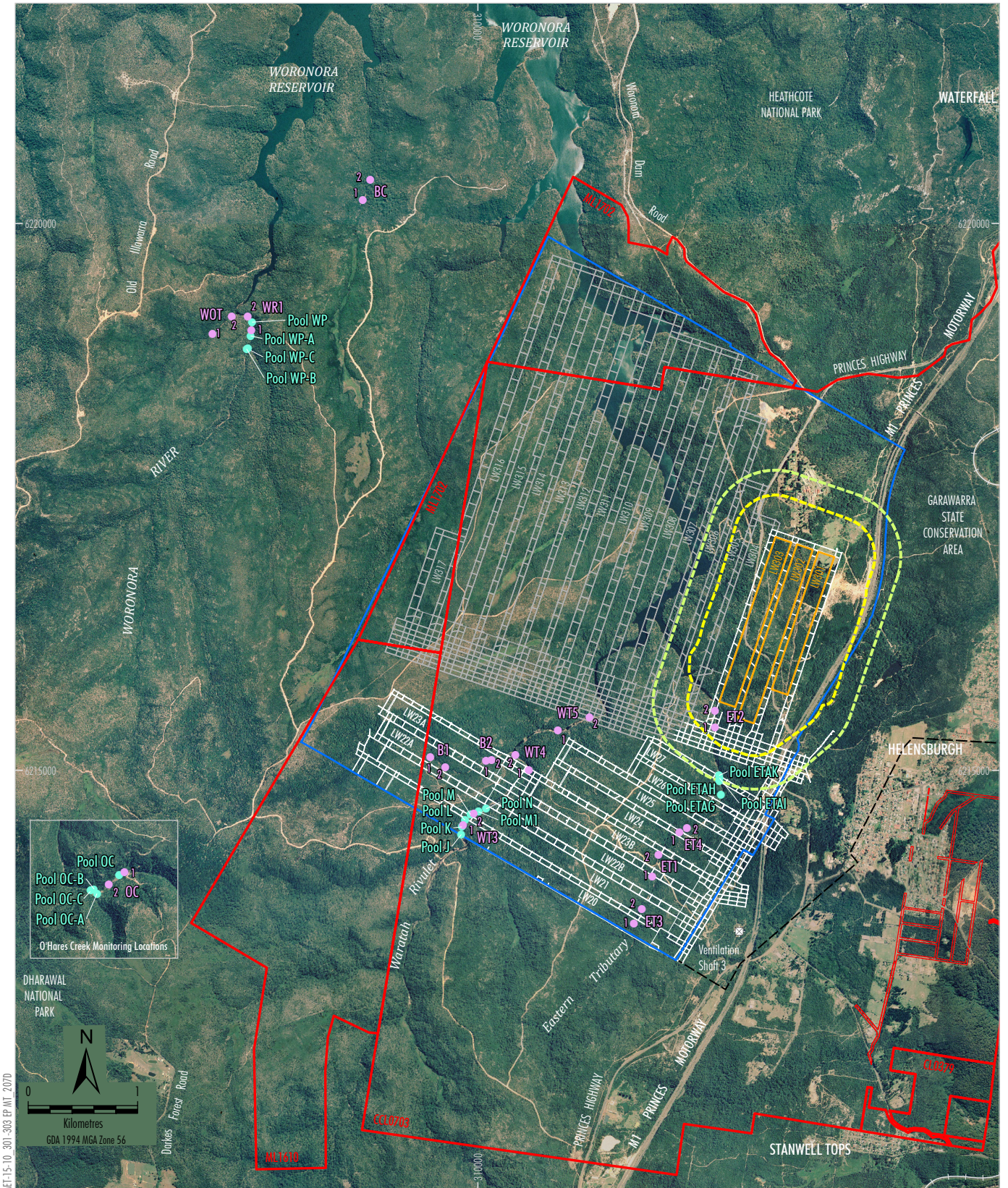
- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - Existing Underground Access 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 (2018); MSEC (2018)

Peabody
METROPOLITAN COAL
Riparian Vegetation Monitoring Locations

Figure 20



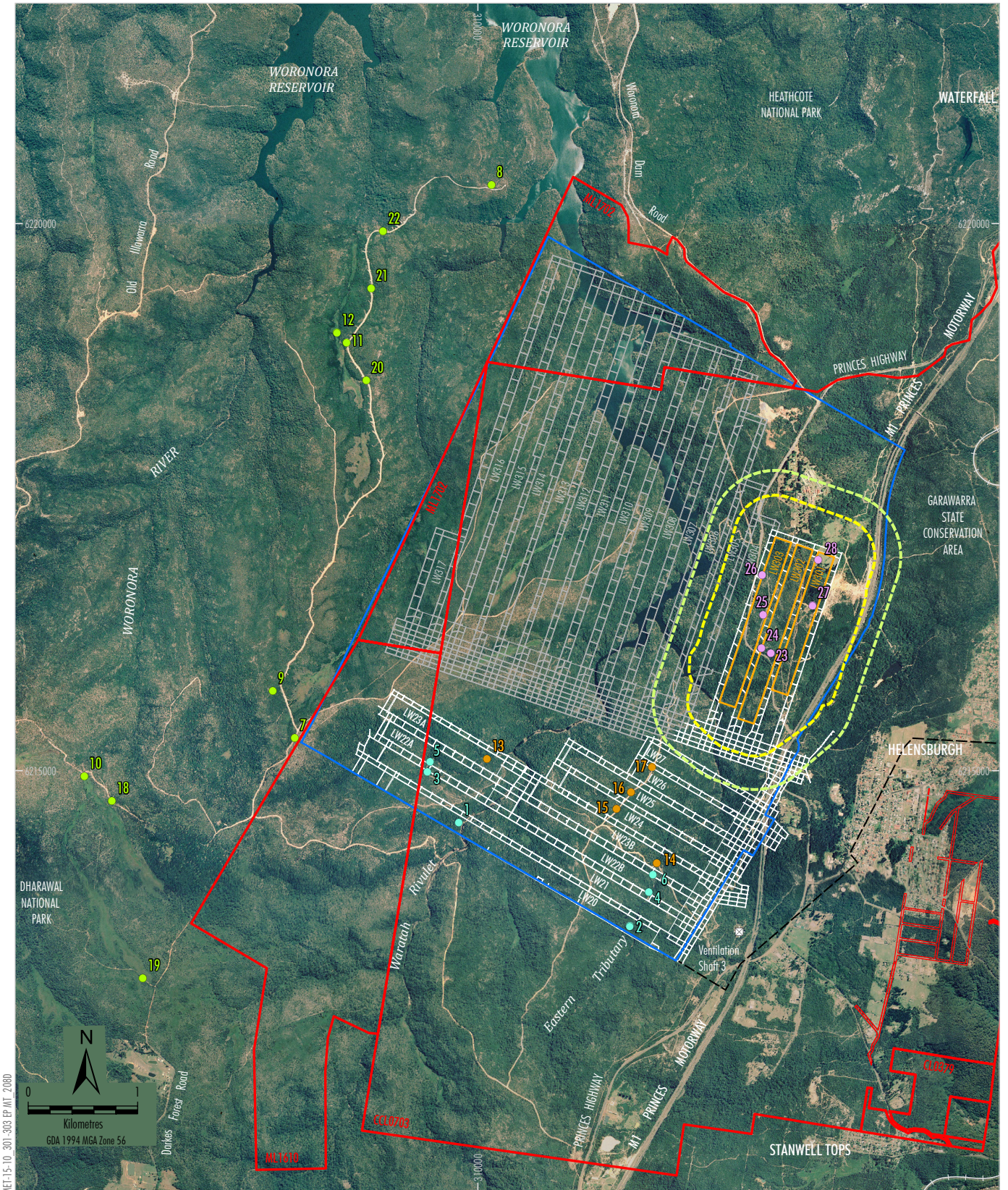
- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - Existing Underground Access 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 (2018); MSEC (2018)

Peabody
METROPOLITAN COAL
Aquatic Ecology Monitoring Locations

Figure 21



- LEGEND**
- Mining Lease Boundary
 - Railway
 - Project Underground Mining Area
Longwalls 20-27 and 301-317
 - Longwalls 301-303 Secondary Extraction
 - 35° Angle of Draw and/or Predicted
20 mm Subsidence Contour
 - 600 m from Secondary Extraction of
Longwalls 301-303
 - Existing Underground Access Drive (Main Drift)

- Monitoring Sites**
- Longwalls 20-22 Amphibian Monitoring
 - Longwalls 23-27 Amphibian Monitoring
 - Longwalls 301-303 Amphibian Monitoring
 - Control Site

Source: Land and Property Information (2015); Date of Aerial Photography 1998;
Department of Industry (2015); Metropolitan Coal (2018); MSEC (2018)

Peabody
METROPOLITAN COAL
Amphibian Monitoring Locations

Figure 22

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 301-303 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 Manager – Technical Services and/or the Environment & Community Superintendent within 24 hours.
- The Manager – Technical Services 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 DP&E, 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 DP&E for approval.
- Metropolitan Coal will implement the approved course of action to the satisfaction of the DP&E.

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 DP&E if either the contingency measures implemented by Metropolitan Coal have failed to remediate the impact or the Secretary of the DP&E 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 21 is designed to support the Trigger Action Response Plans (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 13.
- 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 20 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 DP&E and any other relevant agencies (Table 20) 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 DP&E 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.

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Table 20
Summary of Reporting Framework

Report	Frequency	Distribution	Distribution Method¹	Responsibility for Data Collation and Preparation	Responsibility for Submission
Incident Report	As required	DP&E (Secretary of the DP&E, c/- Executive Director) DRG (Manager and Principal Inspector, Environment) Other regulators as specified in management plans	Email	Manager – Technical Services or Environment & Community Superintendent	Manager – Technical Services, Environment & Community Superintendent or General Manager
Bi-monthly Subsidence Impact Report	Every two months	DP&E (Director, Resource Assessments) WaterNSW (Manager, Mining) DRG (Manager and Principal Inspector, Environment)	Email	Manager – Technical Services or Environment & Community Superintendent	Manager – Technical Services or Environment & Community Superintendent
Six Monthly Report	Six monthly	DP&E (Director, Resource Assessments)	Email and Post	Manager – Technical Services or Environment & Community Superintendent	Manager – Technical Services or Environment & Community Superintendent
Annual Review	Annually	DP&E (Director, Resource Assessments) DRG (Manager and Principal Inspector, Environment) Other regulators as specified in management plans Metropolitan Coal website	Email, Post and Website	Manager – Technical Services or Environment & Community Superintendent	Manager – Technical Services or Environment & Community Superintendent
Complaints Register	Updated following receipt of complaints	Metropolitan Coal website	Website	Environment & Community Superintendent	Environment & Community Superintendent

¹ See Attachment 4 for distribution details.

4.3.2 Bi-monthly Subsidence Impact Reporting

Bi-monthly Subsidence Impact Reports will be prepared every two months if new subsidence impacts are identified. The Bi-monthly Subsidence Impact Report will include:

- a description of the subsidence impact(s) and location;
- whether the observed/recorded impact(s) is within predictions;
- whether the observed/recorded impact(s) exceeds predictions, but remain within performance measures;
- whether the observed/recorded impact(s) exceeds the performance measure(s); and
- associated preliminary characterisation of the impact(s) in accordance with the relevant TARP(s).

4.3.3 Six Monthly Reporting

A Six Monthly Report will be prepared to report on subsidence impacts and environmental consequences associated with the longwalls 301-303 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, 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.

4.3.4 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 DP&E 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;

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- 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.

4.3.5 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.

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.

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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 DP&E, 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 DP&E. 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, 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.

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 the notification of revisions are 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 21. The component management plans provide additional responsibilities under the plans.

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Table 21
Key Extraction Plan Responsibilities

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

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.

Helensburgh Coal Pty Ltd (2008) *Metropolitan Coal Project Environmental Assessment*.

Helensburgh Coal Pty Ltd (2009) *Metropolitan Coal Project Preferred Project Report*.

Metropolitan Coal Pty Ltd (2016a) *Letter to the NSW Department of Planning and Environment, Re: Condition 5, Schedule 3 of the Metropolitan Coal Project Approval*. 5 May 2016.

Metropolitan Coal Pty Ltd (2016b) *Metropolitan Coal Longwalls 301-303 Environmental Risk Assessment Report*. June 2016.

Metropolitan Coal Pty Ltd (2018) *Metropolitan Coal 2017 Annual Review*.

Mine Subsidence Engineering Consultants (2018) *Metropolitan Mine – Longwalls 301 to 303 Subsidence Predictions and Impact Assessments for the Natural and Built Features in Support of the Extraction Plan (MSEC Report MSEC984)*.

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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